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Neurovascular clot retrieving system

Abstract

Various embodiments of devices and methods of use are provided. The device can include a catheter shaft having a proximal end and a distal end. The device can include an extractor. The extractor can include engagement panels located at a first longitudinal location and engagement panels located at a second longitudinal location. The extractor can include a spacer between engagement panels located at the first longitudinal location and engagement panels located at the second longitudinal location. The device can include a sheath, wherein the extractor comprises a collapsed state within the sheath for delivery and an expanded state within a blood vessel. In the expanded state, the engagement panels are configured to engage material between engagement panels located at a first longitudinal location and engagement panels located at a second longitudinal location.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS (1) This application is a continuation of U.S. patent application Ser. No. 18/583,727, filed Feb. 21, 2024, which claims priority benefit to U.S. Provisional Patent Application No. 63/610,696, filed Dec. 15, 2023 and U.S. Provisional Patent Application No. 63/617,321, filed Jan. 3, 2024, the entirety of each is hereby incorporated by reference herein.

BACKGROUND
Field
(1) Some embodiments described herein relate generally to systems and methods for removing a material, such as a blood clot, or foreign materials in the body and, in particular, to methods for treating a neurovascular embolism.
Description of the Related Art
(2) Stroke is the third most common cause of death in the United States and the most disabling

neurologic disorder. Approximately 700,000 patients suffer from stroke annually. Stroke is characterized by the acute onset of a neurological deficit that persists for at least 24 hours and is the result of a disturbance of the cerebral circulation. Stroke incidence increases with age. There are hemorrhagic stroke and ischemic stroke. Hemorrhagic stroke accounts for 20% of the stroke population and occurs due to rupture of an aneurysm or arteriovenous malformation bleeding into the brain tissue resulted in cerebral infarction. Ischemic stroke occurs in 80% of the population and is caused by occluded vessels that deprive the brain of oxygen-carrying blood. Ischemic strokes are caused by emboli that have dislodged from different areas of the body or from the cerebral vessels themselves to occlude in the narrow cerebral arteries more distally. Many such occlusions occur in the middle cerebral artery (MCA), although such is not the only site where emboli come to rest.

(3) Traditionally, medical management of acute ischemic stroke consisted mainly of general supportive care. In 1996, the Food and Drug Administration approved the use of thrombolytic drug, tissue plasminogen activator (t-PA) for treating acute stroke. A randomized, double-blind trial, the National Institute of Neurological Disorders and t-PA Stroke Study, revealed a statistically significant improvement in stroke scale scores at 24 hours in the group of patients receiving intravenous t-PA within 3 hours of the onset of an ischemic stroke. Since the approval of t-PA, an emergency room physician could offer stroke patients an effective treatment besides supportive care.

(4) However, treatment with systemic t-PA is associated with increased risk of intracerebral hemorrhage and other hemorrhagic complications. Patients treated with t-PA were more likely to sustain a symptomatic intracerebral hemorrhage during the first 36 hours of treatment. The frequency of symptomatic hemorrhage increases when t-PA is administered beyond 3 hours from the onset of a stroke. Besides the time constraint in using t-PA in acute ischemic stroke, other contraindications include for example if the patient has had a previous stroke or serious head trauma in the preceding 3 months, if the patient has a systolic blood pressure above 185 mmHg or diastolic blood pressure above 110 mmHg, if the patient requires aggressive treatment to reduce the blood pressure to the specified limits, if the patient is taking anticoagulants or has a propensity to hemorrhage, and/or if the patient has had a recent invasive surgical procedure. As a result, there is only a small percentage of stroke patients are qualified to receive t-PA.

(5) Another treatment to remove the emboli is to mechanically remove the clot or emboli from the vessel. However, the need remains to effectively mechanically remove the clot, such as to completely remove the clot from the vessel. As such, the need remains to efficiently mechanically remove the clot, such as by requiring only a single pass with a clot remover. There are additional needs related to the small scale of the neurovascular vessels.

SUMMARY

(6) Devices and methods are disclosed for treating vessels, including blood vessels and other body lumen other than blood vessels. In some embodiments, the devices and methods are tailored to neurovascular vessels. Currently, there are various stent retriever designs attempts to remove clot from the vessel. However, there are several disadvantages with the current stent retriever or mechanical removal devices. When conventional stent retriever deploys, the entire stent retriever has to deploy in order for the stent retriever to be effective. When deploying, the stent retriever is required to expand inside the clot to engage or secure into the clot. First, this requires time to expand which then prohibits immediate blood flow thus prevents immediate recanalization. Second, if the clot is tough or organized, the stent retriever may not have enough radial force to engage into the clot thereby preventing good engagement rendering the stent retriever ineffective. Another disadvantage is that once the stent retriever is deployed and allowed to engage into the clot, the stent retriever is then retracted or pulled proximally to remove the clot. During the retraction or pulling the stent retriever, the stent retriever tends to axially lengthen or elongate under tension thereby pulling away from the clot and therefore the stent retriever does not hold well onto the clot. As a result, it is required to have multiple passes to retrieve and remove the clot with

the stent retriever. The multiple passes results in longer time to recanalization and reduces the potential for good clinical outcomes. The current stent retriever designs do not completely secure the clot when retrieving the clot due to the tension causing axially lengthening and the clot potentially releasing downstream emboli. Under tension, these stent retrievers axially lengthen and elongate allowing clot material to escape. Additionally, the current stent retrievers have high vessel surface area contact when the stent retriever is fully expanded. The outer surface of the stent-like structure of the stent retriever contacts the vessel wall and that contact can potentially cause vessel trauma during removing the stent retriever.

(7) Specifically, the current mechanical thrombectomy designs such as stent retrievers used to remove the clot from the neurovascular system have several shortcomings. The stent retrievers when deployed require some time in order for the stent retriever to fully expand. This results in a longer time to restore blood flow. Once deployed, the stent retriever expands and should engage into the clot. However, full engagement with the clot is not always achieved. This engagement of the stent retriever can be achieved with soft acute clot. If there are organized tough clot, then the stent retriever is unable to engage the clot. Furthermore, when the stent retriever retracts proximally to remove the clot, the stent retriever has tendency to stretch or elongate. The stent elongation causes the stent retriever to reduce in diameter thereby pulling away from the clot and potentially disengaging from the clot, thus resulting in downstream emboli. The stent retrievers also have high surface contact to the vessel resulting in high friction force that can potentially cause trauma to the vessel wall.

(8) Advantages of certain embodiments described herein include that the extractor can be effective when partially deployed. For instance, only a distal portion of the extractor can be deployed for smaller clots. The engagement panels at the first longitudinal location can be deployed, but engagement panels at another longitudinal location can remain collapsed. The extractor is effective whether engagement panels at one longitudinal location are deployed or engagement panels at a plurality of longitudinal locations are deployed. When deploying, the extractor can expand distal to the clot and the extractor can be pulled proximally to engage the clot. The extractor does not necessarily need to be expanded inside the clot to engage or secure into the clot. The deployment process of the extractor can save time compared to stent retrievers. Time is of the essence to restore blood flow. The extractor can allow immediate blood flow thus immediate recanalization, and in some cases, within about 120, 90, 60, 45, 40, 30, 20, 10 seconds or less, or ranges including any two of the aforementioned values. Further, the extractor is designed to have enough radial force to engage into tough or organized clot. The engagement panels can be supported in the radial direction. The engagement panels can be stacked. The radial force of the extractor allows good engagement rendering the extractor very effective. The extractor can be engaged with the clot and retracted or pulled proximally to remove the clot. During the retraction or pulling the extractor the extractor resists axially lengthening or elongating under tension. The extractor does not pull away from the clot when retracted and therefore holds onto the clot. The extractor may effectively remove the clot in a single pass. The single pass results in a shorter time to recanalization and increases the potential for good clinical outcomes. The extractor completely secures the clot when retrieving the clot due to the tension and thus reduces the risk that the clot releases downstream emboli. Under tension, the extractor does not axially lengthen and elongate in some cases. Additionally, the extractor has low vessel surface area contact when the engagement panels are fully expanded. The outer surface of the extractor minimally contacts the vessel wall which reduces the risk of vessel trauma during removing the extractor.

(9) The extractor or engager has several advantages, including any number of the following. The extractor or engager when deployed requires little time in order for the extractor to fully expand. This resulted in a shorter time to restore blood flow. Once deployed, the extractor expands and engages into the clot or is pulled into engagement with the clot. The extractor can effectively capture soft acute clot. The extractor can effectively capture organized tough clot. The extractor can

capture harder clots that the stent retriever is unable to engage. Furthermore, the extractor does not have a tendency to stretch or elongate. The extractor does not reduce in diameter when retracted. The engagement panels retain their shape when pulled. The engagement panels conform to the vessel wall while maintaining good clot engagement. In some embodiments, the diameter of the engagement panels does not change. In some embodiments, the diameter of the engagement panels conforms to the vessel wall. In some embodiments, the diameter of the engagement panels conforms to the vessel diameter. In some embodiments, the engagement panels are constrained for delivery and open within a vessel to conform to the vessel. The engagement panels can pass along the vessel wall without reducing in diameter. Thereby, the extractor has less tendency to pull away from the clot and potentially disengage from the clot. The extractor has less tendency to create downstream emboli. The extractor also has little surface contact with the vessel resulting in a low friction force that reduces the risk of trauma to the vessel wall. The extractor herein is able to deploy and is fully functional once deployed. Upon retraction of the extractor to remove clot, the engagement panels act independently and do not stretch or elongate under tension thus securing the clot during transit. The engagement panels also have minimal vessel surface contact which reduces the friction between the extractor and vessel, thereby potentially causing less vessel trauma. In some embodiments, the devices and methods completely remove a material from the vessel. In some embodiments, the devices and methods remove a material in a single pass. In some embodiments, the devices and methods can remove a material from other parts of the vascular system such as arterial disease, filtering chronic total occlusion, arteriovenous fistulas, deep vein thrombosis or pulmonary embolism.

(10) In some embodiments, a device for removing material from a patient is provided. The device can include a catheter shaft. The device can include an extractor comprising engagement panels located at a first longitudinal location and engagement panels located at a second longitudinal location. In some embodiments, the extractor comprises a collapsed state for delivery and an expanded state within a blood vessel. In some embodiments, in the expanded state the engagement panels are configured to engage material between engagement panels located at a first longitudinal location and engagement panels located at a second longitudinal location.

(11) In some embodiments, the extractor or engager is unitarily formed from one member. In some embodiments, the extractor can be formed from two or more members. In some embodiments, the member can be a wire. In some embodiments, the member can be solid, tubular and other geometric configurations such as flat ribbon and oval. In some embodiments, the extractor is unitarily formed from one member. In some embodiments, each engagement panel comprises two legs and an arc therebetween. In some embodiments, each engagement panel comprises an eyelet. In some embodiments, legs of the engagement panels at the first longitudinal location do not overlap. In some embodiments, legs of each engagement panels have a constant angle therebetween. In some embodiments, legs of each engagement panels have a different angle therebetween. In some embodiments, legs of each engagement panels extend straight and outwardly. In some embodiments, legs of each engagement panels can have any pattern. In some embodiments, legs of each engagement panels have a curve. In some embodiments, legs of each engagement panels are a zig zag. In some embodiments, each engagement panel comprises an eyelet to receive the catheter shaft. In some embodiments, engagement panels located at the first longitudinal location and engagement panels located at the second longitudinal location are moveable relative to the catheter shaft. In some embodiments, engagement panels located at the first longitudinal location and engagement panels located at the second longitudinal location are fixed relative to the catheter shaft. In some embodiments, engagement panels located at the first longitudinal location comprise three engagement panels. In some embodiments, engagement panels located at the first longitudinal location comprise four engagement panels. In some embodiments, the engagement panels located at the first longitudinal location comprise two engagement panels. In some embodiments, engagement panels located at the first longitudinal location comprise a

single helical engagement panel. In some embodiments, engagement panels located at the first longitudinal location comprise a double helical engagement panel. In some embodiments, engagement panels located at the first longitudinal location comprise a plurality helical engagement panels. In some embodiments, the engagement panels initial expanded portion revert proximally when the engagement panels first deploy. In some embodiments, the engagement panels second expanded portion extend outward. In some embodiments, engagement panels located at the first longitudinal location comprise of five, six, seven or more engagement panels. In some embodiments, engagement panels have space between them. In some embodiments, engagement panels can be next to each other in series with no spacer (thereby minimal to no gap). In some embodiments, the engagement panels' initial expanded portion revert proximally when the engagement panels first deploy. In some embodiments, the engagement panels' second expanded portion extend outward. In some embodiments, engagement panels located at the first longitudinal location deploy simultaneously. In some embodiments, the extractor further comprises a spacer between engagement panels located at the first longitudinal location and engagement panels located at the second longitudinal location. In some embodiments, the spacer comprises a tube. In some embodiments, the spacer comprises a coil. In some embodiments, the spacer comprises a single ring or a plurality of rings. In some embodiments, the spacer is integrally formed with the engagement panels located at the first longitudinal location and engagement panels located at the second longitudinal location. In some embodiments, the spacer provides an open space between the engagement panels located at the first longitudinal location and engagement panels located at the second longitudinal location. In some embodiments, the spacer is movable relative to the catheter shaft. In some embodiments, the spacer is fixed relative to the catheter shaft. In some embodiments, engagement panels located at the first longitudinal location are configured to engage a clot while the engagement panels located at the second longitudinal location are collapsed. In some embodiments, engagement panels located at the first longitudinal location and engagement panels located at the second longitudinal location are configured to engage a clot while additional engagement panels are collapsed. In some embodiments, the device can include a connecting member between engagement panels located at the first longitudinal location and engagement panels located at the second longitudinal location. In some embodiments, the connecting member is radially offset from a central axis of the catheter shaft. In some embodiments, the catheter shaft is a core wire. In some embodiments, the core wire has a taper at the distal end. The core wire can be produced in the form of laser cut hypotube or any geometric configurations. In some embodiments, the engagement panels do not comprise sharp edges and are configured to be atraumatic with respect to the blood vessel. In some embodiments, a device for removing material from a patient, comprising any number of features as disclosed herein.
(12) In some embodiments, a device for removing material from a patient is provided. The device can include a catheter shaft or core wire. The device can include an extractor comprising engagement panels located at a first longitudinal location and engagement panels located at a second longitudinal location. The device can include a sheath. In some embodiments, the extractor comprises a collapsed state within the sheath for delivery and an expanded state within a blood vessel. In some embodiments, in the expanded state the engagement panels are configured to engage material between engagement panels located at a first longitudinal location and engagement panels located at a second longitudinal location.
(13) In some embodiments, engagement panels located at the first longitudinal location are configured to engage a clot while the engagement panels located at the second longitudinal location are collapsed within the sheath. In some embodiments, engagement panels located at the first longitudinal location and engagement panels located at the second longitudinal location are configured to engage a clot while additional engagement panels are collapsed within the sheath. In some embodiments, the engagement panels do not comprise sharp edges and are configured to be atraumatic with respect to the blood vessel. In some embodiments, the extractor further comprises a

spacer between engagement panels located at the first longitudinal location and engagement panels located at the second longitudinal location.

(14) In some embodiments, a device for removing material from a patient is provided. The device can include a catheter shaft or core wire. The device can include a distal member. The device can include an extractor comprising engagement panels located at a first longitudinal location and engagement panels located at a second longitudinal location. In some embodiments, the extractor further comprises an open space or spacer between engagement panels located at the first longitudinal location and engagement panels located at the second longitudinal location. In some embodiments, the distal member and the extractor comprise a collapsed state for delivery and an expanded state within a blood vessel. In some embodiments, in the expanded state the engagement panels are configured to engage material between engagement panels located at a first longitudinal location and engagement panels located at a second longitudinal location. The device can include a sheath. In some embodiments, the extractor comprises a collapsed state within the sheath for delivery and an expanded state within a blood vessel.

(15) In some embodiments, engagement panels located at the first longitudinal location are configured to engage a clot while the engagement panels located at the second longitudinal location are collapsed within the sheath. In some embodiments, engagement panels located at the first longitudinal location and engagement panels located at the second longitudinal location are configured to engage a clot while additional engagement panels are collapsed within the sheath. In some embodiments, the extractor further comprises a spacer between engagement panels located at the first longitudinal location and engagement panels located at the second longitudinal location.

(16) In some embodiments, a device for removing material from a patient is provided. The device can include a distal member. The device can include an extractor comprising engagement panels located at a first longitudinal location and engagement panels located at a second longitudinal location. In some embodiments, the distal member and the extractor comprise a collapsed state for delivery and an expanded state within a blood vessel. In some embodiments, in the expanded state the engagement panels are configured to engage material between engagement panels located at a first longitudinal location and engagement panels located at a second longitudinal location.

(17) In some embodiments, the distal member is positioned distal, within, or proximal to the extractor. In some embodiments, the distal member is configured to straighten in the collapsed state. In some embodiments, the distal member is comprised of plurality of members. In some embodiments, the engagement panels located at the first longitudinal location form a relatively complete circle configured to be in contact with a vessel. In some embodiments, the engagement panels located at the first longitudinal location and the engagement panels are configured to have minimal surface contact with a vessel wall. In some embodiments, the engagement panels located at the first longitudinal location and the engagement panels are separated longitudinally by a connecting member. In some embodiments, the engagement panels located at the first longitudinal location are configured to expand without stretching or shortening.

(18) In some embodiments, a device for removing material from a patient is provided. The device can include a distal member. The device can include an extractor comprising engagement panels located at a first longitudinal location and engagement panels located at a second longitudinal location. In some embodiments, the distal member and the extractor comprise a collapsed state for delivery and an expanded state within a blood vessel. In some embodiments, in the expanded state the engagement panels are configured to engage material between engagement panels located at a first longitudinal location and engagement panels located at a second longitudinal location.

(19) In some embodiments, the distal member is positioned distal to the extractor. In some embodiments, the distal member is configured to collect loose clot, soft clot and/or in transit clot. In some embodiments, the distal member is configured to straighten in the collapsed state. In some embodiments, the distal member comprises a tubular portion and an expanded portion in the expanded state. In some embodiments, there are three or four engagement panels located at the first

location. In some embodiments, there are three or four engagement panels located at the second location. In some embodiments, the engagement panels located at the first longitudinal location comprise a first eyelet and the engagement panels located at the second longitudinal location comprise a second eyelet. In some embodiments, the engagement panels located at the first longitudinal location are formed from a single wire. In some embodiments, the engagement panels located at the first longitudinal location and the engagement panels at the second longitudinal location are formed from a single wire. In some embodiments, the engagement panels located at the first longitudinal location form a relatively complete circle configured to be in contact with a vessel. In some embodiments, the engagement panels located at the first longitudinal location are configured to have minimal surface contact with a vessel wall. In some embodiments, the engagement panels located at the first longitudinal location and the engagement panels located at the second longitudinal location are configured to have minimal surface contact with a vessel wall. In some embodiments, the engagement panels located at the first longitudinal location and the engagement panels located at the second longitudinal location are configured to move relative to each other. In some embodiments, the engagement panels located at the first longitudinal location comprise pores radially inward from the perimeter of the engagement panels. In some embodiments, the engagement panels located at the first longitudinal location and the engagement panels located at the second longitudinal location are separated longitudinally by a connecting member. In some embodiments, the engagement panels located at the first longitudinal location are configured to expand without stretching or shortening. In some embodiments, the engagement panels located at the first longitudinal location are configured to radially expand to open. In some embodiments, the engagement panels located at the first longitudinal location comprise a double wire.

(20) In some embodiments, a device for removing material from a patient is provided. The device can include a catheter shaft. The device can include an extractor comprising a first array of engagement panels located at a first longitudinal location and a second array of engagement panels located at a second longitudinal location. In some embodiments, the extractor further comprises a spacer between the first array of engagement panels located at the first longitudinal location and the second array engagement panels located at the second longitudinal location. In some embodiments, the extractor comprises a collapsed state for delivery and an expanded state within a blood vessel. In some embodiments, in the expanded state the engagement panels are configured to engage material between the first array of engagement panels located at the first longitudinal location and the second array of engagement panels located at the second longitudinal location.

(21) In some embodiments, the first array of engagement panels comprises a first engagement panel and a second engagement panel operably coupled to the catheter shaft, wherein the first engagement panel and the second engagement panel are configured to at least partially contact each other when the extractor is in the expanded state. In some embodiments, the second array of engagement panels comprises a first engagement panel and a second engagement panel operably coupled to the catheter shaft, wherein the first engagement panel and the second engagement panel are configured to at least partially contact each other when the extractor is in the expanded state. In some embodiments, the first array of engagement panels comprises at least four engagement panels. In some embodiments, the second array of engagement panels comprises at least four engagement panels.

(22) In some embodiments, the device can include a distal member. In some embodiments, the catheter shaft comprises a plurality of segments. In some embodiments, the plurality of segments of the catheter shaft are operably connected via a sleeve connector. In some embodiments, each of the arrays of engagement panels comprises at least one radiopaque marker. In some embodiments, the at least one radiopaque marker is operably connected to a leg of an engagement panel. In some embodiments, the at least one radiopaque marker is operably connected to an arc of an engagement panel. In some embodiments, the engagement panels do not comprise sharp edges and are

configured to be atraumatic with respect to the blood vessel.

(23) In some embodiments, a method of removing a thrombus from a target cerebral blood vessel is provided. The method can include deploying a guidewire into an access vessel. The method can include advancing the guidewire into the target cerebral blood vessel and across the thrombus. The method can include advancing a catheter across the thrombus. In some embodiments, the catheter houses an extractor comprising a first array of engagement panels located at a first longitudinal location and a second array of engagement panels located at a second longitudinal location. The method can include deploying at least a portion of the extractor such that the first array of engagement panels is positioned distal to the thrombus and the second array of engagement panels is positioned within the thrombus or proximal to the thrombus. The method can include withdrawing the extractor from the target cerebral vessel, thereby capturing at least a portion of the thrombus.

(24) In some embodiments, the extractor further comprises a spacer or free space between the first array of engagement panels location at the first longitudinal location and the second array engagement panels located at the second longitudinal location. In some embodiments, the second array of engagement panels located at the second longitudinal location are configured to engage the thrombus while additional engagement panels are collapsed. In some embodiments, the thrombus is located within the middle cerebral artery. In some embodiments, as the catheter is retracted proximally, the first array of engagement panels revert proximally. In some embodiments, as the catheter is retracted proximally, the first array of engagement panels move outward until the engagement panels are relatively aligned with a respective eyelet. In some embodiments, as the catheter is retracted proximally, the first array of engagement panels expand to the diameter of the target cerebral blood vessel.

(25) In some embodiments, the extractor or engager is unitarily formed from one member. In some embodiments, the extractor can be formed from two or more members. In some embodiments, the extractor can be formed of two or more elongated members. In some embodiments, the member can be a wire. In some embodiments, the member can be a single wire. In some embodiments, the member can be a double wire. In some embodiments, the member can be a triple wire. In some embodiments, the elongate members are side-by-side. In some embodiments, the elongated members are twisted or woven. In some embodiments, the wire can be made of solid super elastic nitinol wire. In some embodiments, the wire can be made of DFT wire (drawing filled tubing) Nitinol with platinum core. In some embodiments, the member can be solid, tubular, and other geometric configurations such as flat ribbon and oval. In some embodiments, each engagement panel comprises two legs and an arc therebetween. In some embodiments, each engagement panel comprises an eyelet. In some embodiments, legs of the engagement panels at the first longitudinal location do not overlap. In some embodiments, legs of each engagement panels have a constant angle therebetween. In some embodiments, legs of each engagement panels have a different angle therebetween. In some embodiments, legs of each engagement panels extend straight and outwardly. In some embodiments, legs of each engagement panels can have any pattern. In some embodiments, legs of each engagement panels have a curve. In some embodiments, the panel has radiopaque marker bands. In some embodiments, the radiopaque marker band is a coil. The marker bands can be made of platinum/iridium tube or coils. In some embodiments, the radiopaque marker band is cylindrical or circular. In some embodiments, there is one marker band. In some embodiments, there are a plurality of marker bands. In some embodiment, there is one or more marker bands along the length of the distal end of the catheter. In some embodiment, there is one or more marker bands along the length of the proximal end of the catheter. In some embodiments, legs of each engagement panels are a zig zag. In some embodiments, the engagement panels at each longitudinal location comprises an eyelet to receive the catheter shaft. In some embodiments, the engagement panels located at the first longitudinal location and the engagement panels located at the second longitudinal location are moveable relative to the catheter shaft. In some embodiments,

the engagement panels located at the first longitudinal location and the engagement panels located at the second longitudinal location are fixed relative to the catheter shaft. In some embodiments, the engagement panels located at the first longitudinal location comprise three engagement panels. In some embodiments, the engagement panels located at the first longitudinal location comprise four engagement panels. In some embodiments, the engagement panels located at the first longitudinal location comprise a single helical engagement panel. In some embodiments, the engagement panels located at the first longitudinal location comprise a double helical engagement panel. In some embodiments, the engagement panels located at the first longitudinal location comprise a plurality helical engagement panels.

