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REACH REMOTE ELEVATED ANCHOR

Abstract

An apparatus and method of use for establishing a temporary overhead anchor that can be attached and detached to a variety of anchorage points. The temporary overhead anchor is intended to be used as an anchorage point for fall arrest equipment to be anchored to. The apparatus is designed to be securely attached to an anchorage point from ground level as to avoid the use of a ladder. The apparatus further includes a shuttle subassembly which allows for the transport of additional heavier fall arrest equipment from ground level to the elevated position via a rope and pulley system. Because this system includes a shuttle system and can be installed and removed from ground level, many of the shortcomings of other comparable systems are addressed with this disclosure.

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Background/Summary

FIELD OF THE INVENTION

[0001] The present disclosure, in some embodiments, relates to apparatuses and methods for establishing a temporary overhead anchor and shuttle system. For example, the disclosure presents various embodiments of an apparatus for establishing a temporary overhead anchor and shuttle system from the ground level that can be used as an initial anchorage point to tether safety equipment such as self-retracting lanyards, as well as to shuttle additional safety equipment from the ground level to the temporary overhead anchor position. According to exemplary embodiments, the apparatus is designed to be attached to a variety of common elevated structural attachment points including, for example, I-beams and pipes, the features of which may also be utilized for attachment to other common anchorage points as well.

BACKGROUND

[0002] There are many instances when it may be desirable to establish a temporary overheard anchor and shuttle system at an elevated structural attachment point. For example, OHSA regulations often require workers to use personal fall arrest or protection devices when working at elevations above **4-6** feet above the ground. These devices operate by quickly slowing the fall of a worker and preventing impact on the ground or objects below in the event of a fall or incident.

[0003] For these devices to safely prevent fall injuries, the worker will usually wear a harness that attaches to a safety cable. Typically, this safety cable is contained within a fall protection device, and is retractable so that it does not get in the way of the worker while performing their jobs at elevated heights. In order to be effective at stopping falls, the fall protection device must be anchored at a point generally above where the worker is performing their job. This way, the tension on the cable can counteract the downward motion of a falling worker.

[0004] As the fall protection device must support the full weight of a worker, the anchor point must be firmly established. In certain industries, such as in manufacturing plants, permanent anchor points may be built directly into the manufacturing areas when workers must regularly attach to the overheard anchor positions. In other instances, for example electrical repairman, no permanent anchor point is present. As such, these temporary fall protection systems must find a separate way to attach to a temporary anchorage point above the worker. These temporary anchorage points must be secure enough to support the weight of a worker, easily attachable and detachable, and able to attach to a variety of temporary anchorage points without causing damage.

[0005] A variety of temporary anchorage points are often available. For example, common temporary anchorage points include pipes, I-Beams, and D-Rings. Each of these points must be generally above the worker, and of sufficient strength to operate as an anchorage point, while still allowing for easy attachment and detachment.

[0006] Even assuming that a temporary anchorage point exists, workers must still find a way to safely attach and detach the fall protection devices to the temporary anchorage points. Typically this would entail the use of a ladder, however, this poses its own entire set of dangers associated with the use of ladders in the workplace.

[0007] As such, a need exists for a device and method of establishing a temporary overhead anchor and shuttle system from the ground level. The ideal apparatus and method will allow a worker to quickly and easily attach a temporary overhead anchor and shuttle system to an elevated structural attachment point for fall arrest equipment from the ground level without the need for ladders. Further, the device will allow for temporary, secure attachment to a variety of elevated structural attachment points. Lastly, the device will also allow a worker to establish a shuttle system to allow

workers to safely transport additional safety materials from ground level to an elevated position.

BRIEF SUMMARY OF THE INVENTIONS

[0008] Embodiments of the present disclosure addresses the problems presented above. In this regard, the present disclosure presents an exemplary device that can be used to establish a secure, temporary anchorage point to tether fall-protection safety equipment to from the ground level without the inherent risks involved with ladders or lifts.

[0009] Another exemplary use for the present disclosure is to establish a temporary overhead anchor and shuttle system for use in a personal fall arrest system ("PFAS"). This type of system allows workers to shuttle more permanent safety equipment such as heavy self-retracting lanyards and other safety equipment from the ground to an elevated position where it can be used for work. Typically, this type of system utilizes a pulley and rope setup, wherein the pulley is attached to a temporary anchorage point at the top, and ropes are used to raise and lower the safety equipment which is typically attached to one end of the rope. Many of the issues faced with the attachment of the fall protection devices are also shared with the attachment of the PFAS.

