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RATCHETING CABLE CLAMP

Abstract

A clamp including a body having a top portion hinged to a bottom portion, each of the top portion and the bottom portion including a rounded inner surface for receiving an elongated element, a ratchet on the top portion having a plurality of teeth, an opening in the bottom portion for removably receiving the ratchet, and a retaining assembly for adjustably engaging a portion of the plurality of teeth in the opening, the retaining assembly being releasable without tools.

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Background/Summary

FIELD OF THE INVENTION

[0001] The present disclosure relates to clamps, and more particularly, to cable clamps or clips with ratcheting mechanisms.

BACKGROUND

[0002] Cable clamps are widely used to secure cables and wires in cable systems. Cable clamps are available in numerous different styles and sizes. While some are adjustable to accommodate different cable and wire sizes, the range of adjustment is often limited. In large cable systems, such as large-scale solar installations, the cables are required to be secured at regular intervals, and the size and number of cables can vary from one location to the next. Cable installers often struggle to properly manage all of the required cables and often require a plurality of different cable clamps.

[0003] Furthermore, existing cable clamps either cannot be reopened or require tools to do so. This makes adjusting or replacing a cable clamp difficult and time consuming. For example, cable ties generally must be cut to open. Most p-clips are closed with fasteners requiring tools to open.

[0004] U.S. Pat. No. 10,119,631 describes an adjustable p-clamp assembly and method to secure elongated items such as wires, cables, and the like. The assembly is closed with a tongue member, having serrations along a width of the tongue, that engages into a slot. A wedge-shaped pawl with teeth engages the serrations. In order to open the assembly, an elongate release tool must be inserted to disengage the teeth from the serrations.

[0005] U.S. Pat. No. 11,054,063 describes a clamping device with a clamp frame that is configured to move between an open configuration and a closed configuration to wrap around and hold a longitudinal element. The clamping device includes a locking mechanism including a fastener to secure a coupling end to a coupling base. Though some embodiments may be used without a tool, the clamping device is not adjustable.

[0006] There is a need for improved clamps for cables and other elongated elements. The present invention solves these and other problems in the prior art.

SUMMARY

[0007] An object of the present invention is to provide a clamp that accommodates a variety of sizes of elongated elements, such as cables, and that is easy to open, operate, and/or reuse. A further object is to provide a clamp that is adjustable and openable by hand without the need for tools.

[0008] In one exemplary embodiment according to the present disclosure, a P-clip style device is provided that uses a ratcheting mechanism to secure elongated elements, such as cables, of various sizes. The ratcheting mechanism can be manually released without the use of tools to aid with adding or removing wires. The device may have a large robust design with adjustment for various sized cables and/or bundles of cables.

[0009] In one exemplary embodiment according to the present disclosure, a clamp is provided including a body having a top portion hinged to a bottom portion, each of the top portion and the bottom portion including a rounded inner surface for receiving an elongated element, a ratchet on the top portion having a plurality of teeth, an opening in the bottom portion for removably receiving the ratchet, and a retaining assembly for adjustably engaging a portion of the plurality of teeth in the opening, the retaining assembly being releasable without tools. In some embodiments, the ratchet includes a first plurality of teeth on a first side of the ratchet and a second plurality of teeth on a second side of the ratchet opposite the first side of the ratchet.

[0010] In some embodiments, the retaining assembly includes a first retainer on a first side of the bottom portion and a second retainer on a second side of the bottom portion opposite the first side of the bottom portion. Each of the first and second retainers may include a pawl extending into an interior of the bottom portion, the pawl being selectively disengaged by manipulating the respective

first or second retainer. Each of the first and second retainers may further include a button and a center portion, the pawl and the button being at least partially rotatable about the center portion.

[0011] In some embodiments, the retaining assembly includes a first retainer on a first side of the bottom portion and a second retainer on a second side of the bottom portion opposite the first side of the bottom portion, wherein each of the first and second retainers includes a pawl extending into an interior of the bottom portion, a center portion, and a button, the pawl and the button being rotatable about the center portion, and the pawl being selectively disengaged by pressing the button of the respective first or second retainer. In some embodiments, the ratchet is released from the retaining assembly only when the buttons of both of the first and second retainers are pressed.

[0012] The ratchet may be formed integrally with the top portion. In some embodiments, the rounded inner surfaces of the top portion and the bottom portion include ribs. In some embodiments, the bottom portion includes an attachment portion with at least one hole configured to receive a fastener. The attachment portion may be formed integrally with the bottom portion. In some embodiments, the clamp includes a living hinge between the top portion and the bottom portion of the body.

