May 22, 1951 S. T. WILLIAMS 2,554,477

HOSE CLAMP TOOL

Filed Nov. 13, 1946

Fig. 1.

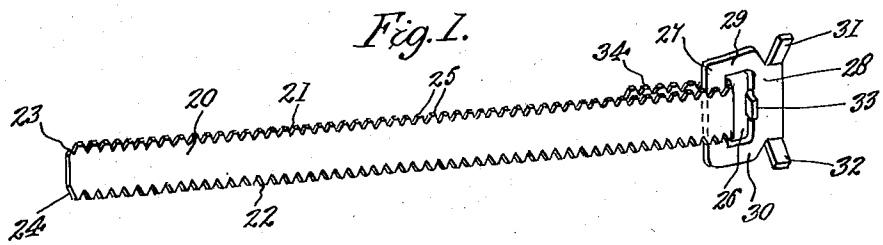


Fig. 2.

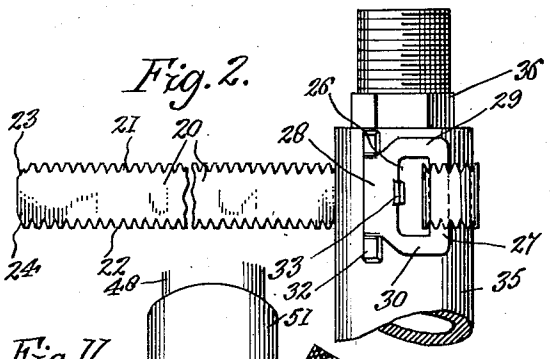


Fig. 3.

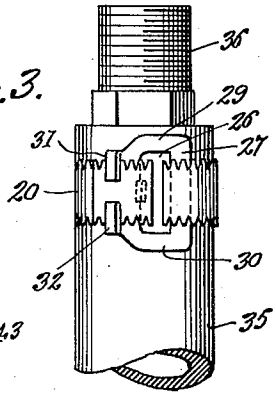


Fig. 10.

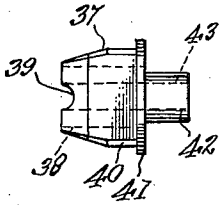


Fig. 11.

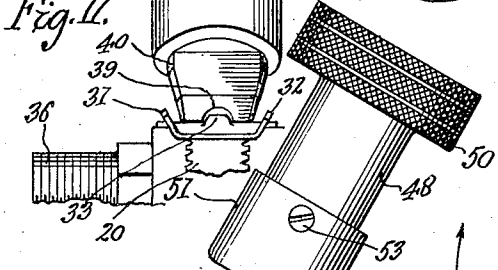


Fig. 5.

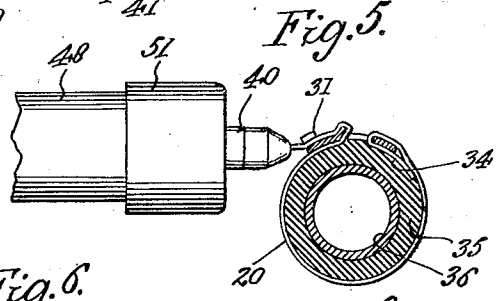


Fig. 4.

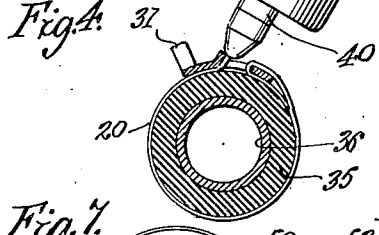


Fig. 6.

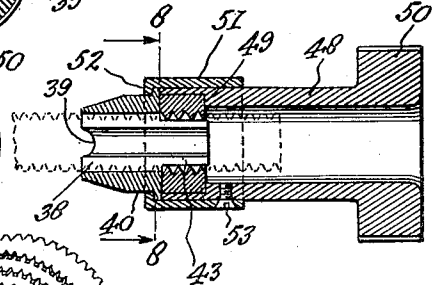


Fig. 8.

