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Tension Wire Clamp Tool

Abstract

The present invention is a tool for clamping a wire to a hose or cable. The tool is formed by a hollow housing unit to hollow for a rod to pass through and be moved forward by a spring assembly. The rod as a wire groove at the front that is sized to allow for wires of different sizes to fit inside. The spring assembly is activated by a user repeatedly engaging a trigger arm. Once a wire has been clamped onto a hose, a user simply has to press down on a tab at the back of the housing to release the rod and allow the user to manually push the rod back to its original position.

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Background/Summary

FIELD OF THE INVENTION

[0001] This invention generally relates to tools for applying and securing clamps to a hose. More specifically, this invention is a tension wire clamp tool that uses a spring mechanism and tension to

securely clamp a wire around a hose.

BACKGROUND OF THE INVENTION

[0002] Many different tools have been used in attempt to simplify the process of applying clamps around a hose. One of the original hose-clamping solutions was done by wrapping wire with hose pliers such as what was disclosed in U.S. Pat. No. 699,349 and U.S. Pat. No. 2,600,394. While these tools were a step in the right direction, they were not without their own set of problems. Often times, a user had to perform multiple steps before being able to even use the tool, and even once they could use the tool, there was a risk that they could not generate enough leverage to effectively clamp the wire on the hose.

[0003] An alternative to the prior mentioned tools are specific clamp tools that were designed for use on hoses; commonly known as hose or worm clamps. These tools were designed in order to secure a specific type of wire clamp such as disclosed in U.S. Pat. No. 6, 164, 162 and U.S. Patent Publication No. 2004/0011161. The problem with these tools is that they are constructed specifically to apply either a hose or worm clamp and are expensive, and often designed for a preset size, thus limiting their ability to be used on hoses of varying size. In addition, they are also constructed with one use type in mind, so they are incompatible for use when a user wants to apply a different style of clamp onto a hose.

[0004] In consideration of the above, there is a need in the art for a wire clamping tool that is inexpensive and has near universal applicability.

SUMMARY OF THE INVENTION

[0005] The present invention is a tension wire clamp tool that was designed to be low cost and universally applicable. To achieve this, the tension wire clamp tool has a rod that runs through a housing and protrudes out the face of the tool. This protrusion has a notch at the end that allows for a wire of any size to fit inside of it. On top of the housing there is a second rod that extends at an angle up and away from the housing and was designed so that the other end of the wire can be tied off, effectively anchoring the wire on one side. As a user engages the trigger handle, the spring mechanism pushes the rod forward, thus tightening the wire. To release the rod, all the user has to do is press down on the tab and manually push the rod back to its initial position.

[0006] Another benefit of the present invention is that it was designed to be a universal tool by being compatible with a wide number of different wire sizes that can be clamped onto a wide number of different pipes or hoses. This is due to a number of different features. The first is due to the notch at the end of the rod that protrudes from the housing of the tool and is sized to accommodate wires of all different sizes. The second is that the housing unit itself has scores, that start wide at the top and become narrower at the bottom of the housing, to serve as guides for the wire. Finally, since the rod only needs to engage the wire that is wrapped around the pipe prior to use, the tension wire clamp tool can be used on pipes of varying diameter. These features allow for a low-cost tool that can be used in a wide variety of different settings and on a wide variety of applications.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The novel features of the current invention are best exemplified by drawings of embodiments in conjunction with the following description, in which similarly-referenced characters refer to similarly-referenced parts, and in which:

[0008] FIG. **1** is a side view of the tension wire clamp tool for tightening a wire clamp around a hose;

[0009] FIG. **2** is a cutaway view of the tension wire clamp tool in which the spring mechanism of the tension wire clamp tool is visible to show the push spring around the rod and against the push

wall actuated by the trigger arm;
[0010] FIG. **3** is a top view of the tension wire clamp tool showing the housing and the rod passing through the housing and having a rod groove to receive a clamping wire;
[0011] FIG. **4** is a front view of the tension wire clamp tool showing the rod and rod groove;
[0012] FIG. **5** is a side close-up view of the release mechanism of the tension wire clamp tool to release the rod once a wire claim is tightly placed around a hose or pipe;
[0013] FIG. **6** is a side view of the tension wire clamp tool with the trigger arm partially compressed as used to install a wire clamp;
[0014] FIG. **7** is a side view of the tension wire clamp tool with the trigger arm fully compressed to urge the rod through the housing to tighten the wire clamp;
[0015] FIG. **8** is a close-up view of the tension wire clamp tool with the groove of the rod situated on a wire on a hose with one end of the wire clamp in the rod groove of the rod, and the other end of the wire clamp on the post;
[0016] FIG. **9** is a side elevational view of the tension wire clamp tool being used with a wire on a hose when the wire is seated in the rod groove and wrapped around the post;
[0017] FIG. **10** is a side elevational view of the tension wire clamp tool being used to install a wire clamp on a hose and the trigger arm being actuated;
[0018] FIG. **11***a* is a wire with a closed loop;
[0019] FIG. **11***b* is a wire with a bight and two free ends;
[0020] FIG. **11***c* is the wire of FIG. **11***b* showing the free ends twisted together to create a wire loop having a particular length to accommodate the hose or pipe being clamped;
[0021] FIG. **12** shows a wire that is looped through the bight end; and
[0022] FIG. **13** is a block diagram depicting the steps to accomplish the method of the present invention according to several embodiments.