(26) In some embodiments, an initial expanded portion of engagement panels revert proximally when the engagement panels first deploy. In some embodiments, a second expanded portion of engagement panels extend outward. In some embodiments, the arcs of the engagement panels at the first longitudinal location are in a first, constrained position where the arcs of the engagement panels are distal to the eyelet at the first longitudinal location. The arcs of the engagement panels can be folded downward toward the catheter shaft or core wire. The arcs of the engagement panels can lie down. The arcs of the engagement panels can be coaxial with the catheter shaft or core wire. The arcs of the engagement panels can extend distally. The arcs of the engagement panels can extend toward the distal member. The arcs of the engagement panels can be within a loading tube assembly or microcatheter in in the first, constrained position. In some embodiments, the arcs of the engagement panels at the second longitudinal location are in the first, constrained position where the arcs of the engagement panels are distal to the eyelet at the second longitudinal location. In some embodiments, the arcs of the engagement panels at the third longitudinal location are in the first, constrained position where the arcs of the engagement panels are distal to the eyelet at the third longitudinal location. The engagement panels at the first longitudinal location and the second longitudinal location can fold in the same direction, such as distally. The engagement panels at the second longitudinal location and the third longitudinal location can fold in the same direction, such as distally. The engagement panels at the first longitudinal location and the third longitudinal location can fold in the same direction, such as distally. The engagement panels at the first longitudinal location and the second longitudinal location can fold in opposite directions, such as distally for the engagement panels at the first longitudinal location and proximally for the engagement panels at the second longitudinal location. The engagement panels at the second longitudinal location and the third longitudinal location can fold in opposite directions, such as distally for the engagement panels at the second longitudinal location and proximally for the engagement panels at the third longitudinal location. The engagement panels at the first longitudinal location and the third longitudinal location can fold in opposite directions, such as distally for the engagement panels at the first longitudinal location and proximally for the engagement panels at the third longitudinal location.

(27) In some embodiments, the arcs of the engagement panels at the first longitudinal location are in the second, expanded position where the arcs revert proximally and outwardly. The arcs of the engagement panels at the first longitudinal location can be relatively inline with the eyelet at the first longitudinal location. The arcs of the engagement panels can be substantially perpendicular to the catheter shaft or core wire. The arcs of the engagement panels can be radially outward from the eyelet. The arcs of the engagement panels can be substantially perpendicular to the eyelet. The arcs of the engagement panels can extend to the vessel wall. The arcs of the engagement panels can extend can expand to the diameter of the vessel. The arcs of the engagement panels can be distal to a loading tube assembly or microcatheter in the second, expanded position. In some methods, reverting from the first, constrained position to the second, expanded position will scrap along the vessel wall and/or grab the material as the engagement panels move from the first, constrained position to the second, expanded position. In some embodiments, the legs of the engagement panels at the first longitudinal location are next to each other along the length of the catheter or core wire

in the first, constrained position. The legs of the engagement panels are folded inward along the catheter or core wire. The legs of the engagement panels can lie down. In some embodiments, the legs of the engagement panels at the first longitudinal location are farther apart in the second, expanded position. The legs of the engagement panels extend outward from the respective eyelet in the second, expanded position.

(28) For example, the arc of the engagement panels initially expands proximally, where the arc portions of the engagement panels move proximally or revert proximally as the loading tube assembly or microcatheter or delivery catheter is retracted. Reverting the arcs of the engagement panels proximally will allow the engagement panels to capture and secure the clot better. As the delivery catheter is further retracted, the legs of the engagement panels extends outward in the second, expanded position. In some embodiments, the engagement panels located at the first longitudinal location comprise of two, three, four, five, six, seven, eight, nine, ten, or more engagement panels.

(29) In some embodiments, the engagement panels have space between them. In some embodiments, the engagement panels can be next to each other in series with no spacer (thereby minimal to no gap). In some embodiments, the engagement panels located at the first longitudinal location deploy simultaneously. In some embodiments, the engagement panels located at the first longitudinal location deploy independently. In some embodiments, the engagement panels located at the first longitudinal location deploy sequentially. In some embodiments, the eyelet of the engagement panels is stacked together with no gap. The elongate member or wire forms a portion of the eyelet, the leg of the first engagement panel at the first longitudinal location, the arc of the first engagement panel, and the leg of the first engagement panel. Then, with little to no gap, the elongate member forms a portion of the eyelet, the leg of the second engagement panel at the first longitudinal location, the arc of the second engagement panel, and the leg of the second engagement panel. Then, with little to no gap, the elongate member can form additional engagement panels at the first longitudinal location. The eyelet can be formed such that the engagement panels at the first longitudinal location deploy together or substantially together from the first, constrained position to the second, expanded position. In some embodiments, the eyelet of the engagement panels has a gap so that the engagement panels at the first longitudinal location deploy independently. The elongate member or wire forms a portion of the eyelet, the leg of the first engagement panel at the first longitudinal location, the arc of the first engagement panel, and the leg of the first engagement panel. Then, in some embodiments, the elongate member can form multiple coils to form a gap. Then, after the gap, the elongate member forms a portion of the eyelet, the leg of the second engagement panel at the first longitudinal location, the arc of the second engagement panel, and the leg of the second engagement panel. Then, with additional gaps therebetween, the elongate member can form additional engagement panels at the first longitudinal location. The eyelet can be formed such that the engagement panels at the first longitudinal location deploy independently from the first, constrained position to the second, expanded position. The eyelet can be formed such that the engagement panels at the first longitudinal location deploy sequentially from the first, constrained position to the second, expanded position. In some embodiments, the engagement panels located at the first longitudinal location and the engagement panels at the second longitudinal location deploy independently. In some embodiments, the engagement panels located at the first longitudinal location and the engagement panels at the second longitudinal location deploy sequentially.

(30) In some embodiments, the extractor includes a spacer between the engagement panels at the first longitudinal location and the engagement panels at the second longitudinal location. In some embodiments, the spacer comprises a tube. In some embodiments, the spacer comprises a coil. In some embodiments, the spacer is located between the engagement panels at the first longitudinal location and the engagement panels at the second longitudinal location. In some embodiments, the spacer is continuous with the eyelets. In some embodiments, the spacer is integrally formed with

the engagement panels located at the first longitudinal location and the engagement panels located at the second longitudinal location. In some embodiments, the spacer provides an open space between the engagement panels located at the first longitudinal location and the engagement panels located at the second longitudinal location. In some embodiments, the engagement panels located at the first longitudinal location are configured to engage a clot while the engagement panels located at the second longitudinal location are collapsed. In some embodiments, the engagement panels located at the first longitudinal location and the engagement panels located at the second longitudinal location are configured to engage a clot while additional engagement panels are collapsed. In some embodiments, the device can include a connecting member between the engagement panels located at the first longitudinal location and the engagement panels located at the second longitudinal location. In some embodiments, the spacer is movable relative to the catheter shaft. In some embodiments, the spacer is fixed relative to the catheter shaft. In some embodiments, the catheter shaft is a core wire. In some embodiments, the core wire has a taper at the distal end. In some embodiments, the core wire can be produced in the form of laser cut hypotube or any geometric configurations. In some embodiment, the extractor includes a distal member or distal plug. The distal member is positioned distal to the extractor to collect loose clot, soft clot and/or in transit clot.

(31) In some embodiments, a device for removing material from a patient is provided. The device can include a catheter shaft or core wire. The device can include an extractor comprising engagement panels located at a first longitudinal location and engagement panels located at a second longitudinal location. In some embodiments, the extractor further comprises a spacer between engagement panels located at the first longitudinal location and engagement panels located at the second longitudinal location. The device can include a distal member. The device can include a loading tube or sheath or a tubular member. In some embodiments, the extractor comprises a collapsed state within the sheath or tubular member for delivery and an expanded state within a blood vessel. In some embodiments, in the expanded state the engagement panels are configured to engage material between engagement panels located at a first longitudinal location and engagement panels located at a second longitudinal location.

(32) In some embodiments, engagement panels located at the first longitudinal location are configured to engage a clot while the engagement panels located at the second longitudinal location are collapsed within the sheath or tubular member. In some embodiments, engagement panels located at the first longitudinal location and engagement panels located at the second longitudinal location are configured to engage a clot while additional engagement panels are collapsed within the sheath or tubular member. In some embodiments, the extractor further comprises a spacer between engagement panels located at the first longitudinal location and engagement panels located at the second longitudinal location. In some embodiments, systems and methods as disclosed herein can include any number of the following advantages. In some embodiments, clots or other unwanted material within a body lumen can be removed without requiring deployment, expansion, and/or unsheathing of the entire length of the extractor as sets of engagement panels can act independently relative to other sets of engagement panels. In some embodiments, the atraumatic sets of engagement panels can control clot removal by pinching or otherwise exerting forces, such as axial forces, between adjacent sets of longitudinally spaced-apart engagement panels. In some embodiments, the spacer between engagement panels can control the distance and force exerted between adjacent sets of longitudinally spaced-apart engagement panels. In some embodiments, the engagement panels can be integrally formed from a single wire, a single material and/or a tubular member for improved durability and manufacturing. In some embodiments, each engagement panel forms a perimeter surrounding a free space or pore devoid of material. The pore advantageously reduces size and weight of the extractor and improves maneuverability of the extractor without adversely affecting control of clot removal. In some embodiments, each set of engagement panels are operably connected to each other with one or more connecting elements. The connecting

elements can be discrete from and radially offset from the catheter or core wire. The arrangement of the connecting elements can further modulate actuation between adjacent sets of engagement panels while still allowing each set of engagement panels to act independently of one another. In some embodiments, one or more of the engagement panels have radiopaque markers or material to improve visualization. In some embodiments, the engagement panel has a distal member to prevent clot distal migration. In some embodiments, the engagement panels can be adjusted at the proximal ends to increase the space or opening between the engagement panels at the first and second longitudinal locations or decrease the space or opening between the engagement panels at the first and second longitudinal locations. In some embodiments, a system, device, or method can include any number of features as disclosed herein. In some embodiments, a system, device, or method does not comprise one or more features disclosed herein.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) The structure and method of use will be better understood with the following detailed description of embodiments, along with the accompanying illustrations, in which:
(2) FIG. **1** is a side view of an embodiment of a helical engagement panel extractor.
(3) FIG. **2** is a side view of an embodiment of a three engagement panel extractor.
(4) FIG. **3** is a side view of an embodiment of a helical engagement panel extractor.
(5) FIGS. **4**A-**4**G are views of deployment of the first panel of the first embodiment of the three engagement panels extractor.
(6) FIGS. **5**A-**5**G are views of deployment of the second panel of the first embodiment of the three engagement panels extractor.
(7) FIGS. **6**A-**6**G are views of deployment of the first panel of a second embodiment of the four engagement panels extractor.
(8) FIGS. **7**A-**7**G are views of deployment of the second panel of an extractor the second embodiment of the four engagement panels extractor.
(9) FIGS. **8**A-**8**G are views of further detailed deployment of the first panel of the first embodiment of the extractor.
(10) FIGS. **9**A-**9**H are views of further detailed deployment of the second panel of the first embodiment of the extractor.
(11) FIG. **10** is a top view of the second embodiment of the four engagement panels extractor.
(12) FIGS. **11-14** are side views of the second embodiment of the four engagement panels extractor.
(13) FIG. **15** is another view of the second embodiment of the extractor.
(14) FIGS. **16-18** are views of the third embodiment of the helical engagement panel extractor.
(15) FIGS. **19-26** are views of the first embodiment of the three engagement panels extractor.
(16) FIGS. **27-30** are views of the third embodiment of the helical engagement panel extractor.
(17) FIG. **31** is a view of the third embodiment of the helical engagement panels extractor.
(18) FIGS. **32-34** are views of the second embodiment of the three engagement panels extractor deployed.
(19) FIGS. **35-39** are views of the first embodiment of the helical engagement panel extractor with spacer in between the engagement panels and eyelets.
(20) FIGS. **40-42** are views of the third embodiment of the helical engagement panel extractor with spacer in between the engagement panel.
(21) FIGS. **43-44** are view of the second embodiment of the four engagement panel extractor with spacer in between the engagement panels and eyelets.
(22) FIGS. **45-47** are view of the first embodiment of the three engagement panel extractor fixed on

the catheter shaft.
(23) FIGS. **48-52** are views of the third embodiment of the helical engagement panel extractor with spacers between the engagement panels and eyelets.
(24) FIG. **53** is view of a three engagement panels extractor system.
(25) FIG. **54** is view of a three engagement panels extractor system with integral coil spacer.
(26) FIG. **55** is view showing a panel and coil spacer.
(27) FIG. **56** is another view showing the engagement panel.
(28) FIG. **57** is view of a four engagement panels extractor system with coil spacer of a fourth embodiment.
(29) FIG. **58** is view showing a panel of a four engagement panels extractor system of the fourth embodiment.
(30) FIG. **59** is view of a four engagement panels extractor system with integral coil spacer of the fourth embodiment.
(31) FIG. **60** is view of another four engagement panels extractor system with integral coil spacer of the fourth embodiment
(32) FIG. **61** is view of the four engagement panels extractor system of the fourth embodiment.
(33) FIG. **62** is view of the four engagement panels extractor system with coil spacer of the fourth embodiment.
(34) FIG. **63** is another view of the four engagement panels with closed gap coil spacer of the fourth embodiment.
(35) FIG. **64** is another view of the four engagement panels with open gap coil spacer of the fourth embodiment.
(36) FIG. **65** is view of the four engagement panels extractor without spacer. The extractor engagement panels are in an unconstrained or unstretched position of the fourth embodiment.
(37) FIG. **66** is another view of the four engagement panels extractor with spacer and is in an unconstrained unstretched position of the fourth embodiment.
(38) FIG. **67** is another view of the extractor of the second embodiment.
(39) FIG. **68** is a view of an extractor with double four engagement panels with a proximal core wire, sleeve connector and distal core wire of a fifth embodiment.
(40) FIG. **69** is a view of the double four engagement panels of the fifth embodiment.
(41) FIG. **70** is another view of the double four engagement panels of the fifth embodiment.
(42) FIG. **71** is another view of the double four engagement panels where the panels can be 1, 2, 3 or more layers of nitinol, Stainless steel or shape memory polymers of the fifth embodiment.
(43) FIG. **72** is another view of the double four engagement panels with support coils and PTFE jacket of the fifth embodiment.
(44) FIG. **73** is a view of the loading tube assembly used to load the extractor into the delivery catheter. The loading tube assembly can also be a sheath or a tubular member.
(45) FIG. **74** is a view of the single four engagement panels of the fifth embodiment.
(46) FIG. **75** is a view of the single four engagement panels with marker bands that can be made of platinum/iridium tube or coils. The engagement panels can be made of solid elastic nitinol wire or DFT wire (drawn filled tubing) Nitinol with platinum core of the fifth embodiment.
(47) FIGS. **76**A-**76**B are views of the single four engagement panels with platinum coils and radiopaque markers of the fifth embodiment.
(48) FIG. **77** is another view of the single four engagement panels with marker bands showing at both ends of the fifth embodiment.
(49) FIG. **78**A is a view of the single four engagement panels of the fifth embodiment. FIG. **78**B is a view of a distal member.
(50) FIG. **79** is a view of the extractor in the expanded configuration and loading tube assembly. The loading tube assembly can also be a tubular member or a sheath.
(51) FIGS. **80**A-**80**B are views of a stent retriever assembly.

(52) FIGS. **81**A-C are views of the extractor and a proximal funnel assembly.
(53) FIGS. **82**A-**82**B are views of the extractor that is within the stent retriever assembly.
(54) FIGS. **83**A-**83**C are views of the extractor that can be distal to and/or within the stent retriever.
(55) FIGS. **84**A-**84**D are views of the single four engagement panels with multiple distal members. The distal member can be positioned at any location along the extractor to collect loose clot, soft clot, or in transit clot.
(56) FIGS. **85**A-**85**B are views of the single four engagement panels showing a single distal member configuration and a multiple distal members configuration.
(57) FIGS. **86**A-**86**B are views of the single four engagement panels of the fifth embodiment. The panels can have angles alpha, beta, pi, lamda. The panels can have arcs theta.
(58) FIGS. **87**A-**87**C are view of the extractor showing the engagement panels and connecting members.
(59) FIGS. **88**A-**88**B are view of the distal member.
(60) FIGS. **89**A-**89**C are views of the single four engagement panels of the fifth embodiment.
(61) FIGS. **90**A-**90**C are views of the double four engagement panels of the fifth embodiment.
(62) FIGS. **91**A-**91**C are additional views of the single four engagement panels of the fifth embodiment.
(63) FIGS. **92**A-**92**H are views of the distal member and the loading tube assembly.
(64) FIGS. **93**A-**93**F are views of methods of use.
(65) FIGS. **94**A-**94**B are views of engagement panels.
DETAILED DESCRIPTION
(66) Mechanical therapies can be provided such as capturing and removing a clot or emboli, dissolving the clot, disrupting and suctioning the clot, and/or creating a flow channel through the clot. The MERCI Retriever System was one of the first mechanical devices developed for stroke treatment. The retriever consists of a wire with a helical coil formed at the distal end. For the procedure, a guide catheter with a balloon at the tip is placed in the internal carotid artery (ICA). A microcatheter is threaded through the balloon guide catheter and used to introduce the MERCI retriever across the clot. The microcatheter is then pulled back to deploy the retriever around the clot or emboli. The microcatheter and retriever are then pulled back together, along with the clot or emboli, into the balloon guide catheter. The balloon of the guide catheter is inflated, and a syringe is connected to the balloon guide catheter to aspirate the guide catheter while the clot or emboli are inside the guide catheter. There remains a need for mechanical systems to retrieve clots. Some systems and methods do not include any balloon members.
(67) Physicians currently perform thrombectomies with new generation stent retrievers to resolve ischemic stroke. Stent retrievers can be stent-like devices to capture material. Generally, the physician deploys the stent retriever into the clot to engage within the clot. The physician then withdraws the stent retriever while it is expanded against and engaging within the clot. The physician must be able to withdraw the clot through the vasculature into a guide catheter positioned within vessels. Even in successful procedures, a physician's objective is to prevent the vessel wall or lumen from experiencing trauma. The physician also desirably prevents dislodging the clot or emboli as the stent retriever passes through the vasculature when removing the stent retriever. Another risk in such a procedure is that the clot or emboli can break free from the stent retriever and lodge in smaller downstream vessels causing more concern than the original blockage. If the clot or emboli breaks free from the device and flows downstream, the loose clot or emboli may become trapped in smaller and more tortuous vessels. This will be difficult for the physician to use the same stent retriever device to again remove the clot because the device may be too large in the new obstruction location. There remain some disadvantages using this approach. There remains a need for better mechanical systems to retrieve clots.
(68) One challenge with designing clot or emboli removal devices is the nature of the neurovascular vasculature around the clot or emboli. The neurovascular vasculature system is

fragile and delicate. Neurovascular vessels are more fragile than similarly sized vessels in other parts of the body. Applying excessive force to these vessels could result in perforations and hemorrhage. Another challenge is the wide range of clot composition and morphologies. More mature and organized subacute clot material is less compressible than softer, fresher acute clot. In some instances, the organized clot is tightly wedged in the blood vessel due to the flow of blood and pressure exerted onto the clot or emboli. This further causes additional difficulties and challenges for retriever devices, such as for extraction and aspiration devices, to pull the clot or emboli away. Aspiration may require additional suction pressure which tends to be not effective with small bore catheters. Extraction devices, like the stent retriever, may have shortcomings since the radial force may not be high enough to engage or grab the clot securely especially if the clot is robust and organized. In situations where the clot is more organized, the stent retriever device may tend to slide against the vessel wall and not engage the clot or emboli. With the higher radial force produced by the stent retriever device, there is a risk of extending the vessel causing further difficulty retrieving the clot and potentially creating vessel trauma. Additionally, during retraction of the stent retriever device, the radial force exerted on the vessel wall causes the vessel perforators to extend and potentially cause vessel damage and hemorrhage. Thus, the current devices are typically not suited for material removal in the neurovascular vasculature.
(69) Current devices include stent retrievers, stent-like devices, that are being used to remove clots. Stent retrievers are self-expanding devices attached to the end of a long catheter shaft, which are advanced through a microcatheter and deployed across clot obstructions to engage and remove the clot.
(70) One disadvantage of some stent retrievers is that they can mainly rely on an outward radial force to retain and grip on the clot. If the radial force is too low, then the stent retrievers is unable to encapsulate or engage the clot radially, particularly when the clot is tough and/or organized. The stent retrievers may lose their grip on the clot. If the radial force is too high, then the stent retrievers can damage the vessel wall and also the stent retrievers may require excessive force to withdraw or pull the stent retrievers from the vessel. The stent retrievers that apply sufficient radial force to deal with all clot types may cause vessel trauma and the stent retrievers that have low radial force to remain atraumatic may not effectively retrieve all clot types. Furthermore, during retraction of the stent retriever through tortuous anatomy, the stent retriever will axially lengthen or elongate, and this stretching causes the stent retriever diameter to reduce in size thereby pulling away from the clot and causing potential emboli.
(71) Another potential disadvantage with some stent retrievers is with the pinning mechanism itself. The stent retrievers that rely exclusively on pinning clots against a vessel wall may not restrain the clot effectively when retrieving the clot, passing a branch vessel or when passing into a vessel that is larger than the fully expanded diameter of the stent retrievers.
(72) Another disadvantage with the stent retrievers is the lack of distal protection. During retrieval, the stent retrievers may have potential clot fragments that are released downstream into smaller vessel causing further damage.
(73) Another potential disadvantage is that the stent retriever may not sufficiently retain the clot as it pulls the clot to the catheter. In such a case, some or all of the clot or emboli might remain in the vasculature. As the stent retriever moves the clot, the clot might not adhere to the stent retriever as the stent retriever is withdrawn. Even if the clot is successfully withdrawn to the tip of the guide catheter, the clot may be sheared from the stent retriever as the stent retriever is retrieved along with the clot into the guide catheter. Withdrawing the expanded stent retriever, either fully or partially expanded, by itself can result in undesired trauma to the vessel. In most cases, since the stent retriever is oversized compared to the vessel, dragging a fixed metallic structure can pull the arteries and/or strip the inner lining of the vessel causing further trauma such as a hemorrhagic stroke or leakage of blood from a cerebral vessel. The stent retriever can get stuck on plaque on the vessel walls resulting in further vascular damage.

(74) Another potential disadvantage is that the stent retriever axially lengthen or elongates and stretches under tension. Specifically, when the stent retriever is retracted to capture the clot, the stent retriever tends to axially lengthen or elongate and stretch due to the tension exerted onto the stent retriever. The tension will cause the stent retriever to axially lengthen and reduce its diameter and cause the stent retriever to release or pull away from the clot. This will potentially loosen the grip of the stent retriever on the clot and allow the clot to dislodge.
(75) Another potential disadvantage are concerns about dislodged or fragmented clot. The migration of dislodged fragments can increase the time of the procedure. During a procedure, restoration of blood flow is critical. Furthermore, a physician might be unaware of one or more fragments that dislodge from the initial obstruction and cause blockage of smaller more distal vessels.
(76) While utilizing mechanical thrombectomy may lead to clot removal, there are several potential risks and disadvantages. There is a high occurrence of patients that do not achieved adequate reperfusion after the first pass through the vessel due to the clot not being retrieved completely. This is due to the structural and functional disadvantages of many existing and previous stent retrievers. There is a need for, among other things, an improved retriever device that can improve the grip on, or otherwise effectively control the removal of an occlusive clot without necessarily increasing the outward radial force on the clot, thereby protecting the surrounding vasculature. Some embodiments described herein address one, two, or more of the shortcomings and disadvantages of the stent retrievers.
(77) Although certain embodiments and examples are disclosed below, it will be understood by those in the art that the disclosure extends beyond the specifically disclosed embodiments and/or uses of the invention and obvious modifications and equivalents thereof. Thus, it is intended that the scope should not be limited by the particular disclosed embodiments described herein.
(78) The systems and methods described herein relate, for example, to embodiments of extractors. The methods can include treating a body lumen, such as a vessel, such as a neurovascular vessel. The methods can include expanding the extractor within a vessel to capture material, such as clot or emboli. The extractors can have several advantages over stent retrievers.
(79) FIGS. **1-3** illustrate embodiments of an extractor **100**. Other embodiments include extractor **200**, the extractor **300**, the extractor **400**, and the extractor **500**. The embodiments can include any feature described herein. The extractor **100** is configured for removal of clot material from a treatment site within a vessel. The extractor **100** can be particularly suited for neurovascular retrieval, wherein the vessels are fragile and delicate. The extractor **100** can be designed for the removal and retrieval of material by way of mechanical extraction within a lumen of a vessel.
(80) The extractor **100** can include a proximal end **102** and a distal end **104**. The extractor **100** can be a generally elongate member. The extractor **100** can include a length between the proximal end **102** and the distal end **104**. In some embodiments, the proximal end **102** extends through the vasculature and is disposed outside of the body of the patient. The distal end **104** is configured to be advanced to a treatment site within a lumen of the patient. The extractor **100** can include one or more sections along the length of the extractor **100**. The extractor **100** can include a distal member **180**. The distal member **180** can include any feature described herein.
(81) In some embodiments, a catheter shaft **106** is provided. The catheter shaft **106** can be advanced through the vasculature of the patient. The catheter shaft **106** can be a tubular shape with a lumen. The catheter shaft **106** can be a solid shaft. The catheter shaft **106** can be considered part of the extractor **100**. The catheter shaft **106** can be considered separate from the extractor **100**. The catheter shaft **106** can be made of, for example, metal such as stainless steel or nitinol, or another appropriate material. The distal end of the catheter shaft **106** can have a taper, such as a reduced outer diameter taper from proximal to distal, for example, to provide flexibility. The proximal end of the catheter shaft **106** can have a lubricious coating, or a PTFE jacket, or bare metal, as some examples. In some embodiments, the catheter shaft **106** is a core wire.