[0010] Accordingly, embodiments of the present disclosure includes an apparatus for establishing a temporary overhead anchor and shuttle system that can be attached and detached to a variety of elevated structural attachment points. The apparatus can be used to establish a shuttle system, that, in some embodiments, utilizes a ratcheting and locking claw mechanism, magnetic attachments, and a telescoping pole to securely attach to I-beams, pipes, D-rings, and other elevated structural attachment points from the ground level. More specifically, embodiments of the present invention allows a user to remotely attach the temporary overhead anchor to an elevated structural attachment point such that the temporary overhead anchor can be used to establish a connection point for fall arrest equipment, and simultaneously includes a shuttle system to allow a user to safely raise additional items such as self-retracting lanyards ("SRLS"), lifelines, and other PFAS materials to the temporary overheard anchor position. By using a scissor-like claw mechanism, the apparatus can be easily and securely attached to a variety of elevated structural attachment points. The use of a ratcheting and locking mechanism ensures the apparatus remains attached to the elevated structural attachment point under a variety of conditions. The use of an extendable pole allows the operator to safely attach the temporary overhead anchor to an elevated structural attachment point at a variety of heights, from the ground level. Finally, the use of the shuttle assembly allows the operator to safely raise and lower heavier fall arrest devices and other safety equipment between the ground level and the temporary overhead anchor position. This apparatus is designed for use in a variety of industrial or occupational uses, including construction, electrical, and tactical scenarios, and allows an operator to safely establish a temporary overhead anchor and shuttle system under a variety of conditions.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. **1** illustrates a perspective view of an example of the presently disclosed temporary overhead anchor apparatus for establishing a temporary anchor point and shuttle system, according to one embodiment.

[0012] FIG. **2** illustrates an exploded view of an example of the presently disclosed temporary overhead anchor apparatus for establishing a temporary anchor point and shuttle system, according to one embodiment.

[0013] FIG. **3** illustrates a front view of an example of the presently disclosed temporary overhead anchor apparatus wherein the clamp subassembly is opened, according to one embodiment.

[0014] FIG. **4** illustrates a front view of an example of the presently disclosed temporary overhead anchor positioned onto an elevated structural attachment point, according to one embodiment.

[0015] FIG. **5** illustrates a perspective view of the clamp subassembly of the presently disclosed temporary overhead anchor apparatus, according to one embodiment.
[0016] FIG. **6** illustrates an exploded view of the ratcheting locking subassembly of the presently disclosed temporary overhead anchor apparatus, according to one embodiment.
[0017] FIG. **7** illustrates a perspective view of the shuttle subassembly of the presently disclosed temporary overhead anchor apparatus, according to one embodiment.
[0018] FIG. **8** illustrates an exploded view of the shuttle subassembly of the presently disclosed temporary overhead anchor apparatus, according to one embodiment.
[0019] FIG. **9** illustrates a perspective view of the pull cord for the shuttle subassembly of the presently disclosed temporary overhead anchor apparatus, according to one embodiment.
[0020] FIG. **10** illustrates a perspective view of the pulley and pulley housing for the shuttle subassembly of the presently disclosed temporary overhead anchor apparatus, according to one embodiment.
[0021] FIG. **11**A illustrates a perspective view of the extendable pole subassembly with the threaded hook attachment, according to one embodiment.
[0022] FIG. **11**B illustrates a perspective view of the extendable pole subassembly with the removable magnetic end, according to one embodiment.
[0023] FIG. **12** illustrates a perspective view of the extendable pole being inserted into the pole mount of the clamp subassembly attached to the stabilizing brace, according to one embodiment.
[0024] FIG. **13** illustrates an operator using the presently disclosed temporary overhead anchor apparatus to establish a temporary overhead anchor position, according to one embodiment.
[0025] FIG. **14**. illustrates an operator using the extendable pole to release the shuttle from the temporary overhead anchor apparatus, according to one embodiment.
[0026] FIG. **15** illustrates an operator utilizing the temporary overhead anchor apparatus to raise additional fall arrest equipment to a temporary overhead anchor position, according to one embodiment.