DETAILED DESCRIPTION

[0023] Referring now to FIG. **1**, a side view of tension wire clamp tool **10** is shown. Housing **20** and housing handle **22** form one piece. Housing **20** is a hollowed out rectangular shape that has an open top and bottom so that rod **54** and spring assembly **36** (see FIG. **2**) are visible, while housing handle **22** extends vertically downward from the back end of housing **20**. It is fully envisioned that in other embodiments that the top and bottom ends of housing **20** are closed off. On the front end **11** of tension wire clamp tool **10**, housing **20** is also constructed with a housing bridge **24** that connects the front end of housing **20** to housing arm **59**. The housing arm **59** includes a convexity **84** to provide additional grip comfort for a user.
[0024] Trigger arm **30** is attached to the housing **20** by housing stud **32** and trigger stud **34**. Both of these studs are screwed in on one side of the top of housing handle **22** and secured by a nut (not shown) on the opposite side of housing **20**. Using this method of attachment allows trigger arm **30** to rotate freely about housing stud **32** in a bidirectional way; depending on whether a user compresses trigger arm **30** or releases it back to its resting position. The open position is when the trigger arm **30** is the farthest from the housing arm **22** as currently shown in FIG. **1**. Trigger arm can also be designed to include divots **82** which will provide additional grip support for a user while also increasing the comfort of trigger handle **30**.
[0025] Rod **54** extends all the way through both the front and back end of housing **20** entering at front aperture **26** and exiting at aft aperture **28**. The front end **55** of rod **54** has a wire groove **56** which is sized to accommodate wires of different sizes. The portion of rod **54** that runs through housing **20**, is encased by spring assembly **36** (shown in FIG. **2**) before it extends out the back end of housing **20**. Once rod **54** is outside of housing **20**, it passes through release spring **64** and release handle **60** on the back end **13** of tension wire clamp tool **10**. The purpose of release handle **60** is to allow a user to compress it in direction **80** (shown in FIG. **5**) and slide rod **54** back to its starting position after successfully clamping on a wire. Spring assembly **36** (see FIG. **2**) is what provides the axial force to rod **54** so that it tightens the wire when a user compresses trigger handle **30**.

Every time a user compresses trigger handle **30**, rod **54** is prevented from moving back to its original position by latch stop **68**, which does not release rod **54** until release tab **60** is compressed in direction **80** by a user.

[0026] Referring now to FIG. **2**, a cutaway view of housing **20** is shown to better illustrate the different components that make up spring assembly **36**, which is made up of push spring **48**, push wall **40**, and push wall stopper **46**. Push spring **48** is coiled around rod **54** and extends from the inner front end **21** of housing **20** to the push wall **40**. Push wall **40** is positioned at the back end **49** of push spring **48** and has push wall aperture **44**, illustrated by the dotted line, that rod **54** runs through.

[0027] In a preferred embodiment, push wall **40** is a rectangular shape that is larger than the diameter of the push spring **48** so that push wall **40** compresses spring **48** when a user squeezes trigger arm **30**. However, it is fully envisioned that push wall **40** can come in a variety of different shapes, such as a circle. Push wall **40** has a foot **42** that extends from push wall **40** and is secured to trigger arm **30** by trigger stud **34**. On the opposite side of push wall **40** from back end **49** is push wall stopper **46**, which prevents push wall **40** and trigger arm **30** from moving too far in the wrong direction when trigger handle **30** is no longer engaged by a user. In this embodiment, push wall stopper **46** is cylindrically shaped and encases rod **54**; however, it is full envisioned that push wall stopper **46** can be any other shape that performs substantially the same way.

[0028] Referring now to FIG. **3**, a top view of tension wire clamp tool **10** prior to using wire **14** is shown. In this embodiment, the top of tension wire clamp tool **10** is open so that a user can easily view the entirety of spring assembly **36**. This view also clearly shows rod **54** running the entire length of tension wire clamp tool **10** and protruding out of either end of the tension wire clamp tool. At the front end tension wire clamp tool **10**, post **50**, first score **52***a*, and second score **52***b* are shown; while at the back end curb **62** is shown.