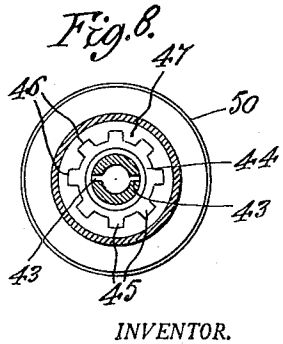


Fig. 7.

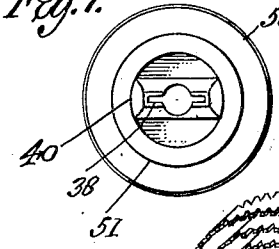


Fig. 9.



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HOSE CLAMP TOOL

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5 Claims. (Cl. 81—9.3)

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The present invention relations to improvements in hose clamp tool, and in one aspect an object of the invention is to provide an improved hose clamp strap or band per se in which such band has predominant qualities of cooperating with the hose to the end of avoiding axial sliding or displacement of the band or strap with reference to such hose and also to enable the strap to cooperate with the buckle of the hose clamp in a novel manner with new and advantageous results.

Another object of the invention is to improve the buckle per se in order that it may cooperate in a novel and newly advantageous manner with a strap of conventional form and particularly with a strap such as herein described and claimed.

A further object of the invention is to provide an improved tool for cooperating with the buckle and functioning to draw the strap tightly about the hose and to subsequently function to perform certain steps of the method by which the installation and assembly is improved.

A still further object of the invention is to provide an improved method for installing and assembling the hose clamp to the hose in which the steps are simple, few and direct for accomplishing the end intended, and wherein such steps leave their effects upon the permanent hose clamp assembly in that the steps of the method are identified with the particular and peculiar construction of the strap and with the particular and peculiar construction of the buckle and with the particular and peculiar construction of the tool, all to the end that the assembly may take place quickly and economically and produce a hose clamp coupling having superior qualities and characteristics as hereinafter more fully described.

With the foregoing and other objects in view the invention will be more fully described hereinafter and will be more fully pointed out in the appended claims.

In the drawings in which like parts are denoted by similar reference characters throughout the several views,

Figure 1 is a perspective view of an improved hose coupling constructed in accordance with the present invention and with the parts in an initial step of the method.

Figure 2 is a fragmentary plan view of the nipple and associated hose with the buckle and strap of the improved hose clamp partially engaged therewith and representing an intermediate step of the improved method.

Figure 3 is a view similar to Figure 2 with the hose clamp completely assembled to the hose.

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Figure 4 is a transverse section taken through the hose, nipple and hose clamp with the improved tool in an initial position of operation.

Figure 5 is a view similar to Figure 4 with the tool partly broken away and shown in a subsequent position according to the improved method.

Figure 6 is a longitudinal sectional view taken through the improved tool and showing the serrated clamp strap or band in broken lines to indicate its association therewith.

Figure 7 is an end elevational view of the improved tool taken from the jaw end which is the left end of Figure 6.

Figure 8 is a transverse section taken on the line 8—8 of Figure 6.

Figure 9 is a perspective view of a roll of strip stock in a prefabricated condition from which suitable length sections may be cut off for use as hose straps.

Figure 10 is a plan view of a form of jaw employed.

Figure 11 is a fragmentary front elevational view of the tool and hose clamp taken from the left in Figure 4.

Referring more particularly to the drawings 20 designates the hose encircling band or strap which is made of thin flat metal and 21 and 22 are serrated edges of such band or strap 20, the teeth thus produced progressing from side to side of the band in conformity with the helix of the screw thread.

In Figure 9 the stock strip out of which the hose clamp bands are cut is shown in a roll as being of indeterminate length and as being prefabricated with the teeth 21 and 22. It will be noted that this strip is uniform in width from end to end and that the teeth 21 and 22 are continuous throughout the length of the stock strip as they must necessarily be of the hose straps cut from such stock strip.