(82) The extractor **100** can have a plurality of engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134**. There can be a number of engagement panels at a single longitudinal location. There can be a number of engagement panels at a single location along the shaft **106**. The engagement panels **110**, **112**, **114** are located at a first longitudinal location. The engagement panels **120**, **122**, **124** are located at a second longitudinal location spaced axially apart from the first longitudinal location. The engagement panels **130**, **132**, **134** are located at a third longitudinal location spaced axially apart from the first and second longitudinal locations. The first longitudinal location can be distal to the second longitudinal location. The second longitudinal location can be distal to the third longitudinal location. In other embodiments, the first longitudinal location can be proximal to the second longitudinal location. In other embodiments, the second longitudinal location can be proximal to the third longitudinal location. There can be any number of panels at a longitudinal location (e.g., one engagement panel, two engagement panels, three engagement panels, four engagement panels, five engagement panels, six engagement panels, seven engagement panels, eight engagement panels, nine engagement panels, ten engagement panels, or more or less or any range of two of the foregoing values). The longitudinal locations can be spaced apart at fixed regular intervals. The longitudinal locations can be spaced apart irregular intervals. In some embodiments, engagement panels located at the first longitudinal location comprise one engagement panel, two engagement panels, three engagement panels, four engagement panels, five engagement panels, six engagement panels, seven engagement panels, eight engagement panels, nine engagement panels, ten engagement panels, or more, or less or any range of two of the foregoing values. In some embodiments, engagement panels located at the second longitudinal location comprise one engagement panel, two engagement panels, three engagement panels, four engagement panels, five engagement panels, six engagement panels, seven engagement panels, eight engagement panels, nine engagement panels, ten engagement panels, or more or less, or any range of two of the foregoing values. In some embodiments, engagement panels located at the third longitudinal location comprise one engagement panel, two engagement panels, three engagement panels, four engagement panels, five engagement panels, six engagement panels, seven engagement panels, eight engagement panels, nine engagement panels, ten engagement panels, or more or less or any range of two of the foregoing values. In the illustrated embodiment, there are three engagement panels at each longitudinal location. It is contemplated that the extractor diameter can have any diameter combination thereof from the engagement panel at the first longitudinal location to the last engagement panel at the last longitudinal location. In some embodiments, the extractor **100** can be of the same diameter from the first longitudinal location to the last longitudinal location where engagement panels extend therefrom. In some embodiments, the engagement panels at the first longitudinal location have the same expanded diameter as engagement panels at the second longitudinal location. In some embodiments, the engagement panels at the second longitudinal location have the same expanded diameter as engagement panels at the third longitudinal location. In some embodiments, the extractor **100** can be various tapered geometries where the extractor diameter of the first longitudinal location is larger than the last longitudinal location. In some embodiments, the extractor **100** can be various tapered geometries where the extractor diameter can be tapered where the first longitudinal location is smaller than the last longitudinal location. In some embodiments, the extractor **100** can be various tapered geometries where the extractor diameter can be tapered the extractor middle members are larger than the first longitudinal location and the last longitudinal location. For example, the extractor diameter can be of the same diameter from the first longitudinal location to last longitudinal location end. For example, the extractor diameter can be 0.5 mm, 1 mm, 2 mm, 3 mm, 4 mm, 5 mm, 6 mm, 7 mm, 8 mm or higher or lower, or any range of two of the foregoing values. The extractor diameter can also differ from each longitudinal location. For example, the extractor diameter of the engagement panels **110**, **112**, **114** in the first longitudinal location can be 4 mm. The extractor diameter of the engagement panels **120**, **122**, **124** in the second longitudinal location can

be 5 mm. The extractor diameter of the engagement panels **130**, **132**, **134** in the third longitudinal location can be 4 mm. The extractor diameter in the fourth longitudinal location can be 5 mm. In another embodiment, the extractor diameter of the engagement panels **110**, **112**, **114** in the first longitudinal location is larger than the extractor diameter of the engagement panels in the last longitudinal location at the distal end. For example, the engagement panels **110**, **112**, **114** in the first longitudinal location can be at 8 mm diameter and gradually transition to 7.5 mm, 7.0 mm, 6.5 mm, 6.0 mm, 5.5 mm, 5.0 mm, 4.5 mm, 4.0 mm, 3.5 mm, 3.0 mm, 2.5 mm, 2.0 mm and any diameter combination thereof at other longitudinal locations. In addition, the extractor diameter at the first longitudinal location can be smaller than the extractor diameter at the last longitudinal location. In some embodiments, the extractor **100** can have single layer of engagement panels at a longitudinal location (e.g., first longitudinal location, second longitudinal location, and/or third longitudinal location). In some embodiments, the extractor **100** can have double layers of engagement panels at a longitudinal location (e.g., first longitudinal location, second longitudinal location, and/or third longitudinal location). In some embodiments, the extractor can have three layers of engagement panels at a longitudinal location (e.g., first longitudinal location, second longitudinal location, and/or third longitudinal location). In some embodiments, the extractor **100** can have a plurality of layers of engagement panels. The engagement panels can extend along the circumference once. The engagement panels can extend along the circumference twice. The engagement panels can extend along the circumference three times. In some embodiments, the extractor **100** can have a combination of series of plurality of engagement panels such as single layer engagement panels at the first longitudinal location, double layers engagement panels at the second longitudinal location, single layer engagement panels at the third longitudinal location, and double layers of engagement panels at a fourth longitudinal location, for example. In some embodiments, the extractor **100** can have a series of double layers of engagement panels at the first longitudinal location, three layers of engagement panels at the second longitudinal location, and double layers of engagement panels at the third longitudinal location. In some embodiments, there can be any combinations thereof of layers of engagement panels.

(83) In some embodiments, the extractor **100** can be adjusted or articulated at the proximal end using a control wire to either increase the diameter, distance, space, or opening between the engagement panels at the first longitudinal location and the engagement panels at the second longitudinal location or decrease the diameter, distance, space or opening between the engagement panels at the first longitudinal location and the engagement panels at the second longitudinal location. For example, the proximal end of the extractor **100** includes a control wire attached to the engagement panels. The control wire extends proximally and is attached to a control mechanism wherein the control wire can articulate to slidably move the eyelets of the engagement panels at the first longitudinal location and the second longitudinal location over the catheter shaft **106** or core wire to increase the diameter, distance, space, or opening between the engagement panels at the first longitudinal location and the second longitudinal location thereby creating a larger space or void for clot to reside into between the engagement panels at the first and second longitudinal locations. The control mechanism can also release to slidably allow the eyelets of the engagement panels at the first longitudinal location and the engagement panels at the second longitudinal location to shorten or move closer together reducing the distance, space, or opening between the engagement panels at the first and second longitudinal locations. The engagement panels at the first longitudinal location and the engagement panels at the second longitudinal location can be controlled to move relative to the catheter shaft **106** or core wire. The distance, space, or opening between the engagement panels at the first longitudinal location and the engagement panels at the second longitudinal location can be adjusted by a control mechanism.

(84) The extractor **100** can have a plurality of connecting members **118**, **128**, **138**. The connecting member **118** can connect the engagement panels **110**, **112**, **114** at the first longitudinal location and the engagement panels **120**, **122**, **124** at the second longitudinal location. The connecting member

can be directed connected to one panel **110** at the first longitudinal location and one panel **120** at the second longitudinal location. The connecting member **128** can connect the engagement panels **120**, **122**, **124** at the second longitudinal location and the engagement panels **130**, **132**, **134** at a third longitudinal location. The connecting member **138** can connect the engagement panels **130**, **132**, **134** at a third longitudinal location and another set of engagement panels. The connecting members **118**, **128**, **138** can be helical. The connecting members **118**, **128**, **138** can be linear. The connecting members **118**, **128**, **138** can be curved. The connecting members can be coiled. The connecting members **118**, **128**, **138** can be radially offset or otherwise spaced apart from the longitudinal axis of the extractor **100** as shown. The connecting members **118**, **128**, **138** can be radially offset from the catheter shaft **106**. The connecting members **118**, **128**, **138** can be inward from the outer circumference of the engagement panels. The connecting members **118**, **128**, **138** can be made of the same material as the engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134**. The connecting members **118**, **128**, **138** can be made of a different material than the engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134**. The connecting members **118**, **128**, **138** can be integrally formed with the engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134**. The connecting members **118**, **128**, **138** can otherwise attached with the engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134**, such as bonded together. The connecting members **118**, **128**, **138** can have the same flexibility than the engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134**. The connecting members **118**, **128**, **138** can have more flexibility than the engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134**. The connecting members **118**, **128**, **138** can have less flexibility than the engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134**.

(85) The engagement panels **110**, **112**, **114** can each form an arc **140** as shown in FIG. **21**. The arc **140** can form a generally arcuate profile. The arc **140** can have round, circular, ellipse, or oval profile. The arc **140** can be configured to be atraumatic to the vessel wall. In some embodiments, the engagement panels **110**, **112**, **114** do not comprise barbs, or other sharp elements or vertices that are likely to pierce a luminal wall. In some embodiments, the engagement panels **110**, **112**, **114** form rounded corners. While the extractor **100** illustrated has three panels at a longitudinal location, other embodiments are contemplated. In some embodiments, the engagement panels located at a longitudinal location comprise one engagement panel, two engagement panels, three engagement panels, four engagement panels, five engagement panels, six engagement panels, seven engagement panels, eight engagement panels, nine engagement panels, ten engagement panels, or any range of two of the foregoing values. The engagement panels **110**, **112**, **114** at a single longitudinal location can form a circular profile. The engagement panels **110**, **112**, **114** at a single longitudinal location can extend around the circumference. Each engagement panel **110**, **112**, **114** can form a portion of a circle. Each arc **140** of the engagement panel **110**, **112**, **114** can form an segment of the circumference. Each arc **140** of the engagement panel **110**, **112**, **114** can include an approximately 120 degree arc. Each arc **140** of the engagement panel **110**, **112**, **114** can form an arc of, e.g. about 85 degrees, 90 degrees, 95 degrees, 105 degrees, 110 degrees, 111 degrees, 112 degrees, 113 degrees, 114 degrees, 115 degrees, 116 degrees, 117 degrees, 118 degrees, 119 degrees, 120 degrees, 125 degrees, 130 degrees, approximately 120 degrees, less than 120 degrees, greater than 110 degrees, more or less or any range of two of the foregoing values. Each arc **140** of the engagement panel **110**, **112**, **114** can form an arc that forms part of a circular, oval, or other arcuate profile. Each arc **140** of the engagement panels **110**, **112**, **114** can form the same arc. Each arc **140** of the engagement panels **110**, **112**, **114** can form the same degree of arc. Each arc **140** of the engagement panels **110**, **112**, **114** can form the same length of arc. Each arc **140** of the engagement panels **110**, **112**, **114** can form the arc with the same radius. Each arc **140** of the engagement panels **110**, **112**, **114** can form the arc with the same radius of curvature. Each arc **140** of the engagement panels **110**, **112**, **114** can be identical. Each arc **140** of the engagement panels **110**, **112**, **114** can be similar. Two or more arc **140** of the engagement panels **110**, **112**, **114** can be

the same. Each arc **140** of the engagement panels **110**, **112**, **114** can form a different arc. Each arc **140** of the engagement panels **110**, **112**, **114** can form a different degree of arc. Each arc **140** of the engagement panels **110**, **112**, **114** can form a different length of arc. Each arc **140** of the engagement panels **110**, **112**, **114** can form the arc with a different radius. Each arc **140** of the engagement panels **110**, **112**, **114** can form the arc with a different radius of curvature. Each arc **140** of the engagement panels **110**, **112**, **114** can be different. Two or more engagement panels **110**, **112**, **114** can be different. Two or more arc **140** of the engagement panels **110**, **112**, **114** can have different diameters. Two or more arc **140** of the engagement panels **110**, **112**, **114** can have different arc angles.

(86) Each engagement panels **110**, **112**, **114** can be formed by, or otherwise include one, or a plurality of legs, such as two legs **142**, **144** shown in FIG. **21**. The two legs **142**, **144** connect to the arc **140** of engagement panel **110**, **112**, **114**. The legs **142**, **144** and the arc **140** can form rounded corners. The arc can form an atraumatic surface. The two legs **142**, **144** can be radially outward from the longitudinal axis of the extractor **100**. The two legs **142**, **144** can be angled relative to each other. The two legs **142**, **144** can be straight. The two legs **142**, **144** can be linear. The two legs **142**, **144** can have a constant angle therebetween. The two legs **142**, **144** can connect to the ends of the arc **140**. In some embodiments, the legs **142**, **144** are integrally formed with the arc **140**. In some embodiments, the legs **142**, **144** are operably attached together with the arc **140**. The legs **142**, **144** and the arc **140** can be, made of the same material. The legs **142**, **144** can be made of different material than the arc **140**. The two legs **142**, **144** can form a radius toward the arc **140**. In some embodiments, legs **142**, **144** of each engagement panel **110**, **112**, **114** can have any pattern. In some embodiments, legs **142**, **144** of each engagement panel **110**, **112**, **114** can have a zig zag pattern. In some embodiments, legs **142**, **144** of each engagement panel **110**, **112**, **114** can have a slight curve. In some embodiments, the legs **142**, **144** and the arc **142** define the perimeter of a void or free space area that is devoid or substantially devoid of any material, thus advantageously minimizing the size/weight of the device. The legs **142**, **144** and the arc **142** define a pore. Each engagement panel **110**, **112**, **114** comprises a pore.

(87) In some embodiments, the engagement panels **110**, **112**, **114** of the first longitudinal location do not overlap. In some embodiments, the legs **142**, **144** of the engagement panel **110** do not overlap with the legs **142**, **144** of the engagement panels **112**, **114**. In some embodiments, the legs **142**, **144** of the engagement panel **112** do not overlap with the legs **142**, **144** of the engagement panels **110**, **114**. In some embodiments, the legs **142**, **144** of the engagement panel **114** do not overlap with the legs **142**, **144** of the engagement panels **110**, **112**. In some embodiments, the legs **142**, **144** of the engagement panels **110**, **112**, **114** of the first longitudinal location do not touch. In some embodiments, the legs **142**, **144** of the engagement panels **110**, **112**, **114** of the first longitudinal location are adjacent. In some embodiments, the legs **142**, **144** of the engagement panels **110**, **112**, **114** of the first longitudinal location are spaced apart. In some embodiments, the legs **142**, **144** of the engagement panels **110**, **112**, **114** of the first longitudinal location about each other. In some embodiments, the legs **142**, **144** of the engagement panels **110**, **112**, **114** of the first longitudinal location are in contact along their length. In some embodiments, the legs **142**, **144** of the engagement panels **110**, **112**, **114** of the first longitudinal location are in contact along a portion of the radius of the arc **140**.

(88) The engagement panels **110**, **112**, **114** can form an eyelet **146** as shown in FIG. **21**. The engagement panels **110**, **112**, **114** are located at the first longitudinal location. The eyelet **146** can be located at the first longitudinal location. The engagement panels **110**, **112**, **114** can form a generally round eyelet **146**. The engagement panels **110**, **112**, **114** can form a circular eyelet **146** at the single longitudinal location. Each engagement panel **110**, **112**, **114** can form a portion of the eyelet **146**. In some embodiments, the legs **142**, **144** of the engagement panels **110**, **112**, **114** form the eyelet **146**. The legs **142**, **144** of the engagement panels **110**, **112**, **114** can lie along the same plane. The legs **142**, **144** of the engagement panels **110**, **112**, **114** can form a perimeter of the eyelet

146. The legs **142**, **144** of the engagement panels **110**, **112**, **114** can be circumferentially spaced. The legs **142**, **144** of the engagement panels **110**, **112**, **114** can have ends along the perimeter of the eyelet **146**. In some embodiments, another portion of the engagement panels **110**, **112**, **114** forms the eyelet **146**.

(89) The eyelet **146** can accommodate the catheter shaft **106**. The eyelet **146** can be wrapped around the outer diameter of the elongate member of the extractor. In some embodiments, the eyelet **146** is fixed to the catheter shaft **106**. In some embodiments, the eyelet is moveable relative to the catheter shaft **106**. The eyelet **146** of the engagement panels **110**, **112**, **114** is located at the first longitudinal location. The eyelet **146** of the engagement panels **120**, **122**, **124** is located at the second longitudinal location. The eyelet **146** of the engagement panels **130**, **132**, **134** is located at a third longitudinal location.

(90) The extractor **100** can include a plurality of spacers **150**, **152**, **154**, **156**. The spacer **150** can be located between the distal end **104** and the engagement panels **110**, **112**, **114**. The spacer **152** can be located between the engagement panels **110**, **112**, **114** and the engagement panels **120**, **122**, **124**. The spacer **152** can be between the first longitudinal location and the second longitudinal location. The spacer **154** can be located between the engagement panels **120**, **122**, **124** and the engagement panels **130**, **132**, **134**. The spacer **154** can be between the second longitudinal location and the third longitudinal location. In some embodiments, the spacer **156** can be located between the engagement panels **130**, **132**, **134** and another set of engagement panels. In some embodiments, the spacer **156** can be located between the engagement panels **130**, **132**, **134** and the proximal end **102**. In some embodiments, engagement panels have space between them without spacers (FIG. **34**). In some embodiments, engagement panels have space between them without a discrete structural feature. For example, the extractor or engager's engagement panels can couple directly to the catheter shaft or core wire. The Engagement panels at the first location is coupled to the catheter shaft or core wire. The engagement panels at the second panels is coupled at a distance away from the engagement panels at the first location. The engagement panels can be coupled to the catheter shaft or core wire either by laser, chemical or mechanical bond for example. In some embodiments, a spacer is interspersed in between some, or every adjacent set of engagement panels. The space can be located between the engagement panels **110**, **112**, **114** and the engagement panels **120**, **122**, **124**. The space can be between the first longitudinal location and the second longitudinal location. The space can be located between the engagement panels **120**, **122**, **124** and the engagement panels **130**, **132**, **134**. The spacer **154** can be between the second longitudinal location and the third longitudinal location. In some embodiments, engagement panels can be next to each other in series with no spacer, thereby minimal to no gap. The engagement panels **110**, **112**, **114** and the engagement panels **120**, **122**, **124** can be next to each other in in series with minimal to no gap. The first longitudinal location and the second longitudinal location can be next to each other. The engagement panels **120**, **122**, **124** and the engagement panels **130**, **132**, **134** can be next to each other in in series with minimal to no gap. The second longitudinal location and the third longitudinal location can be next to each other.

(91) The spacers **150**, **152**, **154**, **156** can include a lumen. The spacers **150**, **152**, **154**, **156** can receive the catheter shaft **106** there through. The catheter shaft **106** can be a core wire or laser cut hypotube and any combination thereof. The connecting members **118**, **128**, **138** can be located within the lumen of the spacers **152**, **154**, **156**. The connecting members **118**, **128**, **138** can be located outside of the spacers **152**, **154**, **156**.

(92) The extractor **100** can be used with a sheath **160**. The sheath **160** can be an outer sheath. The sheath **160** can cover the extractor **100**. The sheath **160** can cover the plurality of engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134**, such that engagement panels are configured to move between radially expanded and radially compressed configurations. The sheath **160** can cover the shaft **106**, or a portion thereof. The sheath **160** can cover additional components of the system, such as a filter.

(93) The extractor **100** can be used with other components of a system. The extractor **100** can be used with a filter. The filter can be any filter. The filter can be any distal extraction member. The extractor **100** can be used with a collection chamber or collection bag. The extractor **100** can be used with a macerator tool. The extractor **100** can be used with an expanding filter. The extractor **100** can be used with an expanding guide catheter. The extractor **100** can be used with a suction catheter. The extractor **100** can be used with the catheter shaft **106**.
(94) In some embodiments, the extractor includes a distal member or distal plug **180**. The distal member **180** functions to trap or capture loose emboli in transit or remove and capture soft emboli distal to the extractor. The distal member **180** is designed to have a low profile to be delivered through a small lumen. The distal member **180** is made of braided filaments, wires or woven. The braided wire or filaments can be a single or double layer. The braided wires or filaments can be metallic such as Nitinol, stainless steel, platinum iridium for example. The braided wires or filaments can also be polymeric materials such as polyethylene, PTFE, FEP for example. The braided wires can also include radiopaque metal such as tungsten or gold to aid with better visualization. The distal member **180** can form using laser stent cut hypotube. The distal member **180** can be formed in any geometrical configuration, including, but not limited to, circular, umbrella, ball, elliptical, and/or disc. The distal member **180** can be expandable. The distal member **180** can be compressible. The distal member **180** can conform to the vessel wall.
(95) The extractor **100** can include the catheter shaft **106**. The extractor **100** can have the plurality of engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134**. The plurality of engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can be deployed. In some embodiments, the engagement panels are deployed by retracting a sheath **160**. The sheath **160** will uncover engagement panels **110**, **112**, **114** at the first longitudinal location. The extractor **100** is fully functional to remove clot material with just the engagement panels **110**, **112**, **114** at the first longitudinal location. The sheath **160** will then uncover engagement panels **120**, **122**, **124** at the second longitudinal location, if needed. The extractor **100** is fully functional to remove clot material with just the engagement panels **110**, **112**, **114** at the first longitudinal location and engagement panels **120**, **122**, **124** at the second longitudinal location. The sheath **160** will then uncover engagement panels **130**, **132**, **134** at the third longitudinal location, if needed.
(96) The extractor **100** consists of a series of engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134**. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** function to remove the clot away from the vessel wall. The engagement panels **110**, **112**, **114** at the first longitudinal location can form a generally circular profile similar to the circumference of the vessel wall. The engagement panels **110**, **112**, **114** at the first longitudinal location can sweep against the vessel wall with the arc **140**. The engagement panels **110**, **112**, **114** at the first longitudinal location can include legs **142**, **144** which support the arc **140** as the arc **140** removes the clot away from the vessel wall. The engagement panels **110**, **112**, **114** can be segmented to effectively oppose the vessel wall.
(97) The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can function to control, such as pinch the clot securely, in either or both axially and/or radially compressed directions. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can be used to pinch the clot during retrieving into a collection funnel or other device. The clot can be pinched between the engagement panels **110**, **112**, **114** at the first longitudinal location and the engagement panels **120**, **122**, **124** at the second longitudinal location. The clot can be pinched between the engagement panels **120**, **122**, **124** at the second longitudinal location and the engagement panels **130**, **132**, **134** at the third longitudinal location. For example, in some embodiments, the first longitudinal location engagement panels expand radially and outward to capture or pinch a portion of the clot either against the vessel wall and/or in between the open cavity. As the second longitudinal location engagement panels expand radially and outward, the engagement panels continue to capture or pinch a portion of the clot either against the vessel wall and/or in between the open cavity. The connect member, bridge extension **138** between the first longitudinal location and the second

longitudinal location has tendency to pull the engagement panels of the first longitudinal location and the second longitudinal location together thereby creating a pinching effect and hold the clot better.

(98) The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** are placed apart from each other creating a space or cavity for the clot or emboli to reside in. There is a space or cavity between the engagement panels **110**, **112**, **114** at the first longitudinal location and the engagement panels **120**, **122**, **124** at the second longitudinal location. There is a space between the first longitudinal location and the second longitudinal location for the clot or emboli. There is a space or cavity between the engagement panels **120**, **122**, **124** at the second longitudinal location and the engagement panels **130**, **132**, **134** at the third longitudinal location. There is a space between the second longitudinal location and the third longitudinal location for the clot or emboli.