DETAILED DESCRIPTION

[0027] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the disclosure. As used herein, the term “and/or” includes any and all combinations of one or more of the associated listed items. As used herein, the singular forms “a”, “an” and “the” are intended to include the plural forms as well as the singular forms, unless the context clearly indicates otherwise. It will be further understood that the terms “comprises” and/or “comprising” when used in this specification, specify the presence of stated features, steps, orientations, elements, and/or components, but do not preclude the presence or addition of one or more other features, steps, operations, elements, components, and/or groups thereof.
[0028] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one having ordinary skill in the relevant art. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and the present disclosure and will not be interpreted in an idealized or overly formal sense, unless expressly so defined herein.
[0029] It will be understood that a number of techniques and steps relating to the disclosure are presented. Each of these has individual benefits and each can also be used in conjunction with one or more, or in some cases all, of the other disclosed techniques. Accordingly, for the sake of clarity, this description will refrain from repeating every possible combination of the individual steps in an unnecessary fashion. Nevertheless, the specification and claims should be read with the understanding that such combinations are entirely within the scope of the inventions and the claims.
[0030] According to some embodiments, an apparatus for establishing a temporary overhead

anchor and shuttle system is presented. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the present disclosure. It will be evident, however, to one skilled in the art that the present disclosure may be practiced without these specific details. The present disclosure is to be considered as one or more examples only and is not intended to limit the disclosure to the specific embodiments illustrated by the figures or description below.

[0031] Referring now to FIG. **1**, a perspective view of an apparatus for establishing a temporary overhead anchor and shuttle system is presented. In certain preferred embodiments, the apparatus contains a clamp subassembly **100**, a ratcheting locking subassembly **200**, a pole mount subassembly **300**, and a shuttle subassembly **400**. In some embodiments, the ratcheting locking subassembly **200** is attached laterally to the clamp subassembly **100**, both of which are connected to and positioned above the shuttle subassembly **400**, In certain embodiments, the pole mount subassembly **300** is attached directly to the clamp subassembly **100**.

[0032] Referring to FIG. **2**, an exploded view of the apparatus for establishing a temporary overhead anchor and shuttle system is shown. The clamp subassembly **100**, the pole mount subassembly **300**, and the shuttle subassembly **400** all are held together by a central assembly bolt **350**, and all of the subassemblies combined together form the apparatus for establishing a temporary overhead anchor and shuttle system.

[0033] In certain embodiments, the presently disclosed apparatus is designed so that the clamp subassembly **100** can be opened, as shown in FIG. **3**, and closed and positioned on an elevated structural attachment point **500** such as shown in FIG. **4**. In the closed position, as shown in FIG. **4**, the ratcheting locking subassembly **200** ensures that that the clamp subassembly **100** remains securely closed around the elevated structural attachment point **500** until released from the ground level by the operator.

[0034] FIG. **5** shows a perspective view of the clamp subassembly **100** without any additional subassemblies attached. The clamp subassembly **100**, in certain embodiments, is comprised of a first and second extension arm **110** and **111**, wherein each of the first and second extension arms **110** and **111** include a hooked end **113**, a straight end **114**, and a midpoint **115**. The clamp subassembly **100** further contains a first and second lower clamp arm **120** and **121**, each of which include a lower clamp arm top end **123** and a lower clamp arm bottom end **124**.

[0035] When fully assembled, the elements of the clamp subassembly **100** are arranged such that the hooked ends **113** of the first and second extension arms **110** and **111** face each other and the straight ends **114** of first and second extension arms **110** and **111** overlap each other at their midway points **115** such that the first and second extension arms **110** and **111** are substantially overlapped in an x-shaped formation.

[0036] In certain embodiments, a first rivet **130** is inserted through the midway point **115** of the first and second extension arms **110** and **111** in order to keep the first and second extension arms **110** and **111** pivotally connected.

[0037] Referring still to FIG. **5**, the straight ends **114** of the first and second extension arms **110** and **111** are also arranged such that they each overlap the lower clamp arm top ends **123** of the lower clamp arms **120** and **121**. Second rivets **140** are inserted to maintain a pivotal connection between the straight ends **114** of the first and second extension arms **110** and **111** and the lower clamp arm top ends **123** of lower clamp arms **120** and **121**. The lower clamp arm bottom ends **124** of the lower clamp arms **120** and **121** are arranged such that they are substantially overlapped, and inserted into a stabilizing brace **150**. In certain embodiments the lower clamp arms **120** and **121** are held pivotally in place within the stabilizing brace **150** by a third rivet **160**.