[0013] Further provided is a clamp including a body having a top portion hinged to a bottom portion, each of the top portion and the bottom portion including an inner surface being rounded for receiving an elongated element, a ratchet formed integrally with the top portion and having a first plurality of teeth on a first edge and a second plurality of teeth on a second edge opposite the first edge, an opening in the bottom portion for removably receiving the ratchet, and a retaining assembly for adjustably engaging the ratchet in the opening including a first retainer having a pawl configured to removably engage the first plurality of teeth and a second retainer having a pawl configured to removably engage the second plurality of teeth, the retaining assembly being releasable without tools.

[0014] In some embodiments, each of the first and second retainers further includes a center portion and a button, the pawl and the button being rotatable about the center portion, and the pawl being selectively disengaged by pressing the button of the respective first or second retainer. In some embodiments, the ratchet is released from the retaining assembly only when the buttons of both of the first and second retainers are pressed. The bottom portion may include an attachment portion with at least one hole configured to receive a fastener, wherein the attachment portion is formed integrally with the bottom portion.

[0015] Further provided is a method of clamping an elongated element, including steps of engaging a clamp around the elongated element, the clamp including a body with a top portion hinged to a bottom portion, each of the top portion and the bottom portion including a rounded inner surface, the clamp further including a ratchet on the top portion, an opening in the bottom portion for removably receiving the ratchet, and a retaining assembly, at least partially closing the top portion of the clamp toward the elongated element, and inserting the ratchet into the opening until the rounded inner surfaces of the top portion and the bottom portion are secured against the elongated element, wherein the ratchet has a plurality of teeth and the retaining assembly engages a portion of the plurality of teeth in the opening, the ratchet being releasable from the retaining assembly without tools.

[0016] The retaining assembly may include a first retainer having a pawl configured to removably engage at least one of the plurality teeth on a first edge of the ratchet and a second retainer having a pawl configured to removably engage at least one of the plurality teeth on a second edge of the ratchet opposite the first edge. In some embodiments, the method further includes releasing the ratchet from retaining assembly by simultaneously pressing each of the first and second retainers to release the respective pawls.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] A more complete appreciation of the present disclosure and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

[0018] FIG. 1 is an isometric view of a clamp according to an exemplary embodiment of the present disclosure in an open configuration;

[0019] FIG. 2 is a side view of the clamp shown in FIG. 1;

[0020] FIG. 3 is a top view of the clamp shown in FIG. 1;

[0021] FIG. 4 is a side view of a clamp according to an exemplary embodiment of the present disclosure in a partially closed configuration;

[0022] FIG. 5 is a sectional view of the clamp shown in FIG. 4;

[0023] FIG. 6 is a side view of a clamp according to an exemplary embodiment of the present disclosure in a closed configuration about a cable; and

[0024] FIG. 7 is a side view of a clamp according to an exemplary embodiment of the present disclosure in a closed configuration about a cable.

DETAILED DESCRIPTION

[0025] The present disclosure may be understood more readily by reference to the following detailed description of the disclosure taken in connection with the accompanying drawing figures, which form a part of this disclosure. It is to be understood that this disclosure is not limited to the specific devices, methods, conditions, or parameters described and/or shown herein, and that the terminology used herein is for the purpose of describing particular embodiments by way of example only and is not intended to be limiting of the claimed disclosure.

[0026] Also, as used in the specification and including the appended claims, the singular forms “a,” “an,” and “the” include the plural, and reference to a particular numerical value includes at least that particular value, unless the context clearly dictates otherwise. Ranges may be expressed herein as from “about” or “approximately” one particular value and/or to “about” or “approximately” another particular value. When such a range is expressed, another embodiment includes from the one particular value and/or to the other particular value. Similarly, when values are expressed as approximations, by use of the antecedent “about,” it will be understood that the particular value forms another embodiment. It is also understood that all spatial references, such as, for example, horizontal, vertical, top, upper, lower, bottom, left and right, are for illustrative purposes only and can be varied within the scope of the disclosure.

[0027] FIGS. 1-3 show a clamp **100** according to exemplary embodiment of the present disclosure in an open configuration. The clamp **100** includes a body having a bottom portion **110** hinged to a top portion **120** and operable between the open configuration and at least one closed configuration. As noted above, references to “top” and “bottom” are only for illustrated purposes are not intended to limit the orientation in which the clamp **100** may be used. A hinge **130** is positioned between and/or formed integrally with the bottom portion **110** and the top portion **120**. The hinge **130** may be, for example, a living hinge though it is not limited thereto.

[0028] The bottom portion **110** includes an inner surface **111** that is at least partially rounded for receiving a cable or other elongated element such as tubing or the like. The top portion **120** includes a corresponding inner surface **121** being rounded for receiving the cable or other elongated element such as tubing or the like. The inner surfaces **111,121** may have ribs or other protrusions to assist with securing the clamp **100** to the elongated element.