At one end of the severed strap the same is cut diagonally as to the corners thereof to produce the tapering end 23 and 24 which will assist in entering this end of the strap, hereinafter called the final end, into the tool as hereinafter described. The teeth 21 and 22 naturally have outwardly convergent walls but these walls are preferably not permitted to come to points but the apexes are truncated and flat outer walls 25 produced.

In the improved buckle a cross slot 26 is disposed between the free bar 27, the clamp bar 28 and the end bars 29 and 30. The buckle is given a curvature as indicated in Figures 4 and 5 to conform generally to that of the external surface

of the hose to which it is to be applied and the outer surface, radially speaking, of the clamp bar 28 carries at the sides thereof and preferably integral therewith locking lugs 31 and 32 which are initially in an open position shown in Figure 1 but adapted to be clinched over on the outside surface of such locking bar 28. It will be noted, particularly from Figure 1, that the end portion of the locking bar 28, that is the portion more remote from the slot 26, is reduced in transverse width over the buckle at the bars 29, 30 and that this reduced width carries the locking lugs 31 and 32 to better embrace the strap 20 as hereinafter described. Upon the inner edge of the clamp bar 28 outstands an abutment lug 33 which has several functions as hereinafter explained. The abutment lug occupies preferably a substantial central position of the buckle and lies on the central line between the locking lugs 31 and 32.

As shown in Figure 1 an initial end of the strap 20 may be first entered radially inwardly through the buckle strap 29 and underlapped beneath the free bar 27 and under a considerable length of the circular band portion of the strap 20. This band 20 encircles the hose 35 which is flexible or resilient and has the effect to bind the same to a nipple or other coupling member 36.

The improved tool has a jaw 37 shown more particularly in Figure 10 which is flattened at its outer portion where it is provided with a narrow axial slot 38 of a size to slidably receive therethrough the strap 20. The nose of the jaw is tapered and provided with cut-outs 39 in register at opposite sides of the center portion of the slot 38, either of such cut-outs being adapted to receive the outside abutment lug 33 of the buckle while the end of the nose is adapted to rest against the inner edge of the clamp bar 28 of the buckle. The inner end of the jaw has arcuate bearing surfaces 40 just outwardly of an outstanding circular flange 41. A tail piece cylinder 42 projects inwardly from the flange 41 and has diametrically opposed slots 43 for slidably receiving therethrough the strap 20, it being understood that the external diameter of the cylinder 42 is substantially that of the band 20 minus the toothed edges 21 and 22 which therefore project beyond the cylinder 42 at both sides to be meshed in the internal threads of the nut 44. The slot 43 is the extension of the slot 38.

As best seen in Figure 8 radial projections 45 of the nut 44 are received in the radial sockets 46 of the socketed or broached end 47 of the tool handle 48. This tool handle is tubular to receive therethrough the serrated strap 20. The nut 44 is pushed in the broached socket 47 until it strikes a shoulder 49. A milled circular enlarged head 50 is mounted on the handle 48 for convenience in rotating the same.

An end cap 51 is removably mounted over the socketed end 47 of the tool handle 48 and has an inturned flange 52 adapted to rotate on the arcuate bearings 40 of the jaw while confining the flange 41 in place. The end cap 51 may be held removably to the handle 48 in any desired way for instance by the set screw 53.

In the use of the hose clamp and tool and in the practice of the method, the first step is to cut a suitable length of strip from the rolled or other stock and trim the edges at 23 and 24 at the final end of the resulting strap 20.

The second step is to assemble the strap 20 to the buckle in the association illustrated in Figure 1 in which the other end of the strap 20, which we will call the initial end, is passed over

the outside of the free bar 27, the terminal end of the strap being inserted radially through the buckle slot 26 and the free end inturned or lapped upon itself to extend across the inside surface of the free bar 27 and along a length of the circle of the strap 20.