(99) The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** collapse, e.g., radially during delivery. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can be collapsed within the sheath **160**. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can be folded inward. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can be folded against the catheter shaft **106**.

(100) The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** then expand or open at the treatment site in a manner that engage and pinch the clot securely for removal. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** expand from the sheath **160**. The legs **142**, **144** bias each arc **140** radially outward toward the vessel wall. The legs **142**, **144** provide support for the expanded engagement panel. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** open at the treatment site. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** capture the clot in the spaces between the first longitudinal location and the second longitudinal location. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** capture the clot in the spaces between the second longitudinal location and the third longitudinal location. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can pull together along with the clot disposed in the spaces between the longitudinal locations. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can pull together along with the filter. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can pull together into a collection funnel, a guide catheter, or other device.

(101) There are several potential advantages of the extractor **100**. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** open to deploy rather than radially expand like the stent retriever device. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** open in some cases like petals of a flower. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** pop outward once beyond the tip of the sheath **160**. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** radially expand without an axial movement, and unlike conventional expandable balloon or other retrieval members for example. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** radially expand without axially shortening. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** radially contract without axially lengthening. In contrast, conventional stent retriever devices can radially expand through a mesh-like structure. The stent retriever device can axially shorten as the device radially expands. When pulled, the stent retriever device can axially lengthen and pull away from the vessel wall.

(102) The extractor **100** is functional when the engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** open. The extractor **100** is functional when the engagement panels **110**, **112**, **114** at the first longitudinal location open. The extractor **100** is functional when the engagement panels **110**, **112**, **114** at the first longitudinal location and the engagement panels **120**, **122**, **124** at the second longitudinal location open. The extractor **100** is functional when the engagement panels **110**, **112**, **114** at the first longitudinal location, the engagement panels **120**, **122**, **124** at the second longitudinal location, and the engagement panels **130**, **132**, **134** at the third longitudinal location open. The extractor **100** is functional when one or more engagement panels **110**, **112**, **114** open.

The extractor **100** is functional when partially deployed. The extractor **100** is functional to engage a clot once the engagement panels **110**, **112**, **114** are opened. The functional length of the extractor **100** is adjustable. The complete length of the extractor **100** is not required to be open to be functional, depending on the size of the clot and the desired clinical result. A partial, and less than full length of the extractor **100** can be opened, such as unsheathed in some cases, for the extractor **100** to be able to engage and remove the clot. The length of the extractor can range from, for example, 0.1 cm to 30 cm. In some embodiments, preferably, the extractor length is about 5 cm. In some embodiments, the extractor length is about 6 cm. In some embodiments, the extractor length is about 4 cm, or ranges including any two values as disclosed herein. The number of extractor engagement panels can range from, for example, one engagement panel to 150 engagement panels.
(103) In contrast, conventional stent retriever devices generally must be fully deployed to be functional. The entire length of the stent retriever device must be opened from the catheter. The functional length of the stent retriever device is typically not adjustable.
(104) The sheath **160** can unsheath the extractor **100** partially, such as half-way or even less in some cases, to expose some engagement panels while retaining some engagement panels inside the sheath **160**. The engagement panels **110**, **112**, **114** at the first longitudinal location and the engagement panels **120**, **122**, **124** at the second longitudinal location can be opened (e.g., radially expanded), while the engagement panels **130**, **132**, **134** at the third longitudinal location can remain within the sheath **160**. The engagement panels **110**, **112**, **114** at the first longitudinal location and the engagement panels **120**, **122**, **124** at the second longitudinal location can function to engage the clot. The engagement panels **110**, **112**, **114** at the first longitudinal location and the engagement panels **120**, **122**, **124** at the second longitudinal location can function to control, e.g., pinch the clot between the first longitudinal location and the second longitudinal location. The sheath **160** can unsheath the remaining engagement panels if needed for example. The sheath **160** can unsheath the engagement panels **130**, **132**, **134** at the third longitudinal location.
(105) As the engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** pull back, e.g., proximally within the body lumen to remove the clot obstruction, the engagement panels can be more resistant to compression or bending upon interacting with a clot obstruction. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can include legs **142**, **144** which support the arc **140**. The legs **142**, **144** resist compression of the arc **140** of the engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134**. The arc **140** of the engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can advantageously remain open even when the arc encounters a tough resistance such as an organized clot obstruction. The legs **142**, **144** provide structural support to prevent the arc **140** from sliding past the clot without engaging the clot. The legs **142**, **144** provide structural support to remove tough clots. The legs **142**, **144** provide structural support to remove clots wedged against the vessel wall due to blow flow or pressure. In some embodiment, the legs of the engagement panels are longitudinally aligned. In some embodiments, the legs of the engagement panels can be offset from each other from, for example, about 1 to 179 degrees. For example, in some embodiments, the legs of the engagement panels are offset by 45 degrees. In some embodiment, the legs are offset by 90 degrees. In some embodiment, the legs of each engagement panel are offset from relative to the next engagement panel. As compared to conventional stent retriever devices, the stent retriever device will compress, and slide pass the clot against the vessel wall when encounter a tough resistance such as an organized clot obstruction particularly when the clot obstruction is further wedged due to blood flow or pressure.
(106) The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** also can be configured to function independently. Each engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** comprises the arc **140** and legs **142**, **144** which are independent from the other engagement panels. There are multiple positions where the clot can engage and be captured with respect to the engagement panels during the retrieval. As the clot is trapped in the spaces between the engagement panels, the engagement panels **110**, **112**, **114** at the first longitudinal location and the

engagement panels **120**, **122**, **124** at the second longitudinal location have a pinching effect to ensure the clot does not move relative to the extractor while in transit. The longitudinal separation between the engagement panels **110**, **112**, **114** at the first longitudinal location and the engagement panels **120**, **122**, **124** at the second longitudinal location creates a cavity or space for the clot to reside. As the clot is trapped in the spaces between the engagement panels, the engagement panels **120**, **122**, **124** at the second longitudinal location and the engagement panels **130**, **132**, **134** at the third longitudinal location have a pinching effect to ensure the clot does not move while in transit. The longitudinal separation between the engagement panels **120**, **122**, **124** at the second longitudinal location and the engagement panels **130**, **132**, **134** at the third longitudinal location creates a cavity or space for the clot to reside. There are multiple longitudinal separations between the engagement panels for the clot to reside.

(107) The extractor **100** can include the plurality of spacers **150**, **152**, **154**, **156**. The spacer **150** can be located between the distal end **104** and the engagement panels **110**, **112**, **114**. The spacer **150** can keep the engagement panels **110**, **112**, **114** apart from the filter. The spacer **152** can be located between the engagement panels **110**, **112**, **114** and the engagement panels **120**, **122**, **124**. The spacer **152** can keep the engagement panels **110**, **112**, **114** apart from the engagement panels **120**, **122**, **124**. The spacer **154** can be located between the engagement panels **120**, **122**, **124** and the engagement panels **130**, **132**, **134**. The spacer **154** can keep the engagement panels **120**, **122**, **124** apart from the engagement panels **130**, **132**, **134**. In some embodiments, the spacer **156** can be located between the engagement panels **130**, **132**, **134** and another set of engagement panels or the proximal end **102**. The spacers **150**, **152**, **154**, **156** keep the engagement panels apart. The spacers **150**, **152**, **154**, **156** distance the sets of engagement panels from each other in a longitudinal direction. The spacer can be made of, for example, polymeric materials such as Pebax, Polyester, polyethylene, polypropylene, Polyurethane, silicone, or any combination of these materials. In some embodiments, the spacer can be made of metallic materials such as stainless steel, platinum, gold, silver, nitinol, or any combination of these materials. The spacer can be integrated into the extractor and the material can be, e.g., nitinol. The spacer **150**, **152**, **154**, **156** can provide a pinching force. The spacer **150**, **152**, **154**, **156** can provide a spring force. The spacer **150**, **152**, **154**, **156** can provide a resistive force. The spacer **150**, **152**, **154**, **156** can provide a compressive force. The spacer **150**, **152**, **154**, **156** can bias the engagement panels toward each other. The spacer **150**, **152**, **154**, **156** can function as a spring. The spacer **150**, **152**, **154**, **156** can be passive. The engagement panels **110**, **112**, **114** can be biased toward the engagement panels **120**, **122**, **124** by the spacer **152**. The engagement panel **120**, **122**, **124** can be biased toward the engagement panels **130**, **132**, **134** by the spacer **154**. The spacers **150**, **152**, **154**, **156** are not actuated in some cases. The spacers **150**, **152**, **154**, **156** are not actively pulled toward each other in some cases. Rather, the spacers **150**, **152**, **154**, **156** are passively actuated in some cases. The engagement panels **110**, **112**, **114** and the engagement panels **120**, **122**, **124** can be inherently biased toward each other. The engagement panels **120**, **122**, **124** and the engagement panels **130**, **132**, **134** can be inherently biased toward each other. The spacer **150**, **152**, **154**, **156** can help to keep the engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** open. The spacer **150**, **152**, **154**, **156** can allow movement of the engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134**. The spacer **150**, **152**, **154**, **156** create a certain amount of biasing force. The spacers **150**, **152**, **154**, **156** can be connected to eyelets of the engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134**. The spacer **150**, **152**, **154**, **156** can abut the eyelets.

(108) The spacers **150**, **152**, **154**, **156** can provide a force to separate the engagement panels from each other. The spacers **150**, **152**, **154**, **156** can provide a separation force. The spacers **150**, **152**, **154**, **156** provide a resistive force to keep the engagement panels separated. The force can range from, for example, 0.01 grams to 50 grams. The spacers **150**, **152**, **154**, **156** can bias the engagement panels away from each other. The spacers **150**, **152**, **154**, **156** can bias the engagement panels toward each other. The spacers **150**, **152**, **154**, **156** can comprise a coiled wire. The spacers

150, **152**, **154**, **156** can comprise a tubular member. The spacers **150**, **152**, **154**, **156** can comprise a polymer material such as Pebax, Polyester, polyethylene, polypropylene, Polyurethane, silicone or any combination of these materials. The spacers **150**, **152**, **154**, **156** can comprise a shape memory material. The spacers **150**, **152**, **154**, **156** can comprise a spring. The spacers **150**, **152**, **154**, **156** can comprise a metal such as stainless steel, platinum, gold, silver, nitinol or any combination of these materials. The spacers **150**, **152**, **154**, **156** can exert a force on adjacent engagement panels. The spacers **150**, **152**, **154**, **156** can exert a force on engagement panels and an adjacent structure.
(109) In some embodiments, the first longitudinal location has one engagement panel **110**. The engagement panel **110** can form a generally circular profile, or a portion thereof. The engagement panel **110** can form the arc **140**. The engagement panel **110** can include an approximately 360 degree arc. The engagement panel **110** can form a complete circle. In some embodiment, the eyelet **146** is located at the center of the one engagement panel configuration.
(110) In some embodiments, the first longitudinal location has two engagement panels **110**, **112**. Each engagement panels **110**, **112** can be considered a section or loop. Each engagement panel **110**, **112** can include an arc **140** which forms a portion of a circle or other arcuate geometry. Each engagement panel **110**, **112** can include the arc **140** of approximately 180 degrees or more or less. Each engagement panel **110**, **112** can include the arc **140** that is semi-circular. In some embodiment, the engagement panel **110**, **112** does not form a complete circular shape such as a semi-circular shape, three-quarter of a circular shape, a partial of a circular shape, or any partial circular shape less than 360 degrees. In some embodiments, the partial circular shape is offset from one engagement panel to the next. In some embodiments, the engagement panel **110**, **112** form a complete circular shape. In some embodiments, the eyelet **146** is located at the center of the multi, e.g., two engagement panel configuration.
(111) In some embodiment, the first longitudinal location has three engagement panels **110**, **112**, **114**. Each engagement panels **110**, **112**, **114** can be considered a section or loop. Each engagement panel **110**, **112**, **114** can include an arc **140** which forms a portion of a circle. Each engagement panel **110**, **112**, **114** can include the arc **140** of approximately 120 degree. In some embodiments, the three engagement panels arc does not form a complete circular shape. In some embodiments, the three engagement panels arc form a partial circular shape such as three-quarter shape, semi-circular shape, or any partial circular shape less than 360 degrees. The engagement panels **110**, **112**, **114** have three sections or loops at a single longitudinal location. In some embodiment, the eyelet **146** is located at the center of the three engagement panel configuration.
(112) In some embodiments, the first longitudinal location has four engagement panels. Each engagement panel can include an arc which forms a portion of a circle. Each engagement panel can include the arc of approximately 90 degree. In some embodiments, the four engagement panels arc does not form a complete circular shape. In some embodiments, the three engagement panels arc form a partial circular shape such as three-quarter shape, semi-circular shape, or any partial circular shape less than 360 degrees. In some embodiments, the eyelet **146** is located at the center of the four engagement panel configuration. In some embodiments, the first longitudinal location has five engagement panels. Each engagement panel can include the arc of approximately 72 degrees. In some embodiments, the eyelet **146** is located at the center of the five engagement panel configuration. In some embodiments, the first longitudinal location has six engagement panels. Each engagement panel can include the arc of approximately 60 degrees. In some embodiments, the eyelet **146** is located at the center of the six engagement panel configuration.
(113) The eyelet **146** can be formed at the center of the engagement panels. The eyelet **146** can be formed at the center of the engagement panels **110**, **112**, **114**. In some embodiment, the multiple engagement panel configuration generally surrounds the eyelet **146**. In some embodiment, the engagement panels **110**, **112**, **114** is continuously connecting over the catheter shaft **106** in a spiral configuration. Each engagement panels **110**, **112**, **114** can include an additional arc that forms the eyelet **146**. Each engagement panels **110**, **112**, **114** can form a portion of the eyelet **146**. At the

center of the engagement panels **110**, **112**, **114** is the eyelet **146**. The eyelet **146** can be a shaped set circular eyelet. The eyelet **146** can be multiple coils members.
(114) The engagement panels **110**, **112**, **114** can be made from one continuous wire. The engagement panels **110**, **112**, **114** can be made from individual wire members for each engagement panel. The individual wire members can be coupled to form the engagement panels **110**, **112**, **114** at the first longitudinal location. The engagement panels **110**, **112**, **114** can include additional segments that form the eyelet. The engagement panels **110**, **112**, **114** can include coils that reinforce the eyelet.
(115) The spacers **150**, **152**, **154**, **156** can help to maintain the separation between the engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134**. When the clot is ready to be retrieved, the extractor **100** can be pulled. This pulling tension creates a pinching effect upon contacting the clot. In some embodiment, the spacers **150**, **152**, **154**, **156** can be integrated onto the extractor **100**. Each spacer **150**, **152**, **154**, **156** can be formed with a member that is coiled along the length of extractor and connecting the eyelets **146**. Each spacer **150**, **152**, **154**, **156** can be integrally formed with the engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134**. Each spacer **150**, **152**, **154**, **156** can be integrally formed with the eyelets **146**.
(116) In some embodiment, the spacers **150**, **152**, **154**, **156** can be separately formed from the engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134**. Each spacer **150**, **152**, **154**, **156** can be a tubular member disposed along the length of the extractor **100**. Each spacer **150**, **152**, **154**, **156** can be formed with a member that is coiled. Each spacer **150**, **152**, **154**, **156** can be separately formed from the engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134**. Each spacer **150**, **152**, **154**, **156** can be separately formed from the eyelets **146**. In some embodiment, the engagement panels couple to the catheter shaft without the spacer. In some embodiment, the engagement panels couple to the catheter shaft without a space therebetween. In some embodiment, the engagement panels couple to the catheter shaft in series, adjacent to one another.
(117) The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can be at various angles relative to a center axis **108**. The center axis **108** can extend along the length of the catheter shaft **106**. The engagement panels **110**, **112**, **114** can be at a first angle relative to the center axis **108**. The first angle can range from 45 degrees to 135 degrees relative to the center axis **108**. The engagement panels **120**, **122**, **124** can be at a second angle relative to the center axis **108**. The second angle can range from 45 degrees to 135 degrees relative to the center axis **108**. The engagement panels **130**, **132**, **134** can be at a third angle relative to the center axis **108**. The third angle can range from 45 degrees to 135 degrees relative to the center axis **108**. The first angle and the second angle can be the same angle. The first angle and the second angle can be different angles. The first angle, the second angle, and the third angle can be the same angle. The first angle, the second angle, and the third angle can be different angles. The extractor **100** can include a plurality of engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134**.
(118) The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can angle in the same direction distally. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can angle in the same direction proximally. The engagement panels **110**, **112**, **114** and the engagement panels **120**, **122**, **124** can angle in the same direction. The engagement panels **110**, **112**, **114** and the engagement panels **120**, **122**, **124** can angle in different direction. The engagement panels **110**, **112**, **114** and the engagement panels **120**, **122**, **124** can angle in alternate manner. The engagement panels **120**, **122**, **124** and the engagement panels **130**, **132**, **134** can angle in alternate manner. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can angle in alternate manner for each engagement panels at a longitudinal location such that one engagement panels at the first longitudinal location can angle toward distally and the adjacent engagement panels at the second longitudinal location angle toward proximally.
(119) The engagement panels **110**, **112**, **114** can have a diameter. The diameter of the engagement panels **110**, **112**, **114** can be, e.g., about 2 mm, 2.5 mm, 3 mm, 3.5 mm, 4 mm, 4.5 mm, 5 mm, 5.5

mm, 6 mm, 6.5 mm, 7 mm, 7.5 mm, 8 mm, or more or less, between 2 and 8 mm, or any range of the foregoing values. The engagement panels **120**, **122**, **124** can have a diameter. The diameter of the engagement panels **120**, **122**, **124** can be, e.g. about 2 mm, 2.5 mm, 3 mm, 3.5 mm, 4 mm, 4.5 mm, 5 mm, 5.5 mm, 6 mm, 6.5 mm, 7 mm, 7.5 mm, 8 mm, or more or less, between 2 and 8 mm, or any range of the foregoing values. The diameter of the engagement panels **110**, **112**, **114**, and the diameter of the engagement panels **120**, **122**, **124** can be the same. The diameter of the engagement panels **110**, **112**, **114**, and the diameter of the engagement panels **120**, **122**, **124** can be different. The diameter of the engagement panels can be different or alternating diameter between the engagement panels.

(120) In some embodiments, the diameter of the engagement panels **110**, **112**, **114** and the diameter of the engagement panels **120**, **122**, **124** are about 4 mm. In some embodiments, the diameter of the engagement panels **110**, **112**, **114**, the diameter of the engagement panels **120**, **122**, **124**, the diameter of the engagement panels **130**, **132**, **134** are about 4 mm. In some embodiments, the diameter of the engagement panels **110**, **112**, **114** and the diameter of the engagement panels **120**, **122**, **124** are about 5 mm. In some embodiments, the diameter of the engagement panels **110**, **112**, **114**, the diameter of the engagement panels **120**, **122**, **124**, the diameter of the engagement panels **130**, **132**, **134** are about 5 mm. In some embodiments, the diameter of the engagement panels **110**, **112**, **114** and the diameter of the engagement panels **120**, **122**, **124** are about 6 mm. In some embodiments, the diameter of the engagement panels **110**, **112**, **114**, the diameter of the engagement panels **120**, **122**, **124**, the diameter of the engagement panels **130**, **132**, **134** are about 6 mm. In some embodiments, the diameter of the engagement panels **110**, **112**, **114**, the diameter of the engagement panels **120**, **122**, **124**, the diameter of the engagement panels **130**, **132**, **134** have an alternating diameter of about 4 mm and about 6 mm along the length of the extractor **100**. In some embodiments, the diameter of the engagement panels **110**, **112**, **114**, the diameter of the engagement panels **120**, **122**, **124**, the diameter of the engagement panels **130**, **132**, **134** have an alternating diameter of about 4 mm and about 5 mm along the length of the extractor **100**. In some embodiments, the diameter of the engagement panels **110**, **112**, **114**, the diameter of the engagement panels **120**, **122**, **124**, the diameter of the engagement panels **130**, **132**, **134** have an alternating diameter of about 3 mm and about 4 mm along the length of the extractor **100**.

(121) In some embodiments, the spacers **150**, **152**, **154**, **156** can be loosely fit. The spacers **150**, **152**, **154**, **156** can be movable along the catheter shaft **106**. The spacers **150**, **152**, **154**, **156** can be moveable relative to the eyelets **146**. The spacers **150**, **152**, **154**, **156** can be movable relative to the engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134**. The spacers **150**, **152**, **154**, **156** can create tension between the engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134**. In some embodiments, the spacers **150**, **152**, **154**, **156** can be fixed to remove the tension between the engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134**.

(122) FIGS. **1-3** illustrate the extractor **100**, the spacers **150**, **152**, **154**, **156**, and the collection funnel. The extractor **100** can be made of a wire member. The extractor **100** can be formed in a helix-like shape. The extractor **100** can be formed with a series of round eyelets **146**. The extractor **100** can be formed with a series of legs **142**, **144**. The extractor **100** can be formed with a series of arcs **140**. The extractor **100** can be formed with connecting members **118**, **128**, **138**. The extractor **100** can be formed with one continuous wire member defining all, or a subset of the engagement members, including legs, arcs, and/or spacers. The extractor **100** can be formed with one or more wires.

(123) The eyelet **146** connects to the legs **142**, **144**. The leg **142** extend outward where the leg **142** is connected to the arc **140**. The arc **140** is connected to the next leg **144** where the leg **144** is connected to the next eyelet **146**. The continuation of the series of eyelets **146**, legs **142**, **144**, and arcs **140** form the extractor **100**. Each eyelet **146** can be independent of other eyelets. Each eyelet **146** can be connected together. The legs **142**, **144** and the arc **140** aid in applying tension when the eyelets **146** are spaced apart. In the unconstrained position, the eyelets **146** are positioned adjacent

to each other. The eyelets **146** are separated by the spacer **150**, **152**, **154**, **156** to keep the eyelets **146** apart. In some embodiment, the spacer **150**, **152**, **154**, **156** can be integrated as part of the extractor **100**.
(124) The wire member of the extractor **100** can be made of metallic material. The wire member of the extractor **100** can be made, for example, of a shape memory material such as Nitinol. The wire member of the extractor **100** can have a diameter of, e.g. about 0.0005″, 0.001″, 0.0015″, 0.002″, 0.0025″, 0.003″, 0.0035″, 0.004″, 0.0045″, 0.005″, or more or less, from 0.0005″ to 0.005″, or any range of two of the foregoing values.
(125) The filter can be positioned at the distal end of the catheter shaft **106**. The filter can be made, in some cases, of dual nitinol braid layer. The filter can attach to the distal end of the catheter shaft **106**. The extractor **100** can be proximal to the filter. The spacers **150**, **152**, **154**, **156** can be positioned between the eyelets **146** to keep the eyelets **146** apart and to create a space to capture the clot.
(126) The extractor **100** can be made of a wire member that is formed with a series of round eyelets **146**, spacers **150**, **152**, **154**, **156** formed as coils, the legs **142**, **144** and the arcs **140**. The eyelet **146** connects to the leg **142** that extends outward where the leg **142** is connected to the arc **140**. The arc **140** is connected to the next leg **144** where it is connected to the next eyelet **146**. The continuation of the series of the eyelets **146**, the legs **142**, **144** and the arc **140** form the extractor **100**. The legs **142**, **144** and the arc **140** aid in applying tension when the eyelets **146** are spaced apart. In the unconstrained position, the eyelets **146** are positioned adjacent to each other. The eyelets **146** are separated by the spacer **150**, **152**, **154**, **156** to keep the eyelets **146** apart. The spacer **150**, **152**, **154**, **156** is positioned between the eyelets **146** to keep the eyelets **146** apart and to create a space opening to capture the clot. In some embodiment, the spacer **150**, **152**, **154**, **156** is made of coil. The spacer **150**, **152**, **154**, **156** formed from the coil can be part of the extractor **100**. The spacer **150**, **152**, **154**, **156** formed from the coil can be separate from the extractor **100**. The spacer **150**, **152**, **154**, **156** formed from the coil can be close pitch or loose pitch which can be spring-like.
(127) The extractor **100** can be made of a wire member that is formed in a helix-like shaped with series of round eyelets **146**, the legs **142**, **144**, and the arcs **140**. The helix-like shaped can be a single helix. In some embodiments, the helix can be a double helix. In some embodiments, the helix can be a triple helix or more. The eyelet **146** connects to the leg **142** that extends outward where the leg **142** is connected to the arc **140**. The other end of the arc **140** is connected to the next leg **144** that is connected to the next eyelet **146**. Continuation of the series of eyelets **146**, the legs **142**, **144** and the arcs form the extractor **100**. Each eyelet **146** can be independent of the other eyelet **146** or connected to the adjacent eyelet **146**. In some embodiments, the eyelets **146**, the legs **142**, **144** and the arcs **140** are connected by a single wire. The legs **142**, **144** and the arcs **140** can apply tension when the eyelets **146** are spaced apart. In the unconstrained position, the eyelets **146** are position adjacent to each other. The eyelets **146** are separated by the spacer **150**, **152**, **154**, **156** to keep the eyelets **146** apart. In some embodiment, the spacer **150**, **152**, **154**, **156** can be integrated with the extractor. The wire member can be made of, e.g., one or more metallic materials such as nitinol. The wire member diameter can range from, e.g., 0.0005″ to 0.005″. The extractor **100** can be compressed in the delivery configuration to the intended treatment site through a sheath or a catheter. The extractor **100** is expanded as it is unsheathed. The extractor length can be unsheathed as needed for use as the entire length of the extractor **100** does not need to be open for the extractor **100** to be functional. In some embodiment, a filter can be used and is positioned distal to the extractor and aids in capturing fragmented clot or emboli during the removal of the extractors. The filter can be compressed during delivery and expand when unsheathed. The filter aids in capturing potential fragmented clot or emboli when retrieving the clot or emboli. In some embodiment, there is a collection funnel used to capture the extractor **100** and the filter with clot. The collection funnel can be positioned proximal to the extractor **100**.
(128) To use the extractor **100**, a guidewire can be used to access the treatment area. A guide

catheter with balloon tip can be placed in the carotid artery. The sheath **160** can be introduced through the guide catheter to the treatment site. The extractor **100**, the filter and the collection funnel can introduced over the guidewire to the treatment site via the sheath **160**. The sheath **160** is then unsheathed to deploy the filter and the extractor **100** and the collection funnel. The sheath **160**, the extractor **100** and the filter then withdraw into the collection funnel. Once inside the collection funnel, the entire system is withdrawn into the guide catheter. In some embodiment, a collection funnel is introduced and position near the treatment site via the balloon catheter. The sheath **160** is introduced via the collection funnel to the treatment site. The extractor **100** and the filter are introduced through the sheath **106** to the treatment site. The sheath **160** is then retracted to deploy the extractor **100** and the filter. The sheath **160**, the extractor **100** and the filter withdraw into the collection funnel. The entire assembly is then withdrawn into the guide catheter from the vascular system.