[0029] Post **50** that is a threaded rod that protrudes at a predetermined angle away from the top of housing **20**. The angle and threading of post **50** is what helps temporarily anchor wire **14** (shown in FIG. **8**) while it is being clamped around a hose **12** (shown in FIG. **8**). It is fully envisioned that post **50** can be fully vertical, at different angles, or be a rod without threading.

[0030] On either side of post **50** is first score **52***a* and second score **52***b*. These two scores act as tracks that guide the wire from post **50** to rod **54**, specifically to wire groove **56** on frond end **55** of rod **54**. Both first score **52***a* and second score **52***b* are tapered so that the top of the score is wider than the bottom. This feature will allow a user to use a wide variety of different wires that come in different sizes and thickness due to this design feature of tension wire clamp tool **10**.

[0031] Referring now to FIG. **4**, a front view of tension wire clamp tool **10** is shown. This view better illustrates the shape of first score **52***a* and second score **52***b*. Post **50** is also shown extending at an angle away from the front end **11** (compare to FIG. **1**) of tension wire clamp tool **10**. Another important feature of this view is that wire groove **56** at the front end of rod **54** is shown. Wire groove **56** runs vertically so that wire **14** (see FIG. **8**), which runs perpendicular to wire groove **56**, can neatly fit inside and be secured in groove **56** while a user is clamping wire **14** onto hose **12** (see FIG. **8**).

[0032] Referring now to FIG. **5**, a side view of the back end **13** (compare to FIG. **1**) of tension wire clamp tool **10** is shown. Specifically, release tab **60**, release spring **64**, and curb **62** are shown, and they are what allow a user to release rod **54** once wire **14** (see FIG. **8**) is fully clamped onto hose **12** (see FIG. **8**). As a user repeatedly engages trigger handle **30**, rod **54** will advance along direction **76**. However, once wire **14** (see FIG. **8**) is securely clamped on a hose or pipe **12** (see FIG. **8**), a user can release rod **54** by compressing release tab **60** so that is moves along direction **80**. Specifically, as release tab **60** rotates along direction **80**, curb **62** anchors the upper end of release tab **60** to compress spring **64** to decrease contact between rod **54** and release tab **60**, which in turn, allows a user to move rod **54** along direction **76** back into its original position.

[0033] Referring now to FIGS. **6** and **7**, tension wire clamp tool **10** is shown in the open and closed

position respectively. In FIG. **6**, tool **10** is shown in the "open" position that has rod **54** in its initial retracted position as well as trigger handle **30** in its resting position as well. When a user starts to use tension wire clamp tool **10**, they will grip both trigger handle **30** and housing arm **22**. Trigger handle **30**, when compressed by a user, will move along direction **72** and this movement will force rod **54** to move along direction **74**. FIG. **7** shows trigger arm **30** fully compressed and touching housing arm **22**. Once a user stops applying a compressive force and releases trigger arm **30**, it will return to the initial position shown in FIG. **6**. As a user repeatedly engages and disengages trigger arm **30**, rod **54** will continue to move along direction **74** until wire **14** tightens between groove **56** and post **50** and is firmly secured onto hose **12**.

[0034] Referring now to FIGS. **8**-**10**, tension wire clamp tool **10** is shown in the open and closed position to illustrate the process of wire **14** being clamped onto hose **12**. In FIG. **8**, wire **14** is shown positioned in wire groove **56**. Wire **14** is also shown encircling hose **12** and wrapped around post **50**, so that wire **14** is anchored at one side while a user clamps the other side down. As wire **14** becomes tight, wire **14** will sit further into scores **52** to prevent wire **14** from moving or slipping on housing **20** as more tension is created. The user can then repeatedly squeeze trigger arm **30** in order to move rod **54** forward in direction **74** until the user has reached a desired level of tautness in wire **14** as shown in FIG. **9**. In FIG. **10**, a close-up view of wire **14** being clamped onto hose **12** is shown. Once wire **14** is sufficiently tight, tool **10** is rotated in direction **99** to create an angle in wire **14** where it passes through loop **92** to prevent the wire clamp from releasing its tension around the hose or pipe.

[0035] Referring now to FIGS. **11** and **12**, the different wires and how they can be looped around a hose **12** prior to being clamped down are shown. It is fully envisioned that many different types of wire can be used in conjunction with tension wire clamp tool **10**. One type of wire clamp, as shown in FIG. **11***a*, is closed loop wire **90** having a first loop end **92** for positioning in groove **56**, and a second loop end **94** for positioning over post **50**. It is to be appreciated that loop wire can have any length necessary to encircle a pipe, hose, cable, or any other item in which a tight circular band would secure.