The third step is shown in Figure 2 in which the buckle is applied to a selected segment of the circle of the hose 35 with the underlap 34 against the flexible and resilient outer wall of the hose 35, the strap 20 being then caused to encircle the hose with the free tapered final end of the strap inserted beneath the clamp bar 28 of the buckle and thence radially outward through the buckle slot 26 in the manner shown in Figure 4. The length of the strap 20 will be such as to leave an appropriate margin of this strap, for instance as indicated in chain lines in Figure 6 to pass through the jaw 37 and to engage with the threads of the nut 44. The tool is adjusted to a position as indicated in Figure 4 and the uppermost cut-out 39 interfitted with the outstanding abutment lug 33. This cooperation between the buckle lug 33 and the cut-out 39 has several functions. In the first place the lug and cut-out center the tool with reference to the buckle and particularly with reference to the longitudinal center line of the strap 20 to enable the strap to be forcibly pulled through the tool in correct alignment. As a second function an interlock is created between the cut-out 39 and abutment lug 33 which will prevent any strains to which the tool is subjected from dislocating the tool from its correct position of alignment. Also the cut-out 39 in the third functional aspect permits the end walls of the jaw above the narrow slot 38 (see Figures 4 and 7) to abut against the inner edge of the clamp bar 28 adjacent the slot 26 and thus gives to the jaw sufficient abutment purchase against the buckle to compensate for the strain of pulling the strap tightly around the hose and through the buckle.

Fourthly the cut-outs 39 enable the tool to be adjusted angularly about its axis on the lug 33 without disturbing the interlocking association.

The two cut-outs in the opposite sides of the nose of the jaw 37 are for the purpose of eliminating any necessity for selecting a certain side of the jaw to bring it uppermost in the position indicated in Figure 4. In other words the jaw may be at random threaded on the final end of the strap 20 which projects radially out of the buckle without regard to which side of the jaw 37 is presented to the abutment lug 33.

After the final end of the strap 20 has been initially threaded into the jaw and engaged with the threads of the nut 44, the handle 50 may be rotated, entraining the nut 44 to rotate therewith in a direction to feed the strap end through the nut and hollow handle 48. An additional function of the complementary association of the lug 33 and cut-out 39 is that the same assists to prevent the rotation of the jaw 37. This rotation is of course also opposed by the engagement of the flat strap 20 in the narrow slot 38 of such jaw 37.

It is necessary of course that the jaw and strap 20 be held stationary while the nut 44 rotates and through the threads and teeth 21 and 22 acts to feed the strap through the hollow handle 48 when the same is rotated in one sense.

The next step is to rotate the handle 50 with the tool in the position substantially as shown in Figure 4 until the strap 20 has been constricted with the necessary pressure about the hose.

The tool is then rotated about the abutment

lug 33 as a center in a counterclockwise direction from the position of Figure 4 to that substantially of Figure 5 and during this step the handle 50 and nut 44 are gradually rotated in the reverse direction to enable the jaw and the tool to back off the strap 20 to the degree indicated in Figure 5. In other words the tool is rotated so as to cause the strap 20 to move across and down over the abutment lug 33. In the initial stage of this operation the conformation of the upper cut-out 39 is of importance. While this cut-out 39 has all of the functions heretofore attributed to it so far as its operation with the abutment lug 33 is concerned, it also opens at all times the outer surface of the final end of the strap 20 to the inner surface of the lug so that it becomes easy to cant or tilt the tool toward the left from the position shown in Figure 4 whereby to wrap the strap at this point around three sides of the lug. During this operation or subsequently the tool may be payed out along the overturned end of the strap and by further rotary movement of the tool the final overturned end of the strap may be brought down flush against the outer surface of the clamping bar 23.

The next step is to bend down or hammer down the locking lugs 31 and 32 upon this overturned exposed final end of the strap 20.

The final step consists in swinging the tool back and forth until the strap breaks just beyond the clinched locking lugs 31 and 32.