(129) FIG. **4**A through **4**G represents the extractor deployment. The extractor **100** is first inside the sheath **160** in FIG. **4**A. Then, the sheath **160** is unsheathed (e.g., moved in a direction longitudinally along the extractor) to fully deploy the engagement panels **110**, **112**, **114** of the extractor **100** in FIG. **4**G. The extractor **100** has three engagement panels **110**, **112**, **114**. The engagement panels **110**, **112**, **114** are at the first longitudinal location. The engagement panels **110**, **112**, **114** can deploy together. The engagement panels **110**, **112**, **114** can deploy simultaneously. The engagement panels **110**, **112**, **114** can deploy as the sheath **160** moves past the first longitudinal location. The engagement panels **110**, **112**, **114** open like a flower. The arcs **140** of the engagement panels **110**, **112**, **114** deploy first as the sheath **160** moves. The legs **142**, **144** gradually deploy as the sheath **160** moves. The legs **142**, **144** fully deploy thereby expanding the arcs **140**. The engagement panels **110**, **112**, **114** open to the expanded diameter when the legs **142**, **144** are unsheathed. The engagement panels **110**, **112**, **114** are fully deployed. The engagement panels **110**, **112**, **114** can function to engage a clot.

(130) FIG. **5**A though **5**G represents the deployment of the engagement panels **120**, **122**, **124** of the extractor **100**. The engagement panels **110**, **112**, **114** are fully deployed. The engagement panels **120**, **122**, **124** of the extractor **100** are first inside the sheath **160** in FIG. **5**A. Then, the sheath **160** is unsheathed to fully deploy the engagement panels **120**, **122**, **124** of the extractor **100** in FIG. **5**G. The extractor **100** has three engagement panels **120**, **122**, **124**. The engagement panels **120**, **122**, **124** are at the second longitudinal location. The engagement panels **120**, **122**, **124** can deploy together. The engagement panels **120**, **122**, **124** can deploy simultaneously. The engagement panels **120**, **122**, **124** can deploy as the sheath **160** moves past the second longitudinal location. The engagement panels **120**, **122**, **124** open like a flower. The arcs **140** of the engagement panels **120**, **122**, **124** deploy first as the sheath **160** moves. The legs **142**, **144** gradually deploy as the sheath **160** moves. The legs **142**, **144** fully deploy thereby expanding the arcs **140**. The engagement panels **120**, **122**, **124** open to the expanded diameter when the legs **142**, **144** are unsheathed. The engagement panels **120**, **122**, **124** are fully deployed. The engagement panels **120**, **122**, **124** can function to engage a clot. The engagement panels **110**, **112**, **114** and the engagement panels **120**, **122**, **124** can function to pinch a clot therebetween.

(131) FIG. **6**A through **6**G represents the extractor deployment of an extractor **200**. The extractor **200** can have any of the features described herein. The extractor **200** can have a plurality of engagement panels **210**, **212**, **214**, **216**, **220**, **222**, **224**, **226**, **230**, **232**, **234**, **236**. The engagement panels **210**, **212**, **214**, **216** are located at a first longitudinal location. The engagement panels **220**, **222**, **224**, **226** are located at a second longitudinal location. The engagement panels **230**, **232**, **234**, **236** are located at a third longitudinal location. The first longitudinal location can be distal to the second longitudinal location. The second longitudinal location can be distal to the third longitudinal location. In the illustrated embodiment, there are four engagement panels at each longitudinal location. The engagement panels **210**, **212**, **214**, **216** can form a generally round profile. The engagement panels **210**, **212**, **214**, **216** at a single longitudinal location can form a circular profile.

Each engagement panel **210**, **212**, **214**, **216** can form a portion of a circle. Each engagement panel **210**, **212**, **214**, **216** can form an arc **240**. Each engagement panel **210**, **212**, **214**, **216** can include an approximately 90 degree arc. Each engagement panel **210**, **212**, **214**, **216** can form an arc of, e.g. about 75 degrees, 80 degrees, 81 degrees, 82 degrees, 83 degrees, 84 degrees, 85 degrees, 86 degrees, 87 degrees, 88 degrees, 90 degrees, less than 90 degrees, greater than 80 degrees, or any range of two of the foregoing values. Each engagement panel **210**, **212**, **214**, **216** can form an arc that forms part of a circular profile. Each engagement panel **210**, **212**, **214**, **216** can form the same arc. Each engagement panel **210**, **212**, **214**, **216** can form a different arc. The two legs **242**, **244** connect to an arc **240** of engagement panel **210**, **212**, **214**, **216**. The two legs **242**, **244** can be linear. The two legs **242**, **244** can have a constant angle therebetween. The two legs **242**, **244** can connect to the ends of the arc **240**.

(132) The extractor **200** is first inside the sheath **160** in FIG. **6**A. Then, the sheath **160** is unsheathed to fully deploy the engagement panels **210**, **212**, **214**, **216** of the extractor **200** in FIG. **6**G. The extractor **200** has three engagement panels **210**, **212**, **214**, **216**. The engagement panels **210**, **212**, **214**, **216** are at the first longitudinal location. The engagement panels **210**, **212**, **214**, **216** can deploy together. The engagement panels **210**, **212**, **214**, **216** can deploy simultaneously. The engagement panels **210**, **212**, **214**, **216** can deploy as the sheath **160** moves past the first longitudinal location. The engagement panels **210**, **212**, **214**, **216** open like a flower. The arcs **240** of the engagement panels **210**, **212**, **214**, **216** deploy first as the sheath **160** moves. The legs **242**, **244** gradually deploy as the sheath **160** moves. The legs **242**, **244** fully deploy thereby expanding the arcs **240**. The engagement panels **210**, **212**, **214**, **216** open to the expanded diameter when the legs **242**, **244** are unsheathed. The engagement panels **210**, **212**, **214**, **216** are fully deployed. The engagement panels **210**, **212**, **214**, **216** can function to engage a clot. In some embodiments, the extractor **200** can include a distal member **280**. The distal member **280** can include any feature described herein. In some embodiments, the distal member **280** can deploy before the engagement panels **210**, **212**, **214**, **216**.

(133) FIG. **7**A though **7**G represents the deployment of the engagement panels **220**, **222**, **224**, **226** of the extractor **200**. The engagement panels **210**, **212**, **214**, **216** are fully deployed. The engagement panels **220**, **222**, **224**, **226** of the extractor **200** are first inside the sheath **160** in FIG. **7**A. Then, the sheath **160** is unsheathed to fully deploy the engagement panels **220**, **222**, **224**, **226** of the extractor **200** in FIG. **7**G. The extractor **200** has three engagement panels **220**, **222**, **224**, **226**. The engagement panels **220**, **222**, **224**, **226** are at the second longitudinal location. The engagement panels **220**, **222**, **224**, **226** can deploy together. The engagement panels **220**, **222**, **224**, **226** can deploy simultaneously. The engagement panels **220**, **222**, **224**, **226** can deploy as the sheath **160** moves past the second longitudinal location. The engagement panels **220**, **222**, **224**, **226** open like a flower. The arcs **240** of the engagement panels **220**, **222**, **224**, **226** deploy first as the sheath **160** moves. The legs **242**, **244** gradually deploy as the sheath **160** moves. The legs **242**, **244** fully deploy thereby expanding the arcs **240**. The engagement panels **220**, **222**, **224**, **226** open to the expanded diameter when the legs **242**, **244** are unsheathed. The engagement panels **220**, **222**, **224**, **226** are fully deployed. The engagement panels **220**, **222**, **224**, **226** can function to engage a clot. The engagement panels **210**, **212**, **214**, **216** and the engagement panels **220**, **222**, **224**, **226** can function to pinch a clot therebetween.

(134) FIG. **8**A through **8**G represents the extractor deployment where the extractor **100** is first inside the sheath in FIG. **8**A, then the sheath **106** is unsheathed to fully deploy the engagement panels **110**, **112**, **114** in FIG. **8**G. FIG. **9**A though **9**H represents the deployment of the engagement panels **120**, **132**, **134** of the extractor **100**. The engagement panels **110**, **112**, **114** are fully deployed. The engagement panels **120**, **122**, **124** of the extractor **100** are first inside the sheath **160** in FIG. **9**A. Then, the sheath **160** is unsheathed to fully deploy the engagement panels **120**, **122**, **124** of the extractor **100** in FIG. **9**H. The extractor **100** has three engagement panels **120**, **122**, **124**. The engagement panels **120**, **122**, **124** are at the second longitudinal location. The engagement panels

120, **122**, **124** can deploy together. The engagement panels **120**, **122**, **124** can deploy such that a portion of the engagement panels **120**, **122**, **124** is proximal to the distal end of the sheath **160** in FIG. **9**E. The engagement panels **120**, **122**, **124** can wrap around the distal end during deployment. The engagement panels **120**, **122**, **124** can extend proximally during deployment. The engagement panels **120**, **122**, **124** can be distal to the distal end of the sheath **160** when fully deployed. The initial expanded portion of the engagement panels revert proximally when the engagement panels first deploy.

(135) FIG. **10** represents a top view of the extractor **200**. FIGS. **11-14** represent side views of the extractor **200**. The engagement panels **210**, **212**, **214**, **216** can be configured to be approximately 90 degrees to the catheter shaft **206**.

(136) The engagement panels **210**, **212**, **214**, **216**, **220**, **222**, **224**, **226**, **230**, **232**, **234**, **236** can be at various angles relative to a center axis **208**. The center axis **208** can extend along the length of the catheter shaft **206**. The engagement panels **210**, **212**, **214**, **216** can be at a first angle relative to the center axis **208**. The first angle can range from, e.g., 30 degrees to 150 degrees relative to the center axis **208**. The engagement panels **220**, **222**, **224**, **226** can be at a second angle relative to the center axis **208**. The second angle can range from, e.g., 30 degrees to 150 degrees relative to the center axis **208**. The engagement panels **230**, **232**, **234**, **236** can be at a third angle relative to the center axis **208**. The third angle can range from 30 degrees to 150 degrees relative to the center axis **208**. The first angle and the second angle can be the same angle. The first angle and the second angle can be different angles. The first angle, the second angle, and the third angle can be the same angle. The first angle, the second angle, and the third angle can be different angles.

(137) The engagement panels **210**, **212**, **214**, **216**, **220**, **222**, **224**, **226**, **230**, **232**, **234**, **236** can angle in the same direction distally. The engagement panels **1 210**, **212**, **214**, **216**, **220**, **222**, **224**, **226**, **230**, **232**, **234**, **236** can angle in the same direction proximally. The engagement panels **210**, **212**, **214**, **216** and the engagement panels **220**, **222**, **224**, **226** can angle in the same direction. The engagement panels **210**, **212**, **214**, **216** and the engagement panels **220**, **222**, **224**, **226** can angle in different direction. The engagement panels **210**, **212**, **214**, **216** and the engagement panels **220**, **222**, **224**, **226** can angle in a different, e.g., alternate manner. The engagement panels **220**, **222**, **224**, **226** and the engagement panels **230**, **232**, **234**, **236** can angle in alternate manner. The engagement panels **210**, **212**, **214**, **216**, **220**, **222**, **224**, **226**, **230**, **232**, **234**, **236** can angle in an alternate manner for each engagement panels at a longitudinal location such that one engagement panels at the first longitudinal location can angle toward distally and the adjacent engagement panels at the second longitudinal location angle toward proximally. In some embodiments, the engagement panels **210**, **212**, **214**, **216** and the engagement panels **220**, **222**, **224**, **226** can angle in the same direction. In some embodiments, the engagement panels **210**, **212**, **214**, **216** and the engagement panels **220**, **222**, **224**, **226** can alternate pointing distally or proximally and vice versa. Each engagement panels **210**, **212**, **214**, **216** can angle in the same direction or alternate direction, e.g., facing distally or proximally or any combination thereof. When the engagement panel first exposes or exit the microcatheter, the first portion of the panel revert back proximally behind the tip of the sheath. Then the latter portion of the engagement panel expand or flare outward. The reverting back of the panel tip will grab and pull the clot away from the vessel wall.

(138) In some embodiments, the diameter of the engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can be adjusted to a larger or smaller diameter depending on the vessel diameter as needed. The arcs **140** can expand to be against the vessel wall. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can partially flare outward to contact the vessel wall. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can fully flare outward to contact the vessel wall. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can function when the legs **142**, **144** are partially expanded. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can function when the legs **142**, **144** when the legs are straight. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can function when the legs **142**, **144** are

perpendicular to the catheter shaft **106**. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can function when the legs **142**, **144** are angled to the catheter shaft **106**.

(139) FIG. **15** is another view of the extractor **200**. The extractor **200** can include the legs **242**, **244**. The extractor **200** can include the eyelets **246**. The extractor **200** can include the spacers **250**, **252**, **254**, **256**. The extractor **200** can include the catheter shaft **206**. The extractor **200** can include any of the features described herein.

(140) FIG. **16** is a view of an extractor **300**. The extractor **300** can have any of the features described herein. The engagement panels **310**, **320**, **330** can be arranged in a helical configuration. FIG. **17** is a view of the extractor **300**. The engagement panels **310**, **320**, **330** can be partially deploy distal to the sheath **160**. FIG. **18** is a view of the extractor **300** and sheath **160**. The extractor **300** can include a distal member **380**. The distal member **380** can include any feature described herein.

(141) FIG. **19** is a view of the extractor **100**. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can expand or open from the right to left. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can open upward. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can create a scraping effect. The engagement panels **110**, **112**, **114**, **120**, **122**, **124**, **130**, **132**, **134** can create a pinching effect.

(142) FIG. **20** is another view of the extractor **100**.

(143) FIG. **21** is a view of the extractor **100**. The engagement panels **110**, **112**, **114** can each form an angle theta relative to the central axis **108**. The engagement panels **110**, **112**, **114** can each form an angle theta of approximately 120 degrees.

(144) FIGS. **22-26** are views of the extractor **100**. The engagement panels **110**, **112**, **114** can each form an angle alpha relative to the central axis **108**. The engagement panels **110**, **112**, **114** can each form an angle alpha approximately 90 degrees.

(145) FIGS. **27-30** are views of the extractor **300**.

(146) FIG. **31** is a view of the extractor **300**.

(147) FIG. **32-35** are views showing the extractor **200**. FIGS. **36-39** show the extractor with the engagement panels in a helical shape.

(148) FIGS. **40-42** are views of the third embodiment of the extractor **300**. The engagement panels can be arranged in a helical configuration.

(149) FIGS. **43-44** are views of the second embodiment of the extractor **200**. The extractor **200** can have four engagement panels per longitudinal location.

(150) FIGS. **45-47** are views of the first embodiment of the extractor **100**. The extractor **100** can have three engagement panels per longitudinal location. The engagement panels can be3 coupled to the catheter shaft.

(151) FIGS. **48-52** are views of the third embodiment of the extractor **300**. The engagement panels can be a helix engagement panel.

(152) FIGS. **53-56** are views of a system. The system can include a cover sheath to load the extractor. The system can include a distal filter. The system can include any of the extractors described herein, with the extractor **100** illustrated. The system can include any of the engagement panels described herein. The system can include any of the spacers described herein. The system can include a core wire. FIG. **54** is an enlarged view of the extractor. FIG. **55** is a cross-sectional view. FIG. **56** is a cross-sectional view.

(153) FIGS. **57-64** are views of a fourth embodiment of the extractor **400**. The extractor **400** can have any of the features described herein. The extractor **400** can have a plurality of engagement panels **410**, **412**, **414**, **416**, **420**, **422**, **424**, **426**, **430**, **432**, **434**, **436**. The engagement panels **410**, **412**, **414**, **416** are located at a first longitudinal location. The engagement panels **420**, **422**, **424**, **426** are located at a second longitudinal location. The engagement panels **430**, **432**, **434**, **436** are located at a third longitudinal location. In the illustrated embodiment, there are four engagement panels at each longitudinal location. The engagement panels **410**, **412**, **414**, **416** at a single longitudinal

location can form a circular profile. The extractor **400** can include a plurality of spacers **450**, **452**, **454**, **456**. The spacer **450** can be located between a distal end and the engagement panels **410**, **412**, **414**, **416**. The spacer **452** can be located between the engagement panels **410**, **412**, **414**, **416**, and the engagement panels **420**, **422**, **424**, **426**. The spacer **452** can be between the first longitudinal location and the second longitudinal location. The spacer **454** can be located between the engagement panels **420**, **422**, **424**, **426**, and the engagement panels **430**, **432**, **434**, **436**. The spacer **454** can be between the second longitudinal location and the third longitudinal location. In some embodiments, the spacer **456** can be located between the engagement panels **430**, **432**, **434**, **436** and another set of engagement panels. In some embodiments, the spacer **456** can be located between the engagement panels **430**, **432**, **434**, **436** and a proximal end.

(154) The spacers **450**, **452**, **454**, **456** can be formed from a coil. The coil of the spacer can be integral with the engagement panels. The coil of the spacer can be unitarily formed with the engagement panels. The coil of the spacer can be separate from the with the engagement panels. In some embodiments, the spacer can be formed from a hypo tube. FIG. **61** is a cross-sectional view. FIGS. **62-67** are additional views. The spacer **450**, **452**, **454**, **456** can have a close gap. The spacer **450**, **452**, **454**, **456** can be a tight coil. The spacer **450**, **452**, **454**, **456** can have a loose gap. The spacer **450**, **452**, **454**, **456** can be a looser coil or spring.

(155) FIGS. **65-66** are views of the extractor **400**. The extractor can be biased to for the engagement panels to move toward each other. The biased for the engagement panels to move towards each other have a compressive force thereby a pinch force where it can pinch a clot during clot capture.

(156) The extractors **100**, **200**, **300** describe herein can include engagement panels. The engagement panels can form a diameter. The diameter can be formed from engagement panels at a single longitudinal location. The engagement panels can have a single diameter. The single diameter can be 3 mm, 4 mm, 5 mm, or more. The engagement panels can have multiple diameters. The diameters can be, e.g., 4 mm at a longitudinal location, 5 mm at the next longitudinal location, 4 mm at the next longitudinal location, and 5 mm at the next longitudinal location. The diameter formed from engagement panels can alternate in different sizes along the extractor **100**.

(157) The engagement panels can form a round perimeter. The engagement panels can form a elliptical perimeter. The engagement panels can form an oblong perimeter. The engagement panels can form an angle relative to catheter shaft. The angle can be, e.g. about 1 degree, 5 degrees, 10 degrees, 15 degrees, 20 degrees, 25 degrees, 30 degrees, 35 degrees, 40 degrees, 45 degrees, 50 degrees, 55 degrees, 60 degrees, 65 degrees, 70 degrees, 75 degrees, range from 1 degrees to 360 degrees, or any range of two of the foregoing values.

(158) The engagement panels can have equal longitudinal spacing. The engagement panels can have unequal longitudinal spacing. The spacing between adjacent engagement panels can be, e.g. about 1 mm, 2 mm, 3 mm, 4 mm, 5 mm, 6 mm, 7 mm, 8 mm, 9 mm, 10 mm, 15 mm, range from 2 mm to 15 mm, or any range of two of the foregoing values. The engagement panels can have a custom distance between adjacent engagement panels. The spacing between adjacent engagement panels can be 3 mm, then the spacing between adjacent engagement panels can be 4 mm, and then spacing between adjacent engagement panels can be 5 mm.

(159) In some embodiments, the engagement panels can have one leg. In some embodiments, the engagement panels can have two legs. In some embodiments, the engagement panels can have three legs. In some embodiments, the engagement panels can be connected. The extractor can include connecting members. There can be connection between engagement panels. There can be no connection between engagement panels. In some embodiments, the engagement panels can be formed of a single wire. In some embodiments, the engagement panels can be formed of multiple wires.

(160) FIG. **67** is another view of the extractor **200**. The extractor **200** can include any feature of the extractor **100** described herein. Each engagement panels **210**, **212**, **214**, **216** can be formed by two

legs **242**, **244** shown in FIG. **67**. The two legs **242**, **244** connect to the arc **240** of engagement panel **210**, **212**, **214**, **216**. The two legs **242**, **244** can be radially outward from the longitudinal axis of the extractor **200**. The two legs **242**, **244** can be angled relative to each other. The two legs **242**, **244** can be straight. The two legs **242**, **244** can have a constant angle therebetween. The two legs **242**, **244** can connect to the ends of an arc **240**. The extractor **200** can include the eyelet **246**. The eyelet can form a lumen. The extractor can include the connecting member, extension or bridge **218**. The engagement panels **210**, **212**, **214**, **216** can be at the first longitudinal location. The engagement panels **220**, **222**, **224**, **226** can be at the second longitudinal location. The engagement panels **230**, **232**, **234**, **236** can be at the third longitudinal location. The engagement panels **210**, **212**, **214**, **216** can be continuous with no loop ends. The engagement panels **220**, **222**, **224**, **226** can be continuous with no loop ends. The engagement panels **230**, **232**, **234**, **236** can be continuous with no loop ends. In some embodiments, the engagement panels **220**, **222**, **224**, **226**, **230**, **232**, **234**, **236** can be continuous with no loop ends. In some embodiments, all the engagement panels of the extractor is one single unit with no loop ends. The arc **240** of each engagement panel **210**, **212**, **214**, **216**, **220**, **222**, **224**, **226**, **230**, **232**, **234**, **236** can be configured to be in contact with the vessel wall preferably. The arc **240** of each engagement panel **210**, **212**, **214**, **216**, **220**, **222**, **224**, **226**, **230**, **232**, **234**, **236** can also be configured to be near the vessel wall without contact with the vessel wall. The arc **240** of each engagement panel **210**, **212**, **214**, **216**, **220**, **222**, **224**, **226**, **230**, **232**, **234**, **236** can form a smooth, atraumatic edge.

(161) In some embodiments, the eyelet **246** can allow the engagement panels **210**, **212**, **214**, **216** at the first longitudinal location to move longitudinally. In some embodiments, the eyelet **246** can allow the engagement panels **220**, **222**, **224**, **226** at the second longitudinal location to move longitudinally. In some embodiments, the eyelet **246** can allow the engagement panels **230**, **232**, **234**, **236** at the third longitudinal location to move longitudinally.

(162) The extractor **200** can have a plurality of connecting members **218**, **228**, **238**. The connecting member **218** can connect the engagement panels **210**, **212**, **214**, **216** at the first longitudinal location and the engagement panels **220**, **222**, **224**, **226** at the second longitudinal location. The connecting member **228** can connect the engagement panels **220**, **222**, **224**, **226** at the second longitudinal location and the engagement panels **230**, **232**, **234**, **236** at the third longitudinal location. The connecting member **338** can connect the engagement panels **230**, **232**, **234**, **236** at the third longitudinal location and another set of engagement panels. The connecting members **218**, **228**, **238** and the engagement panels **210**, **212**, **214**, **216**, **220**, **222**, **224**, **226**, **230**, **232**, **234**, **236** can be continuous and integrally formed. The connecting members **218**, **228**, **238** can be formed of the same material as the engagement panels **210**, **212**, **214**, **216**, **220**, **222**, **224**, **226**, **230**, **232**, **234**, **236**. The connecting members **218**, **228**, **238** can be separately formed from the engagement panel **210**, **212**, **214**, **216**, **220**, **222**, **224**, **226**, **230**, **232**, **234**, **236**. The connecting members **218**, **228**, **238** can be formed of a different material as the engagement panels **210**, **212**, **214**, **216**, **220**, **222**, **224**, **226**, **230**, **232**, **234**, **236**.