[0029] The bottom portion **110** includes an attachment portion **112** which may include at least one hole **114** for receiving a fastener. In the exemplary embodiment, the attachment portion **112** is formed integrally with the bottom portion **110**. The bottom portion **110** also includes a housing **116**. In the exemplary embodiment, the housing **116** extends upward from and substantially

perpendicular to the bottom portion **110**. The housing has an opening **118** on its distal end for removably retaining a ratchet **140** at an adjustable position when the clamp **100** is in a closed or partially closed configuration. The housing **116** also includes a retaining assembly comprised of a first retainer **150a** and/or a second retainer **150b** which engage with teeth on the ratchet **140**. [0030] The ratchet **140** may be formed integrally with the top portion **120**. In other embodiments, the ratchet **140** may be formed separately and attached to the top portion **120**. The top portion **120** has a distal end **122** where the ratchet **140** is formed or attached. The distal end **122** may also have an outer surface **124** inboard of and opposite to the ratchet **140**. The outer surface **124** may nest within the inner surface **111** of the bottom portion **110** when the clamp **100** is in some closed configurations.

[0031] As shown in FIG. 3, the ratchet **140** includes a plurality of teeth **142a** on a first side and/or a plurality of teeth **142b** on a second side, the second side being opposite the first side such that the pluralities of teeth **142a**, **142b** are projecting substantially opposite to one another. By having a plurality of teeth **142a**, **142b**, the ratchet **140** may be adjustably positioned in the opening **118** at any one of a range of positions. The first retainer **150a** is positioned and configured to engage one or more of the plurality of teeth **142a** and the second retainer **150b** is positioned and configured to engage one or more of the plurality of teeth **142b**.

[0032] FIG. 4 is a side view of a clamp **100** according to an exemplary embodiment of the present disclosure in a partially closed configuration. The ratchet **140** is shown being removably received in the opening **118**. The ratchet **140** can be retained by the retainers **150a** and/or **150b** in a plurality of positions to accommodate a variety of cable sizes. The retainers **150a** and **150b** can advantageously be engaged and released by hand without tools.

[0033] FIG. 5 is a sectional view A-A of the clamp **100** shown in FIG. 4. In the exemplary embodiment, each of the retainers **150a**, **150b** have a central portion **152a**, **152b**. Each central portion **152a**, **152b** is attached to or formed integrally with a respective side wall of the housing **116**. Each retainer **150a**, **150b** also includes a button **154a**, **154b** and a pawl **156a**, **156b** on opposite sides of the respective central portion **152a**, **152b**. By pressing the buttons **154a**, **154b** and/or squeezing the buttons **154a**, **154b** together (e.g., simultaneously), each of the retainers **150a**, **150b** rotates or flexes about its respective central portion **152a**, **152b**. In one exemplary embodiment, the buttons **154a**, **154b** must both be pressed to release the ratchet **140** which acts as a safety mechanism to prevent an inadvertent release. Rotation of the retainers **150a**, **150b** in turn retracts the pawls **156a**, **156b** from the teeth on the first and second sides of the ratchet **140** and releases the ratchet **140**.

[0034] FIG. 6 is a side view of a clamp **100** according to an exemplary embodiment of the present disclosure in a first closed configuration about a cable **160**. FIG. 7 is a side view of a clamp **100** according to an exemplary embodiment of the present disclosure in a second closed configuration about a cable **162**. As FIGS. 6-7 illustrate, the ratchet **140** may be adjustably positioned in the opening **118** at any one of a range of positions. When a large cable is being clamped, such as the cable **160** having a diameter of approximately 1.5 inches, the clamp **100** may be partially open with a distal end of the ratchet **140** retained by the retaining assembly. When a small cable is being clamped, such as the cable **162** having a diameter of approximately 0.75 inches, the clamp **100** may be closed with the outer surface **124** against or adjacent to the inner surface **111** of the bottom portion **110**. Different sized clamps **100** may be provided to accommodate larger cables such as 3 inches in diameter or and/or smaller cables such as 0.5 inches or less.

[0035] As shown throughout the drawings, like reference numerals designate like or corresponding parts. While illustrative embodiments of the present disclosure have been described and illustrated above, it should be understood that these are exemplary of the disclosure and are not to be considered as limiting. Additions, deletions, substitutions, and other modifications can be made without departing from the spirit or scope of the present disclosure. Accordingly, the present disclosure is not to be considered as limited by the foregoing description.