[0038] In this arrangement, the first and second extension arms **110** and **111** are able to open and close in a scissor-like motion such that when in the open position, shown in FIG. **3**, the first and second extension arms **110** and **111** are opened wide enough to surround an elevated structural attachment point **500**, and when in the closed position, as shown in FIG. **4**, the first and second

extension arms **110** and **111** close tight enough to firmly grasp an elevated structural attachment point **500**.

[0039] In order to ensure the first and second extension arms **110** and **111** remain securely attached to the elevated structural attachment point **500**, the clamp subassembly **100** utilizes a ratcheting locking subassembly **200**. As shown in FIG. **5**, the ratcheting locking subassembly **200** attaches to both the flat end **114** of the second extension arm **111**, and the lower clamp arm top end **123** of the first lower clamp arm **120**. Without the ratcheting locking subassembly **200**, the first extension arm **110** and the first lower clamp arm **120** freely pivot, which causes the hooked ends **113** of the first and second extension arms **110** and **111** to open and close. The ratcheting locking subassembly **200** allows a user to selectively lock this pivot action so that the hooked ends **113** cannot be opened without disengaging the ratcheting locking subassembly.

[0040] As shown in FIGS. **5** & **6**, the ratcheting locking subassembly **200** is comprised of a ball nose detent **210**, a drive gear **220**, a pawl **230**, and a release tab **250**. In certain embodiments, the drive gear **220** attaches to the flat end **114** of the first extension arm **110**, and the pawl **230** is attached to the lower clamp arm top end **123**. A torsion spring **240** is interlaid in between the pawl **230** and the flat end **114** of the first extension arm **110**. The torsion spring **240** ensures that the pawl **230** maintains a constant forward engagement with the drive gear **220**. The constant forward engagement between the pawl **230** and the drive gear **220** prevents the first extension arm **110** and the first lower clamp arm **120** from pivoting. To disengage the ratcheting locking subassembly **200**, a downward force is applied to release tab **250**, which causes the pawl **230** to disengage from the drive gear **220**, thereby allowing the first extension arm **110** and the first lower clamp arm **120** to freely pivot. Once the ratcheting locking subassembly **200** assembly is released, the first extension arm **110** and the first lower clamp arm **120** are free to pivot, and the first extension arm **110** and the second extension arm **111** can open in a scissor-like manner. This allows the clamp subassembly **100** to be removed from the elevated structural attachment point **500**.

[0041] Another aspect of this apparatus is the shuttle subassembly **400**, which is shown assembled in FIG. **7**. The shuttle subassembly **400** includes at least a shuttle housing **410** and a shuttle **420**. The entire shuttle subassembly **400** may be attached directly to the side of the stabilizing brace **150** of the clamp subassembly **100** via the central assembly bolt **350** as shown in

[0042] FIG. **2** by. The shuttle housing **410** may remain attached to the stabilizing brace **150** at all times, while the shuttle **420** is meant to be able to be detached from the shuttle housing **410** in order to be used as a shuttle device, according to some embodiments.

[0043] As shown in FIGS. **7** & **8**, the shuttle **420** is comprised primarily of a top cap **421**, one or more locking bars **422**, a locking bar guide **423**, a bottom cap **424**, and a D-ring **425**. The top cap **421** is the topmost portion of the shuttle **420**. Beneath the top cap **421** is the locking bar guide **423** which contains one or more cutouts **430** which are sized and shaped to accommodate the one or more locking bars **422**. Additionally, one or more compression springs **432** are located in between the one or more locking bars **422** and the locking bar guide **423**. These compression springs **432** exert an outward force on the locking bars **422**, ensuring the locking bars **422** remain outwardly extended from the locking bar guide **423** as far as the cutouts **430** of the locking bar guide **423** allow. The top cap **421** and the locking bar guide **423** are held together by one or more socket head bolts **433** with the one or more locking bars **422** and compression springs **432** maintained in between. The locking bar guide **423** is attached to the bottom cap **424** via one or more socket head bolts **433**. Both the locking bar guide **423** and the bottom cap **424** include substantially u-shaped cutouts **435** which are sized and shaped to accept the D-Ring **425**. In certain embodiments, the pull cord **900** is attached to the one or more locking bars **422**, and runs from the locking bars **422** through the locking bar guide **423** and through an opening **436** in the bottom cap **424** such that a substantial portion of the pull cord **900** hangs below the shuttle **400** as shown in FIG. **7**.