(163) The extractor **200** can include one or more radiopaque markers **248**. The radiopaque marker **248** can be located on the arc **240**. The first longitudinal location can include one or more radiopaque markers **248**. Two arcs **240** at the first longitudinal location can include radiopaque markers **248**. Two diametrically opposed arcs **240** at the first longitudinal location can include radiopaque markers **248**. The second longitudinal location can include one or more radiopaque markers **248**. The third longitudinal location can include one or more radiopaque markers **248**. Other configuration and location are contemplated.

(164) FIG. **68-73** are views of an extractor **500**. The extractor **500** can include any feature described herein. The extractor **500** can include double layers engagement panels. The extractor **500** can include radiopaque markers. The extractor **500** can include a distal end **504**. The extractor **500** can include a catheter shaft **506**. The extractor **500** can have a plurality of engagement panels **510**, **512**, **514**, **516**, **520**, **522**, **524**, **526**, **530**, **532**, **534**, **536**. The engagement panels **510**, **512**, **514**,

516 are located at a first longitudinal location. The engagement panels **520**, **522**, **524**, **526** are located at a second longitudinal location. The engagement panels **530**, **532**, **534**, **536** are located at a third longitudinal location. In some embodiments, the extractor **500** can include four engagement panels at each longitudinal location. The extractor **500** can include a distal member **580**. The distal member **580** can include any feature described herein.

(165) The extractor **500** can include a core wire **570**. The core wire **570** can be made of one, two, three or more components. The core wire **570** can include a proximal core wire **572**. The proximal core wire **572** can comprise stainless steel, nitinol, laser cut tube, polymers, and/or combinations thereof. The core wire **570** can include a distal core wire **574**. The distal core wire **574** can comprise stainless steel, nitinol, laser cut tube, polymers, and/or combinations thereof. The extractor **500** can include a sleeve connector **576**. The sleeve connector **576** can comprise stainless steel, nitinol, laser cut tube, polymers, and/or combinations thereof. The sleeve can be of radiopaque material for better visualization.

(166) FIG. **69** illustrates the engagement panels. The extractor **500** can include double layer engagement panels. Each engagement panel **510**, **512**, **514**, **516** can be formed from two layers. The two layers can be aligned. The two layers can be offset. The first layer can form one substantially complete circumference. The second layer can form one substantially complete circumference.

(167) Each engagement panels **510**, **512**, **514**, **516** can be formed by two legs **542**, **544**. The two legs **542**, **544** connect to the arc **540** of engagement panel **510**, **512**, **514**, **516**. The two legs **542**, **544** can be radially outward. The two legs **542**, **544** can be angled relative to each other. The two legs **542**, **544** can connect to the ends of the arc **540**. The two legs **542**, **544** of the first layer can be offset from the two legs **542**, **544** of the second layer. The arc **540** of the first layer can be offset from the arc **540** of the second layer. The layers can be circumferentially offset. The layers can be twisted relative to a eyelet **546**. The layers can be offset by a small degree. The layers can partially overlap. The two legs **542**, **544** of the first layer can be aligned with the two legs **542**, **544** of the second layer. The arc **540** of the first layer can be aligned with the arc **540** of the second layer. The layers can be longitudinally aligned. The layers can abut. The layers can overlap. The layers can be stacked. The layers can completely align. The first layer can be distal to the second layer.

(168) The extractor **500** can include a coil **578**. The coil **578** can form a lumen for the core wire **570**. The coil **578** can function as a connecting member. The coil **578** can function as a spacer. The coil **578** can connect the engagement panels **510**, **512**, **514**, **516** at the first longitudinal location and the engagement panels **520**, **522**, **524**, **526** at the second longitudinal location. The coil **578** can connect the engagement panels **520**, **522**, **524**, **526** at the second longitudinal location and the engagement panels **530**, **532**, **534**, **536** at a third longitudinal location. The coil **578** can connect the engagement panels **530**, **532**, **534**, **536** at a third longitudinal location and another set of engagement panels. The coil **578** and the engagement panels **510**, **512**, **514**, **516**, **520**, **522**, **524**, **526**, **530**, **532**, **534**, **536** can be continuous. The coil **578** and the engagement panels **510**, **512**, **514**, **516**, **520**, **522**, **524**, **526**, **530**, **532**, **534**, **536** can be integrally formed. The coil **578** and the engagement panels **510**, **512**, **514**, **516**, **520**, **522**, **524**, **526**, **530**, **532**, **534**, **536** can be separately formed and connected together. The coil **578** can include a radiopaque marker. The coil **578** can include a radiopaque material. The coil **578** is substantially inside an outer member **568**. The outer member **568** can be made of polymeric materials such as polyethylene, PTFE, FEP, polyurethane, nylon, PEBAX for example. The outer member **568** can be made of metallic materials. The coil **578** can include a distal marker **558** shown in FIG. **71**.

(169) The engagement panels **510**, **512**, **514**, **516**, **520**, **522**, **524**, **526**, **530**, **532**, **534**, **536** can be made of 1, 2, 3 or more layers. The engagement panels **510**, **512**, **514**, **516**, **520**, **522**, **524**, **526**, **530**, **532**, **534**, **536** can be made of nitinol, stainless steel, shape memory polymers and/or combinations thereof.

(170) FIG. **72** illustrates the extractor **500** with a triple layer engagement panel. The two legs **542**,

544 of the first layer can be offset from the two legs **542**, **544** of the second layer. The two legs **542**, **544** of the second layer can be offset from the two legs **542**, **544** of the third layer. The arc **540** of the first layer can be offset from the arc **540** of the second layer. The arc **540** of the second layer can be offset from the arc **540** of the third layer. The layers can be circumferentially offset. The layers can be offset by a small degree. The layers can be offset by a large degree. The layers can at least partially overlap. The two legs **542**, **544** of the first layer can be aligned with the two legs **542**, **544** of the second layer and the two legs **542**, **544** of the third layer. The arc **540** of the first layer can be aligned with the arc **540** of the second layer and the arc **540** of the third layers. The plurality of layers can be longitudinally aligned. The plurality of layers can abut. The plurality of layers can overlap. The plurality of layers can be stacked. The plurality of layers can completely align. The first layer can be distal to the second layer. The second layer can be distal to the third layer. The coil **578** can function as a support coil. The coil **578** can include a jacket **568**. The jacket **568** can comprise PTFE.

(171) FIG. **73** illustrates the loading tube assembly **590**. The loading tube assembly **590** can include a taper end **592** for engagement with the microcatheter. The loading assembly **590** can include a larger section **594** to minimize slippage during device insertion. The loading tube aids to introduce the device into the microcatheter or delivery catheter and advance within the microcatheter or delivery catheter to the treatment site. The loading tube can be made of polymeric materials such as Polyethylene, PTFE, FEP, Nylon, Polyurethane, PEBAX or PET for example. The loading tube assembly can also be a tubular member or a sheath.

(172) FIG. **74-79** are view of the extractor **500** with single layer engagement panels. The extractor **500** can include radiopaque markers on the engagement panels. The extractor **500** can include one or more radiopaque markers **548**. The radiopaque marker **548** can be located on the arc **540**. The first longitudinal location can include one or more radiopaque markers **548**. One arc **540** can include radiopaque markers **548** at the first longitudinal location. The second longitudinal location can include one or more radiopaque markers **548**. The third longitudinal location can include one or more radiopaque markers **548**. Other configuration are contemplated. The coil segment in between the engagement panels can be radiopaque. For example, the coil segment between the first longitudinal location and the second longitudinal location is made of platinum/iridium or tungsten. The radiopaque markers **548** can be marker bands. The radiopaque markers **548** can be made of platinum and/or iridium. The radiopaque markers **548** can be made of tubes or coils. The extractor **500** can also connecting members, extension or bridge **518**, **528**, **538**. The engagement panels **510**, **512**, **514**, **516**, **520**, **522**, **524**, **526**, **530**, **532**, **534**, **536** can be made of solid super elastic nitinol wire. The engagement panels **510**, **512**, **514**, **516**, **520**, **522**, **524**, **526**, **530**, **532**, **534**, **536** can be made of DFT (drawing filled tubing) nitinol with a platinum core.

(173) The engagement panels **510**, **512**, **514**, **516**, **520**, **522**, **524**, **526**, **530**, **532**, **534**, **536** can be formed from a single layer. The two legs **542**, **544** of the engagement panel **510** can be angled from the two legs **542**, **544** of the engagement panel **512**. The two legs **542**, **544** of the engagement panel **510** can be separated from the two legs **542**, **544** of the engagement panel **512**. The arcs **540** of the engagement panels **510**, **512**, **514**, **516**, **520** can form an incomplete circle. The arcs **540** of the engagement panels **510**, **512**, **514**, **516**, **520** can form segments of a circle. There can be one radiopaque marker **548** on the engagement panels **510**, **520**, **530**. The extractor **500** can include platinum coils along the core wire **570**. The extractor **500** can include one or more additional bands **558**. There can be a band **558** at the distal end. There can be a band **548** at or near the proximal end. There can be a band **558** at any location along the length. There can be a band **558** at both ends. The coil **578** can include platinum coils. There can be one, two, or more radiopaque marker **558** at a longitudinal location.

(174) The extractor **500** can have a plurality of connecting members **518**, **528**, **538**. The connecting member **518** can connect the engagement panels **510**, **512**, **514**, **516** at the first longitudinal location and the engagement panels **520**, **522**, **524**, **526** at the second longitudinal location. The

connecting member **528** can connect the engagement panels **520**, **522**, **524**, **526** at the second longitudinal location and the engagement panels **530**, **532**, **534**, **536** at the third longitudinal location. The connecting member **538** can connect the engagement panels **530**, **532**, **534**, **536** at the third longitudinal location and another set of engagement panels. The connecting members **518**, **528**, **538** can be curved.

(175) The distal member **580** can be made from a single layer nitinol braid. The distal member **580** can be made from a double layer nitinol braid. The distal member **580** can be made from closed end single layer nitinol braid. The distal member **580** can be made from closed end double layer nitinol braid. The distal member **580** can be straightened in a loaded configuration. In some embodiments, the distal member **580** can be straightened distally. In some embodiments, the distal member **580** can invert during deployment. In some embodiments, the distal member **580** can invert to sweep the vessel wall. The distal member **580** can fold proximally when unsheathed.

(176) In some embodiments, the distal member **580** can include a proximal end **582**. The proximal end **582** can be cupped. The proximal end **582** can be folded distally. The proximal end **582** can be folded inward. The proximal end **582** can function as a funnel into the distal member **580**. The distal member **580** can collect material within the distal member. In some embodiments, the distal member **580** can include a distal end **584**. The distal end **584** can be a floating end. The distal end **584** of the distal member **580** can form the distal end of the device. The distal member **580** can include a tubular portion **586**. The tubular portion **586** can extend along a longitudinal or central axis. The tubular portion **586** can extend to the distal end **584**. The distal member **580** can include an expanded portion **588**. The expanded portion **588** flares outward from the tubular portion **586**. The expanded portion **588** encircles the tubular portion **586**. The space between the tubular portion **586** and the expanded portion **588** allows for the collection of material. The space between the tubular portion **586** and the expanded portion **588** is enclosed.

(177) In some embodiments, the distal member **580** can be coupled to the core wire **570**. In some embodiments, the distal member **580** can be coupled to the coil **578**. In some embodiments, the distal member **580** can be coupled to distal marker **558**. The distal marker **558** can be coupled to the tubular portion **586** of the distal member **580**. The distal marker **558** can be laser welded to the distal member **580**. The distal marker **558** can be bonded with an adhesive to the distal member **580**. The distal marker **558** can be crimped or swaged or press fit to the distal member **580**.

(178) The loading tube assembly **590** can compress the extractor **500**. The loading tube assembly **590** can compress the engagement panels. The loading tube assembly **590** can compress the distal member **580**. The distal member can straighten in the loading tube assembly **580**.

(179) FIGS. **80**A-**80**B are views of examples of a stent retriever **600**. The stent retriever **600** can be laser cut. The stent retriever **600** can be self-expandable. The stent retriever **600** can be any shape including the shapes shown. The extractors **100**, **200**, **300**, **400**, **500** can be used in combination with the stent retriever **600**. The stent retriever **600** can include a distal member **680**. The distal member **680** can include any feature described herein. The distal member **680** can capture debris.

(180) FIGS. **81**A-**81**C are views of the extractor **300** and proximal funnel or collection bag **650**. The extractor **300** can include the distal member **380**. The extractor **100**, **200**, **300**, **400**, **500** can be used in combination with the proximal funnel or collection bag **650**. The proximal funnel or collection bag **650** can be built-in. The proximal funnel or collection bag **650** can be proximal to the extractor **100**, **200**, **300**, **400**, **500**. FIG. **81**A illustrates the funnel loaded configuration. FIG. **81**B illustrates the funnel deployed configuration. There can be a proximal stopper and a distal stopper. FIG. **81**C illustrates the extractor **300** retracted into the proximal funnel or collection bag **650**.

(181) FIGS. **82**A-**82**B are views of the extractor **300** and a stent retriever **600**. The extractor **300** can be positioned distal to the stent retriever **600** to enable better clot removal. The extractor **300** can be positioned outside the stent retriever **650**. The extractor **300** can be positioned within the stent retriever **650**. The extractor **300** can include the distal member **380**.

(182) FIGS. **83**A-**83**C views of the extractor **200** stent retriever **600**. The extractor **200** can include the distal member **280**.
(183) FIGS. **84**A-**84**D are views of the extractor **500**. The extractor **500**, or any embodiment disclosed herein, can include one or more distal members. FIGS. **84**A-**84**D are views of multiple distal members **580**. The distal member **580** can be positioned at any location along the extractor **500**. The distal member can collect loose clot, soft clot, or in transit clot. The figures illustrates that the distal end of the device can include one, two, three, four, five, six, or more distal members **580**. The distal members **580** can function as end caps. The distal members **580** can be located at various positions of the extractor **500**. In some embodiments, the distal member **580** can be located distal to the first longitudinal location. Two or more distal members **580** can be located distal to the first longitudinal location. The engagement panel **510**, **512**, **514**, **516** can be located at the first longitudinal location. The engagement panel **520**, **522**, **524**, **526** can be located at the second longitudinal location. The engagement panel **530**, **532**, **534**, **536** can be located at the second longitudinal location. In some embodiments, one or more distal members **580** can be located between the first longitudinal location and the second longitudinal location. In some embodiments, no distal members **580** are located between the first longitudinal location and the second longitudinal location. In some embodiments, one or more distal members **580** can be located between the second longitudinal location and the third longitudinal location. In some embodiments, no distal members **580** are located between the second longitudinal location and the third longitudinal location. In some embodiments, one or more distal members **580** can be located proximal to the third longitudinal location. In some embodiments, no distal members **580** are located proximal to the third longitudinal location. In some embodiments, one or more distal members **580** are regularly spaced. In some embodiments, one or more distal members **580** are irregularly spaced. In some embodiments, the engagement panel **510**, **512**, **514**, **516** and the engagement panel **520**, **522**, **524**, **526** are between adjacent distal members **580**.
(184) FIGS. **85**A-**85**B are views of the extractor **500**. The extractor **500** can include a single distal member configuration. The extractor **500** can include a multiple distal members configuration. In some embodiments, the distal member **580** can have the same diameter as the engagement panel **510**, **512**, **514**, **516**. In some embodiments, the distal member **580** can have the same diameter as the engagement panel **520**, **522**, **524**, **526**. In some embodiments, the distal member **580** can have the same diameter as the engagement panel **530**, **532**, **534**, **536**. In some embodiments, the distal member **580** can have the same diameter as the engagement panels with the largest diameter. In some embodiments, the distal member **580** can have the same diameter as the engagement panels with the smallest diameter. In some embodiments, the distal member **580** can have a different diameter than the engagement panels. In some embodiments, the distal member **580** can have a smaller diameter as the engagement panel **510**, **512**, **514**, **516**. In some embodiments, the distal member **580** can have a smaller diameter as the engagement panel **520**, **522**, **524**, **526**. In some embodiments, the distal member **580** can have a smaller diameter as the engagement panel **530**, **532**, **534**, **536**. In some embodiments, the distal member **580** can have a smaller diameter than the smallest diameter engagement panels. In some embodiments, the distal member **580** can have a larger diameter as the engagement panel **510**, **512**, **514**, **516**. In some embodiments, the distal member **580** can have a larger diameter as the engagement panel **520**, **522**, **524**, **526**. In some embodiments, the distal member **580** can have a larger diameter as the engagement panel **530**, **532**, **534**, **536**. In some embodiments, the distal member **580** can have a larger diameter than the largest diameter engagement panels. In some embodiments, two or more distal members **580** have the same diameter. In some embodiments, two or more distal members **580** have different diameters. In some embodiments, the distal member **580** with the larger diameter is distal to the distal member with the smaller diameter.
(185) FIGS. **86**A-**86**B are views of the extractor **500**. The engagement panels **510**, **512**, **514**, **516** can have two or more different angles alpha, beta, pi, lambda. The engagement panels **510**, **512**,

514, **516** can have one or more same angles alpha, beta, pi, lambda. The engagement panels **510**, **512**, **514**, **516** can have two more different arcs **540** theta. The engagement panels **510**, **512**, **514**, **516** can have one or more of the same arcs **540** theta. Two, three, or four of the engagement panels **510**, **512**, **514**, **516** at the first longitudinal location have the same angle. Two, three, or four of the engagement panels **510**, **512**, **514**, **516** at the first longitudinal location have the same arc. Two, three, or four of the engagement panels **510**, **512**, **514**, **516** at the first longitudinal location have different angles. Two, three, or four of the engagement panels **510**, **512**, **514**, **516** at the first longitudinal location have different arcs **540**.

(186) The engagement panels **510**, **512**, **514**, **516** at the first longitudinal location A and the engagement panels **520**, **522**, **524**, **526** at the second longitudinal location B can be different. The engagement panels **510**, **512**, **514**, **516** at the first longitudinal location A and the engagement panels **520**, **522**, **524**, **526** at the second longitudinal location B can be the same. The engagement panels **520**, **522**, **524**, **526** at the second longitudinal location B and the engagement panels **530**, **532**, **534**, **536** at the third longitudinal location C can be different. The engagement panels **520**, **522**, **524**, **526** at the second longitudinal location B and the engagement panels **530**, **532**, **534**, **536** at the third longitudinal location C can be the same. The engagement panels **510**, **512**, **514**, **516** at the first longitudinal location A and the engagement panels **530**, **532**, **534**, **536** at the third longitudinal location C can be different. The engagement panels **510**, **512**, **514**, **516** at the first longitudinal location A and the engagement panels **530**, **532**, **534**, **536** at the third longitudinal location C can be the same.

(187) FIGS. **87**A-**87**C are view of the extractor **500**. FIG. **87**B is a side view of the extractor showing the engagement panels **510**, **512**, **514**, **516**, **520**, **522**, **524**, **526**, **530**, **532**, **534**, **536** and the connecting members **518**, **528**, **538**. The engagement panels are stacked and next to each other.

(188) FIGS. **88**A-**88**B are view of the distal member. FIG. **88**A illustrates a distal member **580** with a double layer construction. FIG. **88**B illustrates a distal member with a single layer construction.

(189) FIGS. **89**A-**89**C illustrate a single layer engagement panel of the extractor **500**. FIG. **89**A is a perspective view. FIG. **89**B is a front view. FIG. **89**C is a side view. Each engagement panel **510**, **512**, **514**, **516** forms a portion of the eyelet **546**. The elongate member forms a portion of the eyelet **546**, the leg **542** of the engagement panel **510**, the arc **540** of the engagement panel **510**, and the leg **544** of the engagement panel **510**. Then the elongate member forms a portion of the eyelet **546**, the leg **542** of the engagement panel **512**, the arc **540** of the engagement panel **512**, and the leg **544** of the engagement panel **512**. Then the elongate member forms a portion of the eyelet **546**, the leg **542** of the engagement panel **514**, the arc **540** of the engagement panel **514**, and the leg **544** of the engagement panel **514**. Then the elongate member forms a portion of the eyelet **546**, the leg **542** of the engagement panel **516**, the arc **540** of the engagement panel **516**, and the leg **544** of the engagement panel **516**. The elongate member can be continuous. Each engagement panel **510**, **512**, **514**, **516** can form an angle with the legs **542**, **544**. The angles alpha, beta, pi, lambda can be the same. The angles alpha, beta, pi, lambda can be different. In some embodiments, the legs **542**, **544** can cross. In some embodiments, the legs **542**, **544** can stack. In some embodiments, the legs **542**, **544** can be longitudinally offset. There can be one or more portions of the eyelet **546** between adjacent engagement panel **510**, **512**, **514**, **516**. The engagement panel **510**, **512**, **514**, **516** can be spaced apart along the length of the eyelet. The elongate wire member of the extractor can have a diameter of, e.g. about 0.0005″, 0.001″, 0.0015″, 0.002″, 0.0025″, 0.003″, 0.0035″, 0.004″, 0.0045″, 0.005″, or more or less, from 0.0005″ to 0.005″, or any range of two of the foregoing values. The arc length of each panel can be of any size such that the total arc length of all panels will substantially form a 360 degrees circle. For example, a four engagement panels will have 90 degrees arc length for each panel. For example, a three engagement panels will have a 120 degree arc length for each panel. The total arc length for all engagement panels at each longitudinal location will form a 360 degrees circle. In some embodiments, the total arc length is less than 360 degrees. The eyelet diameter can have different luminal diameters. The luminal diameter can be

0.005″, 0.010″, 0.014″, 0.017″, 0.024″, 0.027″, 0.035″, 0.040″, 0.050″ for example. The luminal diameter can range from 0.005″ to 0.050″. The angles alpha, beta, pi, lambda can have the same or different angles such that in total all angles alpha, beta, pi, lambda will be 360 degrees. For example, angles alpha, beta, pi, lambda can be 90 degrees each in some embodiment. The angles can be different for example, alpha and pi angles are 80 degrees and beta and lambda are 100 degrees. The angles can vary in some embodiments. Similarly, a three engagement panels will have similar angles configuration where the total angle of all three panels will be 360 degrees. The length of the eyelet can range from 0.1 cm to 100 cm. The distance between the engagement panels can range from 1 mm to 30 mm. The diameter of the engagement panels can range from 1 mm to 40 mm. In some embodiments with multiple engagement panels layer, the offset layers can range from 1 degree to 180 degrees. The engagement panels at each longitudinal location can be tightly packed where each panel is next to each other. In some embodiment, the engagement panels at each longitudinal location can be loosely packed where there is gap between the panels. In some embodiment, the entire length of the extractor engagement panels and eyelets are loosely packed where there is gap in between. In some embodiment, the entire length of the extractor engagement panels and eyelets are tightly packed where there are no gap in between. In some embodiment, the entire length of the extractor engagement panels and eyelets has certain portion that is tightly packed where there are no gaps and has certain portion that is loosely packed where there are gaps in between the engagement panels and eyelets.

(190) The extractor, or a portion thereof, can be manufactured from a single elongate member, such as a wire. The engagement panels **510**, **512**, **514**, **516** and the eyelet **546** at the longitudinal location can be manufactured from a single elongate member. The single elongate member can form a portion of the eyelet **546**. The portion of the eyelet can be a complete circle, or a portion of a circle such as, e.g. about 45 degrees, 60 degrees, 75 degrees, 90 degrees, 105 degrees, 120 degrees, 135 degrees, 150 degrees, 165 degrees, 180 degrees, 195 degrees, 210 degrees, 225 degrees, 240 degrees, 255 degrees, 270 degrees, 285 degrees, 300 degrees, 360 degrees, more or less, or any range of two of the foregoing values. The single elongate member can extend to form the leg, the arc, and the leg of the first engagement panel **510**. There is a gap in the eyelet **546** between the legs **542**, **544** of the engagement panel **510**, **512**, **514**, **516**. Each leg **542**, **544** begins and ends at the eyelet **546**. However, the single wire forms the arc **540** between the legs **542**, **544** and not a portion of the eyelet. The single elongate member can extend from the leg **544** to form another portion of the eyelet. The single elongate member can extend to form the leg **542**, the arc **540**, and the leg **544** of the second engagement panel **512**. The engagement panel are offset longitudinally by the diameter of the single elongate member. The engagement panel are offset longitudinally by a portion of the eyelet **546**. The single elongate member continues to form a plurality of panels and a plurality of sections of the eyelet **546**. The engagement panels **510**, **512**, **514**, **516** at the longitudinal location are offset around the circumference of the eyelet **546**. The engagement panels **510**, **512**, **514**, **516** and the eyelet **546** at the longitudinal location are spaced to form a circumferential engagement surface with the arcs **540**. The arcs **540** form nearly an entire circumference. The engagement panels **510**, **512**, **514**, **516** are stacked. The first engagement panel **510** is distal to the second engagement panel **512**. The second engagement panel **512** is distal to the third engagement panel **514**. The third engagement panel **514** is distal to the fourth engagement panel **516**. The eyelet **546** is formed by a plurality of partial coils. While four engagement panels are shown, the same method can be used to form any number of panels at the first longitudinal location (e.g., one, two, three, four, five, six, seven, eight, nine, ten, or any range of two of the foregoing values. While the panels at the first longitudinal location are shown, the process can be repeated to form additional arrays at the second longitudinal location and third longitudinal location. The elongate member can form the coil **578** between the eyelets **546**.