Claims

1. A clamp, comprising: a bottom body portion including a first rounded inner surface for receiving an elongated element; a top body portion, hinged to the bottom body portion, including a second rounded inner surface for receiving the elongated element, a top surface, and a rounded end surface extending between the top surface and a distal end of the second rounded inner surface, wherein the rounded end surface is configured to nest within the first rounded inner surface, wherein a distance between the top surface and the second rounded inner surface is largest at the distal end of the second rounded inner surface; a protrusion extending from the top body portion where the top surface meets the rounded end surface; a ratchet extending from the protrusion having a plurality of teeth, the ratchet extending adjacent to the rounded end surface and beyond the distal end of the second rounded inner surface; an opening in the bottom body portion for removably receiving the ratchet; and a retaining assembly for adjustably engaging a portion of the plurality of teeth in the opening.
2. The clamp of claim 1, wherein the ratchet includes a first plurality of teeth on a first side of the ratchet and a second plurality of teeth on a second side of the ratchet opposite the first side of the ratchet.
3. The clamp of claim 2, wherein the retaining assembly includes a first retainer on a first side of the bottom body portion and a second retainer on a second side of the bottom body portion opposite the first side of the bottom body portion.
4. The clamp of claim 3, wherein each of the first and second retainers includes a pawl extending into an interior of the bottom body portion, the pawl being selectively disengaged by manipulating the respective first or second retainer.
5. The clamp of claim 4, each of the first and second retainers further includes a button and a center portion, the pawl and the button being at least partially rotatable about the center portion.
6. The clamp of claim 4, wherein each of the first and second retainers is rotatably attached to the bottom body portion.
7. The clamp of claim 1, wherein the retaining assembly includes a first retainer on a first side of the bottom body portion and a second retainer on a second side of the bottom body portion opposite the first side of the bottom body portion, wherein each of the first and second retainers includes a pawl extending into an interior of the bottom body portion, a center portion, and a button, the pawl and the button being rotatable about the center portion, and the pawl being selectively disengaged by pressing the button of the respective first or second retainer.
8. The clamp of claim 7, wherein the ratchet is released from the retaining assembly only when the buttons of both of the first and second retainers are pressed.
9. The clamp of claim 1, wherein the ratchet is formed integrally with the top portion.
10. The clamp of claim 1, wherein the elongated element is a cable or a tube.
11. The clamp of claim 1, wherein the rounded inner surfaces of the top portion and the bottom body portion include ribs.
12. The clamp of claim 1, wherein the bottom body portion includes an attachment portion with at least one hole configured to receive a fastener.
13. The clamp of claim 12, wherein the attachment portion is formed integrally with the bottom body portion.
14. The clamp of claim 1, further comprising a living hinge between the top portion and the bottom portion of the body.
15. A clamp, comprising: a body having a top portion hinged to a bottom portion, each of the top portion and the bottom portion including a rounded inner surface for receiving an elongated element, wherein the top portion comprises a rounded end surface configured to nest within the rounded inner surface of the bottom portion; a ratchet formed integrally with the top portion and

having a first plurality of teeth on a first edge and a second plurality of teeth on a second edge opposite the first edge, the ratchet extending adjacent to the rounded end surface; an opening in the bottom portion for removably receiving the ratchet; and a retaining assembly for selectively engaging the ratchet in the opening including a first retainer having a pawl configured to removably engage the first plurality of teeth and a second retainer having a pawl configured to removably engage the second plurality of teeth, wherein each of the first and second retainers further includes a button, and the pawl being selectively disengaged by pressing the button of the respective first or second retainer.

16. The clamp of claim 15, wherein each of the first and second retainers further includes a center portion, the pawl and the button being rotatable about the center portion.

17. The clamp of claim 15, wherein the bottom portion includes an attachment portion with at least one hole configured to receive a fastener, the attachment portion formed integrally with the bottom portion.

18. A method of clamping an elongated element, comprising steps of: engaging a clamp around the elongated element, the clamp including a bottom body portion including a first rounded inner surface, a top body portion hinged to the bottom body portion the top body portion including a second rounded inner surface, a top surface, and a rounded end surface extending between the top surface and a distal end of the second rounded inner surface, wherein the rounded end surface is configured to nest within the first rounded inner surface, wherein a distance between the top surface and the second rounded inner surface is largest at the distal end of the second rounded inner surface, the clamp further including a protrusion extending from the top bottom portion where the top surface meets the rounded end surface, a ratchet extending from the protrusion adjacent to the rounded end surface and beyond the distal end of the second rounded inner surface, an opening in the bottom body portion for removably receiving the ratchet, and a retaining assembly; at least partially closing the top body portion of the clamp toward the elongated element; and inserting the ratchet into the opening until the rounded inner surfaces of the top body portion and the bottom body portion are secured against the elongated element, wherein the ratchet has a plurality of teeth, and the retaining assembly engages a portion of the plurality of teeth in the opening, the ratchet being selectively releasable from the retaining assembly.

19. The method of claim 18, wherein the retaining assembly includes a first retainer having a pawl configured to removably engage at least one of the plurality teeth on a first edge of the ratchet and a second retainer having a pawl configured to removably engage at least one of the plurality teeth on a second edge of the ratchet opposite the first edge.

20. The method of claim 19, further comprising a step of: releasing the ratchet from retaining assembly by simultaneously pressing each of the first and second retainers to release the respective pawls.