[0044] FIG. **9** provides an exemplary embodiment of the pull cord **900**, which contains one or more looped ends **901** and a mid-section **902**.

[0045] Referring back to FIGS. **7** and **8**, the locking bars **422** extend outward from the locking bar guide **423** when the compression springs **432** exert an outward force on the locking bars **422**. Also, each looped end **901** of the pull cord **900** is attached to one of the locking bars **422** in a manner such that the mid-section **902** of the pull cord **900** hangs below the shuttle **400** so that when the pull cord **900** is pulled downwardly with a force greater than the outward force of the compression springs **432**, the locking bars **422** are retracted inward. It would be further recognized that the shuttle **420** is designed to be nestled into the shuttle housing **410** such that that locking bars **422**, when extended, catch against the shuttle housing base **445**. This contact is sufficient to lock the shuttle **420** in place within the shuttle housing **410**. To release the shuttle **420** from the shuttle housing **410**, an operator simply exerts a downward force on the pull cord **900** which causes the locking bars **422** to retract. Because the locking bars **422** are the means by which the shuttle **420** attaches to the shuttle assembly **410**, once retracted, the shuttle **420** is free to be lowered to the ground.

[0046] In order to allow the shuttle **420** to ascend and descend to the shuttle housing **410**, a rope and pulley subassembly **450** as shown in FIG. **10** is employed. The rope and pulley subassembly **450** is comprised of a pulley mount **451**, a pulley **452**, a pulley loop **453**, and a rope **454**. The pulley mount **451** is attached directly to the shuttle housing **410** via the central assembly bolt **350** such the pulley **452** is situated substantially above the shuttle **420**. The pulley loop **453** is attached to the pulley mount **451** and substantially encloses the pulley **452** to provide protection from damage to the pulley **452**. The rope **454** has a first rope end **455**, which is tied directly to the shuttle **420**. The second rope end **456** is located on the other side of the pulley **452** and is sufficient length to hang down to the ground. The second rope end **456** is the end that allows operator to raise and lower the shuttle **420**.

[0047] Because this remote anchor apparatus is designed to be attached to an elevated point **500** from the ground level, the disclosed apparatus utilizes an extendable pole subassembly **600** as shown in FIG. **11**A & B. This extendable pole subassembly **600** is comprised of an extendable pole **601** including a first handle end **602** and a second threaded end **603**. There are two interchangeable attachments that can be screwed onto the second threaded end **603** including a hook attachment **604** and a removeable magnetic end **605**.

[0048] In order to raise and lower the presently disclosed remote anchor apparatus, there may be a simple and secure means for attaching the extendable pole subassembly **600** to the clamp subassembly **100**. FIG. **12** shows how this is accomplished according to one embodiment. For example, the pole mount subassembly **300** is attached to the stabilizing brace **150** of the clamp subassembly **100** via the central assembly bolt **350**. The pole mount subassembly **300** includes a substantially hollow and cylindrically shaped pole receiving end **301**, and in certain embodiments this pole receiving end **301** may include internal magnets. The pole receiving end **301** is shaped and designed to accept the removable magnetic end **605** of the extendable pole subassembly **600**.

[0049] Referring now to the process of using the disclosed remote anchor apparatus, those skilled in the art will recognize that FIG. **13** represents one particular embodiment of using the remote anchor apparatus to establish a temporary overhead anchor position. Particularly, in order to establish a temporary overhead anchor position, an operator must first determine that a suitable elevated structural attachment point **500** exists. For the present remote anchor apparatus, this may include an I-beam, a D-ring, round stock, a pipe, and other similar points of contact.

[0050] As shown in FIGS. **11**A and **11**B, an operator may screw the removable magnetic end **605** onto the extendable pole **601**. Then, as shown in FIG. **12**, the operator inserts the removable magnetic end **605** into the pole receiving end **301**. Once the threaded removable magnetic end **605** is inserted into the substantially hollow and cylindrically shaped pole receiving end **301**, the threaded removable magnetic end **605** becomes magnetically attached to the pole mount subassembly **300**. The next step is for the operator to ensure the clamp subassembly **100** is in a fully opened position as shown in FIG. **3**. After the operator has confirmed that the clamp

subassembly **100** is fully open, they must also ensure that the ratcheting locking subassembly **200** is engaged. This ensures that once the clamp subassembly **100** is closed around the elevated structural attachment point **500**, as shown in FIG. **4**, that it does not inadvertently open and cause the entire apparatus to fall.