[0036] FIG. **11***b* shows an alternative embodiment of an open-ended wire **96** that has a bight **97** and two free ends **98***a* and **98***b*. The two free ends **98***a* and **98***b* can be twisted together as **98***c* (shown in FIG. **12***b*) to create a loop of a desired size.

[0037] FIG. **12***a* illustrates the process of pre-installing a loop wire **90** onto a hose **12**. The first end **92** is positioned into wire groove **56** of rod **54** (see FIGS. **8**-**9**) and second end encircles the hose and extend between the groove **56** and the post **50** (see FIGS. **8**-**9**). Loop wires **90** can come in different sizes to accommodate clamping hoses, pipes or cables having differing diameters.

[0038] FIG. **12***b* shows how an open-ended wire **96** is installed onto a hose **12**. The two free ends **98***a* and **98***b* are strung below the bight end such that a loop **99** is formed over a hose **12**. The bight end **97** is positioned into wire groove **56** of rod **54** (see FIGS. **8**-**9**) and free ends **98***a* and **98***b* are twisted **98***c* to form a wire clamp of the desired length to encircle the hose and extend between the groove **56** and the post **50** (see FIGS. **8**-**9**).

[0039] Referring now to FIG. **13**, a flow diagram detailing the steps for a user to follow when using tension wire clamp tool **10** is shown, and generally designated process **100**. At step **102**, a user will stage wire **14** onto hose **12** by wrapping wire **14** around hose **12** as described above. Next, in step **104**, the user will position wire **14** into wire groove **56** on rod **54** and then immediately proceed to step **106**, and loop wire **14** around post **50** so that wire **14** encircles hose **12**. Next, the user will move to step **108** and nest wire **14** into scores **52***a* and **52***b*. Then at step **110** a user will begin repeatedly engaging trigger arm **30** so that rod **54** is propelled forward to create tension in wire **14** to securely clamp wire **14** onto hose **12** at step **112**. Once the user has determined that an appropriate level of tension has been reached, then the user will move to the last step at step **114** and angle tool **10** to form a bend in wire **14** to secure wire **14** around hose **12**. Finally, in step **116**, the user releases rod **54** and remove wire **14** from groove **56** of rod **54** and post **50**.

[0040] While what has been shown is presently considered to be the preferred embodiments of the present invention, it will be apparent to those skilled in the art that various changes and modifications can be made herein without departing from the scope and spirit of the invention.

Claims

1. A tension wire clamp tool comprising: a hollow housing unit that has a top side, a bottom side, a front end, and a back end; a housing arm that extends down from said bottom side of said housing unit; a spring assembly that is installed within said housing unit; a trigger arm that is pivotally connected to the top of said housing arm wherein said trigger arm is also connected to said spring assembly, a rod that runs through both said proximal end and said distal end of said housing; a tab mounted on the distal end of said housing unit; and a post that is mounted onto said top side of said housing unit.
2. The tension wire clamp of claim 1, wherein said rod has a groove at the front end that is sized to receive wires of different sizes.
3. The tension wire clamp of claim 2, wherein said housing unit has scores on the right side and left side of said housing unit.
4. The tension wire clamp of claim 3, wherein said post is set at a predetermined angle.
5. The tension wire clamp of claim 4, wherein the spring assembly further comprises a push spring, and a push wall.
6. The tension wire clamp of claim 5, wherein the tab further comprises a release spring and a curb located on the top of said tab.
7. A method for clamping a wire, said method comprising the steps of: staging a wire on a hose; seating said wire in a groove, said groove being formed on a rod wherein said rod extends through a housing; looping said wire around a post, said post being embedded in said housing; nesting said wire in at least two scores, said at least two scores formed on said housing; propelling said rod toward said wire by actuating a trigger arm wherein said trigger arm is connected to said housing; clamping said wire to said hose; and releasing said rod and said post from said wire.
8. The method for clamping a wire of claim 7, wherein said clamping step is accomplished by repeatedly actuating said trigger arm until said wire is taut.
9. The method for clamping a wire of claim 7, wherein said looping step is engaged by wrapping at least one end of a two-end wire around said post.
10. The method for clamping a wire of claim 7, wherein said looping step is accomplished by placing one end of a closed loop wire around said post.
11. The method for clamping a wire of claim 7, wherein said propelling step is accomplished by compressing a spring against said housing wall with said trigger arm.
12. The method for clamping a wire of claim 7, wherein said releasing step is accomplished by pressing on a latch to permit the rod to slide freely through the housing, said latch being connected to said housing.