This form of strap and buckle assembly is of the order of a permanent assembly, as shown in Figure 3, and cannot be removed without breaking the strap. In other words the hose clamp is ordinarily not reuseable, at least so far as both elements are concerned. The remnant end of the strap may be discharged from the tool by suitable rotary motion of the nut while the flat jaw 37 is held against motion and such remnant end discarded. The original cut length of the strap 20 may be such with relation to the circumference of the hose that very little loss will be entailed through such discarded ends.

In the final position of the hose clamp, the abutment lug 33 compels the formation of a bight in the overturned end of the strap and cooperates with the locking lugs 31 and 32 to bind the strap tightly against slippage which might possibly be induced through the tendency of the resilient hose 35 to expand. The relative positions and proximity of the parts 31, 32 and 33 contribute to an extremely strong lock or clamp.

Another aspect of the invention lies in the strap or band 20 irrespective of whether the teeth 21 and 22 along its side edges are members of a helical thread. Teeth of this character have flattened outer edges 25 which provide two prongs acting in relatively divergent directions which do not penetrate the rubber of the hose 35 as would pointed teeth shaped to a single point by the continuation of the outwardly convergent side walls of the teeth but such outer corner prongs acting in divergent relations settle into the resilient and flexible outer body surface of the hose when the strap is constricted so as to displace portions of such hose included within the strap and which constriction is attended with bulges in an outward radial direction of the masses of the hose adjacent both edges of the strap. Therefore the conformation of the edges will resist axial creeping of the hose clamp on the hose and its dislocation from its originally set position which might be attended with leakage and loosening.

In the case of the underlap 34, such condition

is enhanced as it is driven deeper and more forcibly into the body of the hose by the action of the superposed part of the strap 20 and of the free bar 27 of the buckle. Such condition also causes the underlap 34 to become firmly anchored so as to resist all pressure of slipping when great constrictive pressure is put upon the final end of the band of the special tool.

While I have described only one embodiment of which the hose clamp and tool are susceptible, those embodiments being the best known to me at the present time, it will be understood that such inventions are susceptible of a great many mechanical forms and I reserve the right to make such changes and modifications herein as may come within the scope of the following claims.

What is claimed is:

1. An improved tool for forcibly pulling the free end of a hose clamp strap through a buckle in which the buckle has an abutment and the strap has teeth along its edges arranged in conformity with the helix of a screw thread, comprising a tubular handle, a substantially flat jaw having a slot therethrough to slidably receive said handle for also permitting the passage of the strap, a nut having internal threads carried fixedly by said tubular handle to rotate therewith and adapted to be engaged with the teeth of the strap, said jaw having means to engage the abutment of the buckle for leverage purposes to center the tool to the work, said jaw having an outwardly extending flange and a substantially cylindrical bearing surface adjacent thereto, and an end cap having a flange for rotatably engaging the circular bearing surface and for confining said jaw flange against the end of the tubular handle, said end cap fitting over and secured to said tubular handle.

2. A device for tightening a band about a cylindrical object and wherein the band is provided with screw teeth on its opposite edges, said device comprising a guide member having an axial slot through which said band is drawn, an axial cylindrical extension on said guide member of a diameter less than the width across the band and included teeth, a nut member surrounding said extension and having threads complemental to the teeth of said band, a sleeve surrounding said guide member and nut member and serving to swivelly hold said guide and nut members together as a unit, and an operating means connected to said nut member and having a handle portion exterior of said sleeve.

3. A device as claimed in claim 2 wherein the nut member is provided with exterior projections receivable within complemental recesses in said sleeve for permitting the sliding of the sleeve axially over the nut and for compelling rotation of the nut upon rotation of the sleeve.

4. A device as claimed in claim 2 wherein said operating means is a tubular handle having a knurled raised end portion.

5. A device as claimed in claim 2 wherein said sleeve and operating means are held in operative engagement against relative axial movement by a set screw passing through the sleeve and seating in the operating means.

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