[0051] Referring back to FIGS. **12-13**, after ensuring that the ratcheting locking subassembly **200** is engaged, the operator can use the extendable pole **601** to hoist the remote anchor apparatus up to the structural attachment point **500**. Once the apparatus reaches the elevated structural attachment point **500**, the operator may utilize the extendable pole **601** to navigate the remote anchor apparatus so that at least one of the extension arms **110** or **111** contacts the elevated structural attachment point **500**. As the operator pulls down the remote anchor apparatus, the hooked end **113** of the first extension arm **110** that is in contact with the elevated structural attachment point **500** causes the first extension arm **110** and the second extension arm **111** to close toward each other in a scissor-like motion. As the first extension arm **110** and the second extension arm **111** close into each other, the ratcheting locking subassembly **200** ensures that the first extension arm **110** and the second extension arm **111** are unable to be inadvertently released into the open position, due to the constant forward engagement between the pawl **230** and the drive gear **220** explained previously. After a certain amount of downward pressure is applied to the extendable pole **601**, the first extension arm **110** and the second extension arm **111** will no longer be able to close any more. Once the apparatus is firmly connected to the elevated structural attachment point **500**, all that is left to do is for the operator to continue to apply a downward pressure with the extendable pole **601** in order for the operator to separate the extendable pole's **601** removable magnetic end **605** from the pole mount subassembly **300**.

[0052] In order to use the shuttle system as intended, the operator must first release the shuttle **420** from the shuttle housing **410**. Referring now to FIG. **14**, according to one embodiment, an operator releases the shuttle **420** by using the extendable pole **601** with the hook attachment **604** to pull the pull cord **900**. Once released, the operator can use the second rope end **456** to lower the shuttle **420** to ground level.

[0053] Turning now to FIG. **15**, an exemplary use of the temporary overhead anchor and shuttle system is displayed. Additional fall arrest equipment **700** can be attached directly to the D-ring **425** located on the shuttle **420**. This additional fall arrest equipment **700** could include harnesses, lifelines, SRLs, and other safety equipment allowing workers to securely attach themselves to the temporary overhead anchor position. This D-ring **420** is specifically designed to bear cargo weight, and allows for a variety of methods of attaching fall arrest equipment **700** to the shuttle **420**. Once the fall arrest equipment **700** is securely attached to the shuttle **420**, the ground operator may pull the second rope end **456**, there by utilizing the pulley **452** to raise the shuttle **420** back to the shuttle housing **410**.

[0054] Particularly, the remote anchor apparatus is intended to hoist fall arrest equipment **700**, such as safety self-retracting lanyards, lifelines, and equipment from the ground level up to the temporary overhead anchor position. In order to facilitate the movement of fall arrest equipment **700** from the ground level the temporary overhead anchor position, the operator will use the second rope end **456** to raise and lower the fall arrest equipment **700**. More particularly, the operator can raise and lower the shuttle **420** which is attached to the D-ring **425**.

[0055] FIGS. **7** & **8** show how the shuttle **420** is able to re-engage with the shuttle assembly **400**. Particularly, because of the top cap's **421** pointed shape, the shuttle **420** will be guided back into the shuttle housing **410** as it is raised. As shown in FIG. **8**, the locking bars **422** have a substantially angled top surface, and as the shuttle **420** is pulled back into the shuttle housing **410**, the angled top surface of the locking bars **422** contacts the shuttle housing base **445**, and causes the locking bars **422** to be compressed inward so that the shuttle **420** may continue to be pulled upward into the shuttle housing **410**. Turning back to FIG. **7**, once the locking bars **422** clear the shuttle housing base **445**, the locking bars **422** will expand beyond the shuttle housing **410** because of the outward

force applied by the springs mentioned above, thereby locking the shuttle **420** into the shuttle housing **410** until later re-released by pulling the pull cord **900**. Once the shuttle **420** is securely locked to the shuttle housing **410**, operators can detach and reattach fall arrest equipment **700** as needed.