(191) FIGS. **90**A-**90**C illustrate a double layer engagement panel of the extractor **500**. FIG. **90**A is a perspective view. FIG. **90**B is a front view. FIG. **90**C is a side view. The first layer and the second

layer can be stacked. The first layer and the second layer can follow the same path. The first layer and the second layer are aligned when viewed from the front in FIG. **90**B. In some embodiments, the first layer and the second layer are offset. The two layers can be separated and/or offset from each other. The offset angle can be 5 degrees, 10 degrees, 15 degrees, 20 degrees, 25 degrees, 35 degrees. The offset angle can range from 5 degrees up to 175 degrees.

(192) The extractor, or a portion thereof, can be manufactured from a two or more elongate members, such as a double wire as shown in FIG. **90**A or a triple wire. The double wire can be side-by-side as shown. The double wire can be offset. Each elongate member can form a layer. The double layers can extend or wrap together as illustrated in FIGS. **90**A-**90**C. The double layers can be offset as illustrated in FIG. **69**. The engagement panels and the eyelet at the longitudinal location can be manufactured from double elongate members. The double elongate members can form a portion of the eyelet **546**. The portion of the eyelet **546** can be a complete circle, or a portion of a circle such as, e.g. about 45 degrees, 60 degrees, 75 degrees, 90 degrees, 105 degrees, 120 degrees, 135 degrees, 150 degrees, 165 degrees, 180 degrees, 195 degrees, 210 degrees, 225 degrees, 240 degrees, 255 degrees, 270 degrees, 285 degrees, 300 degrees, 360 degrees, more or less, or any range of two of the foregoing values. The double elongate members can extend to form the leg **542**, the arc **540**, and the leg **544** of the first engagement panel **510**. The double elongate members can be a mirror image. The double elongate members can be stacked directly on top of each other. The double elongate members can be axially aligned. The double elongate members can be offset. The double elongate members can be twisted about the eyelet **546**. There is a gap in the eyelet **546** between the legs **542**, **544** of the engagement panel **510**. This gap can be the diameter of the double elongate members. Each leg **542**, **544** begins and ends at the eyelet **546**. Each leg **542**, **544** of the double elongate members can begin at the same location. Each leg of the double elongate members can begin at a different location. However, the double elongate members forms the arc **540** between the legs **542**, **544** and not a portion of the eyelet **546**. The double elongate members can extend to form another portion of the eyelet **546**. The double elongate members can extend to form the leg **542**, the arc **540**, and the leg **544** of the second engagement panel **512**. The engagement panel are offset longitudinally by the diameter of the double elongate members. The engagement panel are offset longitudinally by a portion of the eyelet **546**. The double elongate members continues to form a plurality of panels **510**, **512**, **514**, **516** and a plurality of sections of the eyelet **546**. The eyelet **546** can be thicker for the double elongate members than the single elongate member. The engagement panel can be thicker for the double elongate members than the single elongate member. In some embodiments, the double elongate members can form panels of different panel size. The smaller panel can be halved the size of the larger panel. The smaller panel can be a third the size of the larger panel.

(193) FIGS. **91**A-**91**C are additional view of the extractor **500**. Relatively to the core wire, the angle theta (FIG. **91**C) can range from 1 degree to 89 degrees.

(194) FIGS. **92**A-**92**H are views of the distal member **580** and the loading tube assembly **590**. FIGS. **92**A and **92**B indicates the distal member **580** is constrained in the loading tube assembly **590**. The distal member **580** is designed to have a low profile for delivery. The distal member **580** can be made of braided or woven material. The distal member **580** can be made of wires or filaments. The distal member **580** can have a single or double layer. The distal member **580** can comprise a metal such as Nitinol, stainless steel, platinum, iridium, or combinations thereof. The distal member **580** can comprise polymeric materials such as polyethylene, PTFE, FEP, or combinations thereof. The distal member **580** can comprise a shape memory material such as a shape memory metal or polymer. In the constrained position, the distal member **580** is elongated to maintain a low profile.

(195) The distal member **580** can include a radiopaque material such as tungsten or gold to aid with visualization. The distal member **580** can include a radiopaque marker. The distal marker **558** can be coupled to the distal member **580**. The distal marker **558** can comprise platinum and/or iridium.

The distal marker **558** can provide visualization of the distal member. The distal marker **558** can facilitate securing the distal member **580** to the distal end of the catheter shaft **506** or core wire **570**. As described herein, proximal to the distal member **580** are the engagement panels **510**, **512**, **514**, **516** at the first longitudinal location, the engagement panels **520**, **522**, **524**, **526** at the second longitudinal location, and the engagement panels **530**, **532**, **534**, **536** at the third longitudinal location. The engagement panels **510**, **512**, **514**, **516**, **520**, **522**, **524**, **526**, **530**, **532**, **534**, **536** are constrained within the loading tube assembly **590**. FIG. **92**A shows the proximal engagement panels and the distal member **580** in a loaded configuration. FIG. **92**B is a close up view.
(196) FIG. **92**C indicates the distal portion of the distal member **598** is in the initial deployed position as the loading tube assembly **590** is retracted. The loading tube assembly **590** can be retracted by being pulled proximally. As the loading tube assembly **590** is retracted proximally, the leading edge **581** of distal member **580** begins to open upward. The distal portion of the distal member **580** extends beyond the end of the loading tube assembly **590**. The distal portion of the distal member **580** extends distally. The distal portion of the distal member **580** flares outward from the loading tube assembly **590**. The majority of the distal member **580** remains constrained in the loading tube assembly **590**. FIG. **92**C shows retracting the loading tube assembly **590** to deploy the distal member **580**.
(197) FIG. **92**D is a view of the distal member **580**. The distal member **580** can have a partially deployed position at approximately half-way. The distal member **580** can open upward. As the loading tube assembly **590** retracts, the distal member **580** curls. As the loading tube assembly **590** retracts, the distal member **580** moves in the proximal direction as shown in FIG. **92**D. The leading edge **581** of the distal member **580** forms a cup or lip. The curling or moving proximally enable the distal member **580** to collect and capture more efficiently. In some embodiments, the leading edge **581** can form a pronounced curl wherein the edge turns back. In some embodiments, the leading edge **581** does not form a pronounced curl. The leading edge **581** can form any straight or curved edge in the fully deployed configuration. FIG. **92**D shows a view when continuing to deploy the distal member **580**.
(198) FIG. **92**E is a view of a position of the distal member **580** when being deployed. In some embodiments, the front edge **581** is proximal or behind the distal end of the loading tube assembly **590**. The leading edge **581** can form the proximal end **582** of the distal member **580** when the distal member **580** is being deployed. The proximal end **582** can function as a funnel into the distal member **580**. The distal member **580** can include a distal end **584** when the distal member **580** is being deployed. The distal end **584** can be a floating end. The distal member **580** can include a tubular portion **586**. The tubular portion **586** can extend along a longitudinal or central axis of the loading tube assembly **580**. The distal member **580** can include an expanded portion **588**. The expanded portion **588** flares outward from the tubular portion **586** toward the proximal end **582**.
(199) FIGS. **92**F and **92**G show the distal member **580** is completely expanded. In some embodiments, when the loading tube assembly **590** is retracted to the distal marker **558**, the distal member **580** is fully deployed. The front edge **581** of the distal member **580** is proximal to the loading tube assembly **590**. The expanded portion **588** surrounds the tubular portion **586** along a portion of the length of the tubular portion **586**. The expanded portion **588** surrounds the distal marker **558** along a portion of the length of the distal marker **558**. The space between the tubular portion **586** and the expanded portion **588** allows for the collection of material. In some embodiments, the distal member **580** is porous. The distal member **580** can allow blood to flow through the distal member **580**. The distal member **580** can be configured to trap or capture loose emboli in transit or remove and capture soft emboli. The distal member **580** can capture material distal to the engagement panels **510**, **512**, **514**, **516**, **520**, **522**, **524**, **526**, **530**, **532**, **534**, **536**.
(200) The distal member **580** can be made of braided material. The distal member **580** can also be made metals such as nitinol, stainless steel, platinum, tungsten, gold, and combinations thereof. The distal member **580** can be made of polymeric filaments such as Polyethylene, PET, nylon, FEP,

PTFE, polyurethane, or combinations thereof. The distal member **580** can comprise wire or filaments having a diameter or cross-section between 0.0005″ and 0.010″, such as, e.g. about 0.0005″, 0.001″, 0.0015″, 0.002″, 0.0025″, 0.003″, 0.0035″, 0.004″, 0.0045″, 0.005″, 0.0055″, 0.006″, 0.0065″, 0.007″, 0.0075″ 0.008″, 0.0085″, 0.009″, 0.0095″, 0.01″, or any range of two of the foregoing values.

(201) The distal member **580** can include a number of filaments or wire that range from, e.g. about 1 to 144 wires, such as 5 to 20, 10 to 50, 20 to 70, 30 to 100, 50 to 100, 60 to 120, or any range of two of the foregoing values. The distal member **580** can have an expanded diameter that can range from 1 mm to 40 mm, such as 1 mm, 5 mm, 10 mm, 15 mm, 20 mm, 25 mm, 30 mm, 35 mm, 40 mm, or any range of two of the foregoing values. The distal member **580** can have a pore size that can range from, e.g. about 25 microns to 2000 microns, such as 25 microns, 50 microns, 75 microns, 100 microns, 150 microns, 200 microns, 250 microns, 375 microns, 500 microns, 750 microns, 1000 microns, 1250 microns, 1500 microns, 2000 microns, or any range of two of the foregoing values.

(202) FIG. **92**H shows the distal marker **558**. The distal marker **558** can include a platinum/iridium tube. The distal marker **558** can function as a radiopaque marker. FIG. **92**H shows the fully deployed position with the distal member **580** and the deployed engagement panels **510**, **512**, **514**, **516**. The extractor **500** can include one or more radiopaque markers **548**. The radiopaque marker **548** can be located on the arc **540** of one of the engagement panels **510**, **512**, **514**, **516**. The first longitudinal location can include one or more radiopaque markers **548**. The radiopaque marker **548** can include a platinum/iridium coil.

(203) There are several advantages of the extractors described herein. The extractor can include the eyelet with a lumen to receive a catheter shaft or core wire. Each engagement panel can include the eyelet, or a portion thereof. The engagement panels at the first longitudinal location can form the first eyelet. The engagement panels at the second longitudinal location can form the second eyelet. The engagement panels at the third longitudinal location can form the third eyelet. In some embodiments, the eyelet can allow movement along the catheter shaft or core wire. In some embodiments, the eyelet can allow the engagement panel to move relative to the catheter shaft or core wire. In some embodiments, the eyelet can allow the engagement panels to move together to pinch material between two engagement panels. In some embodiments, the eyelet can allow the engagement panels to move apart to accept material between two engagement panels. In some embodiments, the eyelet can allow the space between two engagement panels to lengthen and/or shorten. In some embodiments, the eyelet can allow the engagement panels to move longitudinally along the catheter shaft or core wire. In some embodiments, the engagement panel are not fixed to a longitudinal location along the catheter shaft or core wire. In some embodiments, the extractor can include an eyelet with a lumen to receive a catheter shaft or core wire. In some embodiments, the extractor is distinguished from devices without an eyelet.

(204) FIGS. **93**A-**93**F are views of methods of use of some embodiments of extraction systems as described elsewhere herein, such as, for example, the extraction system of FIG. **92**A-**92**H. FIG. **93**A illustrates a blood clot within a blood vessel. In the illustrated embodiment, the clot blockage is located within the middle cerebral artery. FIG. **93**B illustrates a guidewire **700** with its distal end passed entirely through the clot. The guidewire **700** can be used with any system described herein. The method can include a microcatheter **702** to be passed along the guidewire **700**. The microcatheter **702** can be positioned proximal to the clot as shown in FIG. **93**B. The microcatheter **702** can be any microcatheter system used to deliver the extractors described herein. In some embodiments, the standard Seldinger technique is used to access an access vessel, e.g., the femoral artery and to introduce a preliminary guidewire. The preliminary guidewire can be, e.g., a 0.035″ guidewire. In some embodiments, a balloon guide catheter is advanced over the preliminary guidewire to the carotid artery. In some embodiments, the guidewire **700** is exchange for the preliminary guidewire. In some embodiments, the guidewire **700** is an 0.018″ guidewire. In some

embodiments, an 0.018″ guidewire (e.g., a first, smaller diameter guidewire) is exchanged for an 0.035″ guidewire (e.g., a second, larger diameter guidewire). The microcatheter **702** is introduced over the guidewire **700** through the balloon guide catheter to the occlusion treatment area. The guidewire **700** then advances through the clot and is positioned distal to the clot. The microcatheter **702** is then advanced through the clot and positioned distal to the clot. FIG. **93**C illustrates the microcatheter **702** passed through the clot. The guidewire **700** can be removed.
(205) FIG. **93**D illustrates the extractor **500** at least partially deployed. The distal member **580** including leading edge **581** can be deployed distal to the clot blockage. The extractor **500** is at least partially deployed. The engagement panels **510**, **512**, **514**, **516** at the first longitudinal location can be deployed. The engagement panels **520**, **522**, **524**, **526** at the second longitudinal location can be deployed. The engagement panels at the third longitudinal location can be constrained within the microcatheter **700**. In some embodiments, the extractor **500** can be pre-loaded in the loading tube assembly **590**. The loading tube assembly **590** can be introduced into the microcatheter **702**. The extractor **500** can continue to be inserted into the microcatheter **702**. The loading tube assembly **590** can be removed. The extractor **500** can be advanced under fluoroscopy to the distal tip of the microcatheter **702**. The microcatheter **702** can be retracted to deploy at least a portion of the extractor **500** distal to the clot as shown in FIG. **93**D. The microcatheter **702** can be retracted to deploy at least a portion of the extractor **500** within to the clot as shown in FIG. **93**E. The microcatheter **702** can be retracted to deploy at least a portion of the extractor **500** proximal to the clot as shown in FIG. **93**E. In some methods, one or more arrays of engagement panels are distal to the clot. In some methods, one or more arrays of engagement panels are within the clot. In some methods, one or more arrays of engagement panels are proximal to the clot.
(206) The engagement panels can be folded within the loading tube assembly **590**. The engagement panels can be folded distally such that the arcs of the engagement panels at the first longitudinal location are distal to the respective eyelet. The engagement panels can be laid down such that the arcs of the engagement panels are toward the distal member **580**. The extractor **500** can be constrained within the loading tube assembly **590** with the engagement panels at the first, second, and third longitudinal location folded distally. The extractor **500** can be inserted into the microcatheter **702** with the engagement panels at the first, second, and third longitudinal location folded distally. The extractor **500** can be advanced until the distal member **580** is near the distal tip of the microcatheter **702**.
(207) The microcatheter can be retracted and the distal member **580** can expand. As the microcatheter **702** is retracted proximally, the leading edge **581** of distal member **580** begins to open. The distal portion of the distal member **580** extends beyond the distal end of the microcatheter **702**. The distal portion of the distal member **580** flares outward from the microcatheter **702**. As the microcatheter **702** retracts, the distal member **580** curls. As the microcatheter **702** retracts, the distal member **580** moves in the proximal direction. The curling or moving proximally enable the distal member **580** to collect and capture more efficiently. FIG. **93**D is a view of a position of the distal member **580** when being deployed from the microcatheter **702**.
(208) As the microcatheter **702** is retracted proximally, the engagement panels at the first longitudinal location deploy. The engagement panels at the first longitudinal location can deploy at approximately the same time from the distal end of the microcatheter **702**, for instance if there is little or no gap in the eyelet. The engagement panels at the first longitudinal location can deploy sequentially or independently from the distal end of the microcatheter **702**, for instance if there is a gap in the eyelet.
(209) In some embodiments, the engagement panels at the first longitudinal location are in a first, constrained position within the microcatheter **702**. The arcs of the engagement panels are distal to the eyelet at the first longitudinal location. The legs of the engagement panels are distal to the eyelet at the first longitudinal location. The engagement panels at the first longitudinal location can be folded downward toward the catheter shaft or core wire. The engagement panels at the first,

second, and third longitudinal location can be similarly folded.

(210) As the microcatheter **702** is retracted proximally, the engagement panels revert proximally. The engagement panels move outward until the engagement panels are relatively aligned with the respective eyelet. In some embodiments, the arcs of the engagement panels can be substantially perpendicular to the catheter shaft or core wire. The engagement panels moved in an arc from the constrained state toward the inner wall of the vessel. The engagement panels can expand to the diameter of the vessel. The engagement panels can expand to any size vessel up to the maximum diameter wherein the engagement panels are perpendicular to the eyelet.

(211) Once the extractor **500** is deployed, the extractor **500** and the microcatheter **702** are withdrawn into the balloon guide catheter to remove the system from the vascular system. Aspiration can be used to assist when retracting the extractor **500** and the microcatheter **702**. FIG. **93**E illustrates the distal member **580** and the extractor **500** when completely deployed. FIG. **93**F illustrates the microcatheter **702** and the extractor **500** when completely removed with the clot.

(212) FIGS. **94**A-**94**B illustrate a side views of a single layer engagement panels of the extractor **500**. The engagement panels can have a different diameter at each location. Each engagement panel **510**, **512**, **514**, **516** at the first longitudinal location forms a portion of a first diameter. The engagement panels at the first longitudinal location form the first diameter. The total arc length of the engagement panel **510**, **512**, **514**, **516** at the first longitudinal location can substantially form a 360 degrees circle. The total arc length of the engagement panel **510**, **512**, **514**, **516** at the first longitudinal location can be less than a 360 degrees circle. Each engagement panel **520**, **522**, **524**, **526** at the second longitudinal location forms a portion of a second diameter. The engagement panels at the second longitudinal location form the second diameter. The total arc length of the engagement panel **520**, **522**, **524**, **526** at the second longitudinal location can substantially form a 360 degrees circle. The total arc length of the engagement panel **520**, **522**, **524**, **526** at the second longitudinal location can be less than a 360 degrees circle. Each engagement panel **530**, **532**, **534**, **536** at the third longitudinal location forms a portion of a third diameter. The engagement panels at the third longitudinal location form the third diameter. The total arc length of the engagement panel **530**, **532**, **534**, **536** at the third longitudinal location can substantially form a 360 degrees circle. The total arc length of the engagement panel **530**, **532**, **534**, **536** at the third longitudinal location can be less than a 360 degrees circle. The extractor **500** can have engagement panels at a fourth longitudinal location. The extractor **500** can have engagement panels at a fifth longitudinal location. The extractor **500** can have engagement panels at a sixth longitudinal location. The extractor **500** can have engagement panels at a seventh longitudinal location. The extractor **500** can have engagement panels at a eighth longitudinal location. The extractor **500** can have engagement panels at any number of longitudinal locations such as one, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve, thirteen, fourteen, fifteen, sixteen, seventeen, eighteen, nineteen, twenty, or any range of two of the foregoing values.

(213) The first diameter can be greater than the second diameter. The first diameter can be less than the second diameter. The first diameter can be the same as the second diameter. The first diameter can be different from the second diameter. The first diameter can be greater than the third diameter. The first diameter can be less than the third diameter. The first diameter can be the same as the third diameter. The first diameter can be different from the third diameter. The second diameter can be greater than the third diameter. The second diameter can be less than the third diameter. The second diameter can be the same as the third diameter. The second diameter can be different from the third diameter.

(214) The extractor **500** can have engagement panels that have diameters which form a repeating pattern. The extractor **500** can have engagement panels that have diameters which form a random pattern. The extractor **500** can have engagement panels that are symmetric. The extractor **500** can have engagement panels that are asymmetric. The extractor **500** can have engagement panels that have one diameter, two diameters, three diameter, four diameter, five diameter, six diameters, or

any range of two of the foregoing values.
(215) The elongate member can form the engagement panels. Each engagement panel **510**, **512**, **514**, **516** at the first longitudinal location forms a portion of the eyelet **546**. Each engagement panel **520**, **522**, **524**, **526** at the second longitudinal location forms a portion of the eyelet **546**. Each engagement panel **5530**, **532**, **534**, **536** at the third longitudinal location forms a portion of the eyelet **546**. The coil **578** can extend between the eyelets **546**. The elongate member can form the eyelets **546**. The elongate member can form the coil **578**. The engagement panels can be spaced apart by the coil **578**. The length of coil **578** between the eyelets **546** can be the same length. The length of coil **578** between the eyelets **546** can be different lengths. The distance between the engagement panels can be 1 mm, 5 mm, 10 mm, 15 mm, 20 mm, 25 mm, 30 mm, 35 mm, 40 mm, 45 mm, 50 mm, 55 mm, or any range of two of the foregoing values. The engagement panels at each longitudinal location can be spaced close to each other, such as a gap of 1 mm, 2 mm, 3 mm, 4 mm, 5 mm, 6 mm, 7 mm, 8 mm, 9 mm, 10 mm, or any range of two of the foregoing values. The engagement panels at each longitudinal location can be spaced farther apart from each other, such as a gap of 20 mm, 30 mm, 40 mm, 50 mm, or any range of two of the foregoing values. The length of the eyelet can be 1 mm, 5 mm, 10 mm, 15 mm, 20 mm, 25 mm, 30 mm, 35 mm, 40 mm, 45 mm, 50 mm, 55 mm, or any range of two of the foregoing values. The extractor **500** can be manufactured from a single elongate member. The eyelet **546** can be located in the center of the first diameter. The eyelet **546** can be located offset from the center of the first diameter. The eyelet **546** can be located in the center of the second diameter. The eyelet **546** can be located offset from the center of the second diameter. The eyelet **546** can be located in the center of the third diameter. The eyelet **546** can be located offset from the center of the third diameter.
(216) The luminal diameter of the vessel can be 1 mm, 2 mm, 3 mm, 4 mm, 5 mm, 6 mm, 7 mm, 8 mm, 9 mm, 10 mm, 11 mm, 12 mm, 13 mm, 14 mm, 15 mm, 16 mm, 17 mm, 18 mm, 19 mm, 20 mm, 21 mm, 22 mm, 23 mm, 24 mm, 25 mm, 26 mm, 27 mm, 28 mm, 29 mm, 30 mm, 31 mm, 32 mm, 33 mm, 34 mm, 35 mm, 36 mm, 37 mm, 38 mm, 39 mm, 40 mm, or any range of two of the foregoing values. The first diameter of the engagement panel **510**, **512**, **514**, **516** at the first longitudinal location can be 1 mm, 2 mm, 3 mm, 4 mm, 5 mm, 6 mm, 7 mm, 8 mm, 9 mm, 10 mm, 11 mm, 12 mm, 13 mm, 14 mm, 15 mm, 16 mm, 17 mm, 18 mm, 19 mm, 20 mm, 21 mm, 22 mm, 23 mm, 24 mm, 25 mm, 26 mm, 27 mm, 28 mm, 29 mm, 30 mm, 31 mm, 32 mm, 33 mm, 34 mm, 35 mm, 36 mm, 37 mm, 38 mm, 39 mm, 40 mm, or any range of two of the foregoing values. The second diameter of the engagement panel **520**, **522**, **524**, **526** at the second longitudinal location can be 1 mm, 2 mm, 3 mm, 4 mm, 5 mm, 6 mm, 7 mm, 8 mm, 9 mm, 10 mm, 11 mm, 12 mm, 13 mm, 14 mm, 15 mm, 16 mm, 17 mm, 18 mm, 19 mm, 20 mm, 21 mm, 22 mm, 23 mm, 24 mm, 25 mm, 26 mm, 27 mm, 28 mm, 29 mm, 30 mm, 31 mm, 32 mm, 33 mm, 34 mm, 35 mm, 36 mm, 37 mm, 38 mm, 39 mm, 40 mm, or any range of two of the foregoing values. The third diameter of the engagement panel **530**, **532**, **534**, **536** at the third longitudinal location can be 1 mm, 2 mm, 3 mm, 4 mm, 5 mm, 6 mm, 7 mm, 8 mm, 9 mm, 10 mm, 11 mm, 12 mm, 13 mm, 14 mm, 15 mm, 16 mm, 17 mm, 18 mm, 19 mm, 20 mm, 21 mm, 22 mm, 23 mm, 24 mm, 25 mm, 26 mm, 27 mm, 28 mm, 29 mm, 30 mm, 31 mm, 32 mm, 33 mm, 34 mm, 35 mm, 36 mm, 37 mm, 38 mm, 39 mm, 40 mm, or any range of two of the foregoing values.
(217) The extractor can include the coil. The coil can be in the space between two engagement panels. The coil and the engagement panels can be continuously formed. The coil and the engagement panels can be unitary or integrally formed. The coil and the engagement panels can be formed of the same material. The coil and the engagement panels can be connected. The coil and the engagement panels can be formed of different materials. The coil can be more flexible than the engagement panels. The engagement panels can be more flexible than the coil. In some embodiments, the coil allows flexible spacing of the engagement panels. In some embodiments, the coil allows the space between two engagement panels to lengthen and/or shorten. In some embodiments, the coil allows the extractor to bend within the vasculature. In some embodiments,