[0056] Removal of the temporary overhead anchor follows a similar process to its installation. Referring back to FIGS. **11**A, **11**B, **12**, **13** & **14**, once the work at the temporary overhead anchor position is completed, it may be desirable to remove the temporary overhead anchor. To do this, the ground operator must first ensure that there is no remaining fall arrest equipment **700** attached to the shuttle **420**, and that the shuttle **420** is securely attached to the shuttle housing **410**. To ensure that the shuttle **420** is firmly attached to the shuttle housing **410**, the ground operator pulls the rope **454** firmly to fully raise the shuttle **420** into the shuttle housing **410** until the locking bars **422** expand beyond the shuttle housing **410**. Once secured, the ground operator raises the extendable pole **601** with the hook attachment **604** up to the locking ratcheting subassembly **200**, and utilizes the hook attachment **604** to pull the release tab **250** to disengage the ratcheting locking subassembly **200**. Once the ratcheting locking subassembly **200** is released, the entire apparatus is free to be removed, but is no longer safe to use for its shuttling purpose. To finalize the removal, the ground operator swaps the hook attachment **604** with the removable magnetic end **605**, and utilizes the extendable pole **601** to insert the removable magnetic end **605** into the pole mount assembly **300**. Once the extendable pole **601** is firmly attached to the pole mount assembly **300**, the ground operator can safely lower the entire assembly and collapse the extendable pole **601**.

[0057] While various embodiments of the present disclosure have been described in detail, it should be apparent that modifications and variations thereto are possible, all of which fall within the true spirit and scope of the disclosure. For example, various other embodiments may not require all subassemblies to be present, or may include other similar subassemblies. One such example is that the shuttle housing may be attached directly to an elevated structural attachment point by other means than a clamp subassembly. Similarly, other embodiments may not utilize a pulley system but instead rely on electrical lift.

[0058] Additionally, various embodiments may utilize multiple of the same subassemblies. For example, certain embodiments may utilize two or more separate clamp subassemblies to increase the strength of the attachment point. Other embodiments may include multiple pulley systems to allow for simultaneous raising and lowering of multiple PFAS's.

[0059] Similarly, other embodiments may also include remote control options such as to remotely unlock the ratcheting locking subassembly, or to remotely raise and lower the shuttle subassembly without the need for the pulley subassembly.

[0060] Therefore, the foregoing is intended only to be illustrative of the principles of the disclosure. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not intended to limit the disclosure to the exact construction and operation shown and described. Accordingly, all suitable modifications and equivalents may be included and considered to fall within the scope of the disclosure, defined by the following claim or claims.

Claims

1. An apparatus for establishing a temporary overhead anchor, the apparatus comprising: a clamp subassembly configured for attachment to an overhead anchor point, the clamp subassembly comprising a plurality of extension arms, wherein one or more of the extension arms are comprised of a locking subassembly; a pole with an engagement end; and a shuttle subassembly for attachment to the clamp subassembly and comprising a load lifting system and a detachable shuttle configured to raise and lower fall arrest equipment from a first level to the overhead anchor point, wherein the apparatus is configured to be the temporary overhead anchor for the fall arrest equipment when the detachable shuttle is attached to the shuttle subassembly.