the coil allows the extractor to follow the tortuous path of a vessel. In some embodiments, the coil is freely bendable. In some embodiments, the coil has column strength to allow pushability of the extractor.
(218) The extractor can include the connecting member. The connecting member can be in the space between two engagement panels. The connecting member and the engagement panels can be continuously formed. The connecting member and the engagement panels can be unitary or integrally formed. The connecting member and the engagement panels can be formed of the same material. The connecting member and the engagement panels at two longitudinal locations can be connected. The connecting member and the engagement panels can be formed of different materials. The connecting member can be more flexible than the engagement panels. The engagement panels can be more flexible than the connecting member. The connecting member can be helical. The connecting member can be spaced inward from the circumference of the engagement panels. The connecting member can be sized not to make contact with the vessel wall. In some embodiments, the connecting member allows flexible spacing of the engagement panels. In some embodiments, the connecting member allows the space between two engagement panels to lengthen and/or shorten. In some embodiments, the connecting member acts as a biasing member to maintain a space between two engagement panels. In some embodiments, the connecting member acts as a biasing member to maintain a space between the first longitudinal location and the second longitudinal location. In some embodiments, the connecting member acts as a biasing member to maintain a space between the second longitudinal location and the third longitudinal location.
(219) In some embodiments, the extractor can be formed from a single wire. In some embodiments, the extractor is not formed with multi-loop ends. The engagement panels can have no discrete ends. In some embodiments, the single wire can form the connecting members. In some embodiments, the single wire can form the coil. In some embodiments, the single wire can form the engagement panels. The single wire can form the coil near the distal end. The single wire can form the engagement panels at the first longitudinal location. The single wire can form the coil between the engagement panels at the first longitudinal location and the engagement panels at the second longitudinal location. The single wire can form the engagement panels at the second longitudinal location. The single wire can form the coil between the engagement panels at the second longitudinal location and the engagement panels at the third longitudinal location. The single wire can form the engagement panels at the third longitudinal location. The single wire can form the coil near the proximal end. In some embodiments, the extractor is distinguished from devices with multi-loop ends. In some embodiments, the extractor has one single wire where each engagement panel has no discrete ends.
(220) The engagement panel include the arc. The arc can be supported by legs. The legs can extend radially outward from the eyelet. The arc of the engagement panel is in relatively complete contact with vessel wall. In some embodiments, the arcs of the engagement panel at the first longitudinal location form a nearly complete circle. In some embodiments, the arcs of the engagement panel at the first longitudinal location contact more than 80% of the circumference of the vessel wall, more than 85% of the circumference of the vessel wall, more than 90% of the circumference of the vessel wall, more than 95% of the circumference of the vessel wall, nearly all of the circumference of the vessel wall, more or less, or any range of two of the forgoing values. In some embodiments, the arcs of the engagement panel at the second longitudinal location form a nearly complete circle. In some embodiments, the arcs of the engagement panel at the third longitudinal location form a nearly complete circle. The engagement panels each have a partial circumferential arc that together have more vessel wall contact. In some embodiments, the engagement panels arc is relatively complete contact with vessels. In some embodiments, the engagement panel circumferential arc has more vessel wall contact.
(221) The engagement panel has minimal surface contact with the vessel wall along the length of the extractor. This is based on the total surface contact of the extractor compared with other

devices, such as the stent retriever. The arcs of the engagement panels form a nearly complete ring at the longitudinal locations. The space between longitudinal locations does not have a structure that contacts the vessel wall. The engagement panels are relatively thin. The engagement panels can be formed by a single wire. The engagement panels can be formed by a double or triple wire. The engagement panels thereby reduce the friction forces against the vessel wall. The engagement panels result in low pull force. In some embodiments, the low pull force is critical when retracting the extractor inside a neurovascular vessel. The low pull force can prevent sub-arachnoid hemorrhage. For example, the current stent retriever has high surface area contact against the vessel wall. This creates high friction and tension force. As a result, when the stent retriever is retracted, the stent retriever will pull the vessel more aggressively that will potentially damage the surrounding tissue and smaller blood vessels. Whereas the extractor or engager engagement panels have lower material to vessel wall surface contact thereby minimize the friction force and prevent the pulling of the blood vessels or lesser tension applies to the vessels. This will help keeping the vessels stable during the retraction of the device resulting in minimal damage to the blood vessels. In some embodiments, the engagement panels have minimal surface contact to vessel wall, based on device total surface area as compared to a conventional stent retriever. Thereby reducing the friction force against vessel wall result in low pull force. In some embodiments, this is an advantage when retracting the device inside the neurovascular vessel to prevent sub-arachnoid hemorrhage.

(222) The extractor can include an arrays of movable engagement panels. The engagement panels can include an open-space radially inward from the perimeter of the engagement panels. The engagement panels can include an outlined perimeter and a pore therethrough. The engagement panels can be operably connected together. In some embodiments, the engagement panels can be separated longitudinally by the spacer. In some embodiments, the engagement panels can be separated longitudinally by the coil. In some embodiments, the engagement panels can be separated longitudinally by the connecting member. In some embodiments, the extractor or engager has arrays of movable engagement panels and open-space radially inward to the perimeter of the panels, all operably connected together, but separated longitudinally by a spacer.

(223) The extractor can include a method of expansion of the engagement panels as compared to a conventional stent retriever. For example, when stent retriever deploys and expands, the length of the stent retriever is shortened or contracted when fully deploy. The engagement panels when deploy and expands, the length of the device is not shortened. The engagement panels can expand by radial expansion without axial movement. The engagement panels can expand radially outward. The engagement panels can expand or contract without stretching or shortening as compared to stent retrievers. The engagement panels can expand can radially expand or open. In some embodiments, the engagement panels are in a first, constrained position and the arcs of the engagement panels at the first longitudinal location are positioned distal to the eyelet at the first longitudinal location. In some embodiments, the engagement panels are in a first, constrained position and the legs of the engagement panels at the first longitudinal location are compressed and positioned next to each other. The legs of the engagement panels at the first longitudinal location can be coaxial with the catheter shaft or core wire. The legs of the engagement panels at the first longitudinal location can be positional longitudinally inline with the legs of the engagement panels at the second longitudinal location. As the loading tube assembly or sheath is retracted, the engagement panels at the first longitudinal location open, the arcs of the engagement panels at the first longitudinal location expand and the legs of the engagement panels at the first longitudinal location move farther apart. As the loading tube assembly or sheath continues to retract, the arcs of the engagement panels at the first longitudinal location continue to expand and the legs of the engagement panels at the first longitudinal location continue to move apart. In some embodiments, the engagement panels also revert or move proximally and radially outward. The arcs and legs of the engagement panels at the first longitudinal location are fully expanded at the second, expanded

position and positioned relatively inline with the eyelet at the first longitudinal location. As the loading tube assembly or sheath is retracted, the engagement panels at the second longitudinal location expand and then the engagement panels at the third longitudinal location expand. In some embodiments, when the extractor is positioned at the distal end of the delivery catheter, the engagement panels are contained inside the delivery catheter and constrained. As the delivery catheter is retracted to deploy the engagement panels at the first longitudinal location, the engagement panels will expand outward radially while maintaining the same length and the eyelet relatively stay fixed and does move. As the engagement panels at the second longitudinal location are expanded, the previous deployed or expanded engagement panels at the first longitudinal location do not contract. The engagement panels at the second longitudinal location deploy and expand radially without shortening. Once the engagement panels at the second longitudinal location is expanded, the panels will stay relatively fixed to the first longitudinal location. As the delivery catheter is retracted to deploy or expand additional engagement panels, the extractor length does not shorten or contract. In some embodiments, the method of expansion includes radial expansion without axial movement. In some embodiments, the extractor expands or contracts without stretching or shortening as compare to stent retrievers. In some embodiments, engagement panel can radially expand or open.

(224) The extractor can include engagement panels formed of a single layer. Each engagement panel can be formed of a single wire. The extractor can include engagement panels formed of a double layer. Each engagement panel can be formed of a double wire. The layers can be longitudinally aligned. The layers can be stacked. The layers can form the same profile or perimeter. The layers can be offset. The layers can be circumferentially twisted. Each engagement panel can be formed of a triple wire. There can be multiple sets of engagement panels at a longitudinal location. The engagement panels can be offset to each other by certain degrees including, e.g. about 0 degrees, 5 degrees, 10 degrees, 15 degrees, 20 degrees, 25 degrees, 30 degrees, 35 degrees, 40 degrees, 45 degrees, 50 degrees, 55 degrees, 60 degrees, 65 degrees, 70 degrees, 75 degrees, 80 degrees, 85 degrees, 90 degrees, between 0 and 20 degrees, between 0 and 45 degrees, between 0 and 179 degrees, more or less, or any range of two of the foregoing values. The engagement panels that are offset can reduce pore sizes. The engagement panels can bifurcate the opening through the engagement panel. In some embodiments, the extractor includes multiple sets of engagement panels between arrays (e.g. double layer design). In some embodiments, engagement panels can be offset to each other by certain degrees from 0 to 179 degrees. In some embodiments, offset engagement panels can be designed to reduce pore sizes.

(225) In some embodiments, the extractor can include a distal plug or distal member. In some embodiments, the distal member can be located at the distal end. The distal member can be distal to all engagement panels. In some embodiments, the distal member can be near the distal end. The distal member can be distal to some, but not all, engagement panels. There can be one or more engagement panels distal to the distal member. There can be one or more engagement panels proximal to the distal member. In some embodiments, the distal member is located at the first longitudinal location. In some embodiments, the distal member is located at the second longitudinal location. In some embodiments, the distal member is located at the third longitudinal location. In some embodiments, the distal member is located at the fourth longitudinal location.

(226) In some embodiments, the engagement panels can compress upon removal of the spacer. In some embodiments, the engagement panels may not have compressive strength. In some embodiments, the engagement panels comprise double wires. In some embodiments, the engagement panel is designed to reduce deflection force. In some embodiments, the engagement panel can be formed from a large diameter wire. In some embodiments, the engagement panel can be formed from two or more smaller diameter wires. In some embodiments, the engagement panel forms a pore. The pore can be along the longitudinal direction in the direction of blood flow. The pore can allow blood to flow through the extractor. The pore size can be smaller if the engagement

panels comprise offset layers. The pore size or opening between the offset layers will enable the engagement panels to capture smaller clot size or prevent smaller clot size to pass through. In some embodiments, the engagement panels are formed from one or more wires. In some embodiments, the engagement panels and the eyelet are formed from loops bonded to a hypotube. In some embodiments, the engagement panels and the eyelet can be formed using polymer via extrusion. In some embodiments, the engagement panels and the eyelet can be formed from other method like molding. In some embodiments, the engagement panels can compress upon removal of the spacer. In some embodiments, the engagement panels may not have compressive strength.

(227) In some embodiments, the extractor can be formed from a single wire. In some embodiments, the extractor can be formed from a double wire. In some embodiments, the double wire has a smaller diameter wire. In some embodiments, creating the diameter smaller reduces the deflection force.

(228) In some embodiments, the device can include a stent retriever. The device can include a stent like structure. The stent retriever can include a distal member. In some embodiments, the extractor is deployed within the stent retriever. In some embodiments, the extractor is deployed distal to the stent retriever. In some embodiments, the extractor is deployed proximal to the stent retriever.

(229) In some embodiments, the extractor can include an eyelet. In some embodiments, the eyelet can be formed from one or more partial arcs. In some embodiments, the eyelet can be formed from one or more complete arcs. In some embodiments, the eyelet can be formed from a helical wire. In some embodiments, the eyelet can be formed from a coil. In some embodiments, the eyelet can form a central hole.

(230) In some embodiments, the extractor is formed from a wire. In some embodiments, the extractor can be formed from loops. In some embodiments, the extractor can be formed from loops bonded to a hypotube. In some embodiments, the extractor can be formed from extrusion. In some embodiments, the engagement panels and the eyelet can be produced using polymer via extrusion. In some embodiments, the engagement panels and the eyelet can be produced by other methods such as molding.

(231) The extractor can be used to remove material, such as clot material. The extractor can be deployed at or near a treatment site. The treatment site can be in a blood vessel, including but not limited to a neurovascular blood vessel. The extractor can include engagement panels at a first longitudinal location and a second longitudinal location. The extractor can be easy to use compared to complex systems. The extractor can reduce trauma to the blood vessel. The extractor can be easy to navigate to the treatment site. The extractor can be cost effective to manufacture. The extractor can remove material on a first pass, reducing hospitalization and leading to quicker recovery. The extractor can target remove of specific material such as hardened or chronic material from the vasculature. The functional portion of the extractor can include spaced apart arrays of engagement panels. The engagement panels are not covered by material thereby allowing blood flow through the pores of the engagement panels. The engagement panels at a longitudinal location can be in substantially continuous contact with the vessel wall along a circumference of the vessel wall. The engagement panels can be pre-formed with legs and the arc. The engagement panels expand from a collapsed state to an expanded state. The engagement panels expand into engagement with the vessel wall.

(232) The extractor can have column strength to move longitudinally within a vessel. The expanded engagement panels at the longitudinal location are approximately equal to the diameter of the vessel. The engagement panels are segments of the complete circumference. The expanded engagement panels at the longitudinal location have a diameter of, e.g. about 1 mm, 2 mm, 3 mm, 4 mm, 5 mm, 6 mm, 7 mm, 8 mm, 9 mm, 10 mm, 11 mm, 12 mm, 13 mm, 14 mm, 15 mm, more or less, or any range of two of the foregoing values.

(233) The extractor can be pulled proximally without axially lengthening. The extractor can be pulled proximally without radially compressing. The extractor can be pulled proximally and the

engagement panels can scrape along the surface of the vessel. The extractor can be pulled proximally to compress the material between engagement panels at the first longitudinal location and the second longitudinal location. The extractor can retain the material between engagement panels at the first longitudinal location and the second longitudinal location.
(234) In some embodiments, a filter is provided. The filter can prevent downstream emboli and fragmented clot. In some embodiments, the filter can be formed of nitinol. In some embodiments, the filter can be formed of polymeric materials and/or metallic materials.
(235) In some embodiments, the spacer is fixed. The spacer can be unable to move or slide along the length of catheter shaft. In some embodiments, the spacer is movable. The spacer is able to move or slide along the length of the catheter shaft creating a tension variation and/or release.
(236) In some embodiments, a collection bag is provided. The collection bag can encapsulate captured clot for removal. In some embodiments, the collection bag can be formed from nitinol. In some embodiments, the collection bag can be formed from polymeric materials.
(237) In some embodiments, the extractor has a one piece construction. In some embodiments, the extractor comprises distinct members. The extractor can comprise the engagement panels, the spacers, and/or the catheter shaft. The spacers can keep the engagement panels apart. The engagement panels can have distinct legs. The legs can be straight. In some embodiments, the legs do not overlap. The legs provide sufficient support without overlapping. The engagement panels can form a segment of a larger circular profile. In some embodiments, the engagement panels are not loops. The engagement panels can have straight or linear legs connected to the arc. The engagement panels can define an eyelet. The engagement panels can define a lumen. The eyelet can be centrally located among the engagement panels.
(238) In some embodiments, the engagement panels can be dynamic. The engagement panels can move. The engagement panels can have tension. The engagement panels can be spring-like. The engagement panels can be biased to compress toward each other. The engagement panels can be biased to create a pinching force. The engagement panels can include the arc. The arc can be greater than an apex. The arc can provide more surface contact with the vessel wall. In some embodiments, the engagement panels do not stretch. In some embodiments, the engagement panels collapse for delivery. In some embodiments, the engagement panels open for clot engagement. In some embodiments, the engagement panels fold toward the catheter shaft.
(239) Although this invention has been disclosed in the context of certain preferred embodiments and examples, it will be understood by those skilled in the art that the present invention extends beyond the specifically disclosed embodiments to other alternative embodiments and/or uses of the invention and obvious modifications and equivalents thereof. In addition, while several variations of the invention have been shown and described in detail, other modifications, which are within the scope of this invention, will be readily apparent to those of skill in the art based upon this disclosure. It is also contemplated that various combinations or sub-combinations of the specific features and aspects of the embodiments may be made and still fall within the scope of the invention. It should be understood that various features and aspects of the disclosed embodiments can be combined with, or substituted for, one another in order to form varying modes of the disclosed invention. For all the embodiments described above, the steps of the methods need not be performed sequentially. Thus, it is intended that the scope of the present invention herein disclosed should not be limited by the particular disclosed embodiments described above, but should be determined only by a fair reading of the claims that follow.
(240) As used herein in the specification and claims, including as used in the examples and unless otherwise expressly specified, all numbers may be read as if prefaced by the word “about” or “approximately,” even if the term does not expressly appear. The phrase “about” or “approximately” may be used when describing magnitude and/or position to indicate that the value and/or position described is within a reasonable expected range of values and/or positions. For example, a numeric value may have a value that is +/−0.1% of the stated value (or range of values),

+/−1% of the stated value (or range of values), +/−2% of the stated value (or range of values), +/−5% of the stated value (or range of values), +/−10% of the stated value (or range of values), etc. Any numerical values given herein should also be understood to include about or approximately that value, unless the context indicates otherwise. For example, if the value “10” is disclosed, then “about 10” is also disclosed. Any numerical range recited herein is intended to include all sub-ranges subsumed therein. It is also understood that when a value is disclosed that “less than or equal to” the value, “greater than or equal to the value” and possible ranges between values are also disclosed, as appropriately understood by the skilled artisan. For example, if the value “X” is disclosed the “less than or equal to X” as well as “greater than or equal to X” (e.g., where X is a numerical value) is also disclosed. It is also understood that the throughout the application, data is provided in a number of different formats, and that this data, represents endpoints and starting points, and ranges for any combination of the data points. For example, if a particular data point “10” and a particular data point “15” are disclosed, it is understood that greater than, greater than or equal to, less than, less than or equal to, and equal to 10 and 15 are considered disclosed as well as between 10 and 15. It is also understood that each unit between two particular units are also disclosed. For example, if 10 and 15 are disclosed, then 11, 12, 13, and 14 are also disclosed.
(241) Although various illustrative embodiments are described above, any of a number of changes may be made to various embodiments without departing from the scope of the invention as described by the claims. For example, the order in which various described method steps are performed may often be changed in alternative embodiments, and in other alternative embodiments one or more method steps may be skipped altogether. Optional features of various device and system embodiments may be included in some embodiments and not in others. Therefore, the foregoing description is provided primarily for exemplary purposes and should not be interpreted to limit the scope of the invention as it is set forth in the claims.

Claims

1. A device for removing material from a patient, the device comprising: an extractor formed from one continuous wire, the extractor comprising a first array of engagement panels located at a first longitudinal location formed from the one continuous wire, wherein the first array of engagement panels is configured to extend radially outward from a first coiled eyelet formed from the one continuous wire when expanded within a blood vessel, a second array of engagement panels located at a second longitudinal location formed from the one continuous wire, wherein the second array of engagement panels is configured to extend radially outward from a second coiled eyelet formed from the one continuous wire when expanded within the blood vessel, a third array of engagement panels located at a third longitudinal location formed from the one continuous wire, wherein the third array of engagement panels is configured to extend radially outward from a third coiled eyelet formed from the one continuous wire when expanded within the blood vessel, the first longitudinal location is spaced apart from the second longitudinal location, wherein the second longitudinal location is spaced apart from the third longitudinal location, wherein when expanded within the blood vessel, the first array of engagement panels is configured to be positioned distal to a thrombus, the second array of engagement panels is configured to be positioned within the thrombus, and the third array of engagement panels is configured to be positioned proximal to the thrombus, wherein when expanded within the blood vessel, the first array of engagement panels, the second array of engagement panels, and the third array of engagement panels are configured to engage the thrombus between the first array of engagement panels, the second array of engagement panels, and the third array of engagement panels, wherein upon retraction of the extractor to remove the thrombus, the engagement panels are configured to act independently and do not stretch or elongate under tension thus securing the thrombus during transit.
2. The device of claim 1, wherein each engagement panel comprises a quadrant of a circle.

3. The device of claim 1, wherein each engagement panel comprises a fan shape.
4. The device of claim 1, wherein each engagement panel comprises two legs that extend radially outward from the respective coiled eyelet.
5. The device of claim 1, wherein each engagement panel comprises an arc configured to scrape along a wall of the blood vessel.
6. The device of claim 5, wherein the arc comprises a smooth and atraumatic edge.
7. The device of claim 1, wherein the first array of engagement panels located at the first longitudinal location form a relatively complete circle configured to be in contact with the blood vessel.
8. The device of claim 1, wherein the first array engagement panels at the first longitudinal location are configured to contact more than 80% of a circumference of a wall of the blood vessel.
9. The device of claim 1, wherein the first array engagement panels at the first longitudinal location are configured to contact more than 90% of a circumference of a wall of the blood vessel.
10. The device of claim 1, wherein the first array of engagement panels located at the first longitudinal location are configured form a generally circular profile similar to a circumference of a wall of the blood vessel.
11. The device of claim 1, further comprising a distal member distal to the first array of engagement panels, wherein the distal member is configured to prevent distal migration of the thrombus.
12. The device of claim 1, wherein the first coiled eyelet, the second coiled eyelet, and the third coiled eyelet are configured to receive a catheter shaft or core wire.
13. A method for removing material from a patient, the method comprising: expanding an extractor within a blood vessel, wherein the extractor is formed from one continuous wire, the extractor comprising a first array of engagement panels located at a first longitudinal location formed from the one continuous wire, wherein the first array of engagement panels extends radially outward from a first coiled eyelet formed from the one continuous wire when expanded within the blood vessel, a second array of engagement panels located at a second longitudinal location formed from the one continuous wire, wherein the second array of engagement panels extends radially outward from a second coiled eyelet formed from the one continuous wire when expanded within the blood vessel, a third array of engagement panels located at a third longitudinal location formed from the one continuous wire, wherein the third array of engagement panels extends radially outward from a third coiled eyelet formed from the one continuous wire when expanded within the blood vessel, wherein the first location is spaced apart from the second location, wherein the second location is spaced apart from the third location, wherein when expanded within the blood vessel, the first array of engagement panels is positioned distal to a thrombus, the second array of engagement panels is positioned within the thrombus, wherein the third array of engagement panels is positioned proximal to the thrombus, wherein when expanded within the blood vessel, the first array of engagement panels, the second array of engagement panels, and the third array of engagement panels engage the thrombus between the first array of engagement panels, the second array of engagement panels, and the third array of engagement panels, wherein upon retraction of the extractor to remove the thrombus, the engagement panels act independently and do not stretch or elongate under tension thus securing the thrombus during transit.
14. The method of claim 13, wherein the first array of engagement panels located at the first longitudinal location, the second array of engagement panels located at the second longitudinal location, and the third array of engagement panels located at the third longitudinal location engage the thrombus while additional engagement panels are collapsed within a sheath.
15. The method of claim 13, wherein the extractor is pulled proximally and the first array of engagement panels, the second array of engagement panels, and the third array of engagement panels scrape along a surface of the blood vessel.
16. The method of claim 13, wherein the blood vessel comprises a cerebral blood vessel.

17. The method of claim 13, wherein the thrombus is located within the middle cerebral artery.
18. The method of claim 13, wherein the extractor comprises a column strength to move longitudinally within the blood vessel.
19. The method of claim 13, wherein the first array of engagement panels located at the first longitudinal location, the second array of engagement panels located at the second longitudinal location, and the third array of engagement panels located at the third longitudinal location retain their shape when pulled.
20. The method of claim 13, wherein the extractor is expanded approximately equal to a diameter of the blood vessel.