2. The apparatus of claim 1 wherein each of the plurality of extension arms is pivotally connected such that one or more of the plurality of the extension arms open and close in a clamp or scissor-like motion, and wherein the clamp subassembly is designed to be attached to the overhead anchor point comprising one of: a pipe, an I-beam, or a D-ring.
3. The apparatus of claim 1 wherein the locking subassembly comprises a ratcheting mechanism which in an unlocked configuration allows the plurality of extension arms to freely open and close relative to one another, and in a locked configuration allows the extension arms to close relative to one another but prevents the extension arms from opening relative to one another.
4. The apparatus of claim 1 wherein the locking subassembly comprises a release tab, and wherein the locking subassembly is biased by one or more biasing members into the locked configuration to prevent the plurality of extension arms of the clamp subassembly from opening outward until the release tab is pulled to disengage the biasing members to put the locking subassembly in the unlocked configuration.
5. The apparatus of claim 1 wherein the engagement end of the pole includes an interchangeable hook and magnetic end.
6. The apparatus of claim 1 wherein the clamp subassembly comprises a pole mount receiver for receiving the magnetic end of the pole.
7. The apparatus of claim 1 wherein the shuttle comprises one more outwardly-biased tabs which extend beyond one or more sides of the shuttle and a release cord being configured so that when a force is applied onto the release cord, the one or more outwardly-biased tabs are retracted into the shuttle subassembly.
8. The apparatus of claim 1 wherein the load lifting system further comprises a rope and pulley system.
9. A method of establishing and removing a temporary overhead anchor with a shuttle system, the method comprising: forming the temporary overhead anchor for fall arrest equipment by engaging a locking mechanism on a clamp subassembly comprising a plurality of extension arms, attaching the clamp subassembly to an overhead anchor point using a pole; removing the pole from the clamp subassembly; releasing a shuttle from a shuttle subassembly attached to the clamp subassembly; lowering the shuttle from the shuttle subassembly using a load lifting system from the overhead anchor point; attaching the fall arrest equipment to the shuttle; raising the shuttle and attached fall arrest equipment back to the overhead anchor point; engaging the shuttle into the shuttle subassembly using the load lift system so that the fall arrest equipment is established as a temporary overhead anchor; removing the temporary overhead anchor by disengaging the shuttle from the shuttle subassembly and lowering the fall arrest equipment from the shuttle subassembly using the load lifting system; disengaging the locking mechanism and removing the clamp subassembly from the overhead anchor point; and lowering the clamp subassembly from the overheard anchor point.
10. The method of claim 9 wherein the plurality of extension arms of the clamp subassembly are fully spread apart, and the locking mechanism is engaged before the clamp subassembly is raised to the overheard anchor point.
11. The method of claim 9 wherein the clamp subassembly is raised to the overhead anchor point by attaching a pole with a magnetic end to a pole mount receiver on the clamp subassembly and raising the clamp subassembly using the pole.
12. The method of claim 9 wherein the clamp subassembly is engaged with the overheard anchor point by contacting one or more of the plurality of extension arms of the clamp subassembly against the overheard anchor point and applying a downward force with the pole to force the plurality of extension arms to close around the overheard anchor point, the locking mechanism preventing the plurality of extension arms from expanding relative to one another as they close, wherein the greater the downward force that is applied, the tighter the clamp subassembly locks to the overhead anchor point; and wherein once the clamp subassembly is securely attached to the

overheard anchor point, the pole can be removed from the pole mount receiver by applying a downward force to separate the magnetic end of the pole from the pole mount receiver on the clamp subassembly.

13. The method of claim 9 wherein once the clamp subassembly is securely attached to the overheard anchor point, the magnetic end of the pole is replaced with a hook which is configured to disengage the shuttle from the shuttle subassembly by applying a force onto a cord attached to the shuttle which disengages the shuttle from the shuttle subassembly; and wherein the shuttle is lowered from the shuttle assembly using the load lifting system.

14. The method of claim 9 wherein once the shuttle subassembly is lowered using the load lifting system, one or more pieces of fall arrest equipment are attached to the shuttle; and wherein the shuttle and attached fall arrest equipment is raised to the overheard anchor point using the load lifting system.

15. The method of claim 9 wherein the operator applies a sufficient force to the load lifting system to securely reengage the shuttle into the shuttle subassembly at the overheard anchor point such that the fall arrest equipment is sufficiently secured for use as a temporary overhead anchor.

16. The method of claim 9 wherein upon completion of use of the fall arrest equipment as the temporary overhead anchor, the operator uses the pole with the hook to release the shuttle and attached fall arrest equipment from the shuttle subassembly, and lowers the shuttle and fall arrest equipment from the overheard anchor point using the load lifting system.

17. The method of claim 9 wherein upon removing the fall arrest equipment from the shuttle, the operator raises and reengages the shuttle back to the shuttle subassembly by applying a sufficient force onto the load lifting system.

18. The method of claim 9 wherein the operator uses the hook attachment of the pole to disengage the locking mechanism attached to one or more of the plurality of extension arms; thereby allowing the extension arms to open relative to one another.

19. The method of claim 9 wherein the operator replaces the hook on the pole with the magnetic end and uses the pole with the magnetic end to lower the clamp subassembly from the overheard anchor point.

20. A method of establishing a temporary overhead anchor comprising: releasing a shuttle from a shuttle subassembly attached to an overhead anchor point; lowering the shuttle from the shuttle subassembly using a load lifting system; attaching fall arrest equipment to the shuttle; raising the shuttle and attached fall arrest equipment back to the overhead anchor point; and engaging the shuttle into the shuttle subassembly using the load lifting system so that the fall arrest equipment is established as a temporary overhead anchor.