

APPARATUS FOR CRIMPING A TUBULAR FITTING

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This invention relates in general to devices for crimping fittings onto the ends of hoses and particularly, although not exclusively to a self-contained, portable collet crimping apparatus.

The collet crimping machine is a well known device
10 which is adapted to secure a cylindrical end portion of a metallic fitting onto an end of a high pressure hydraulic hose. Initially, the end portion of the fitting is formed having an inner diameter which is slightly larger than the
15 outer diameter of the hose, permitting the end of the hose to be loosely inserted therein. Then, the end of the hose and the fitting are inserted within the collet crimping machine. When the collet crimping machine is actuated, the fitting is crimped so as to permanently deform the tubular end portion thereof about the end of the hose.

20 To accomplish this, a typical collet crimping machine is provided with a hydraulic actuator which is adapted to engage a contractable die assembly. The hydraulic actuator includes a cylinder having a piston slidably disposed therein. When pressurized hydraulic fluid is supplied to
25 the interior of the cylinder, the piston is moved from a first position to a second position. The die assembly typically includes a die ring having a tapered inner surface and a plurality of collet segments disposed within the die ring. A spacer or pusher is disposed between the
30 piston of the hydraulic actuator and the collet segments. Thus, when the piston is moved to the second position, the pusher is moved to engage and move the collet segments. Because of their engagement with the tapered inner surface of the die ring, the collet segments are contracted

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inwardly toward one another, thereby crimping the fitting disposed therein about the hose.

Typically, the die assembly is removable from the collet crimping machine. This is done to permit the
5 installation and removal of collet segments of different sizes, which permit the collet crimping machine to crimp fittings of various sizes onto hoses of various sizes. To facilitate the installation and removal of the collet segments, it is known to provide a pusher which is
10 removable from the collet crimping machine. Such removable pushers provide convenient access to the die assembly when changing the collet segments. However, when these pusher are re-installed in the collet crimping machine, they must be carefully aligned between the piston and the die
15 assembly in order to function properly. This careful re-alignment has been found to be undesirably time consuming after each change of the collet segments. Also, although removable pushers are typically retained to the collet crimping machine in some manner, such as by a chain,
20 they have occasionally become separated therefrom and lost. Accordingly, it would be desirable to provide a collet crimping machine wherein the pusher is secured thereto, yet which is movable between extended and retracted positions to facilitate changing of the collet segments.

25 As mentioned above, the collet crimping machine typically includes a hydraulic actuator which is operated by the application of pressurized hydraulic fluid thereto. In a manufacturing situation, the collet crimping machine can be connected to any conventional external source of
- 30 pressurized fluid which is commonly available in the manufacturing environment. However, often it is necessary to repair fittings and hoses in the field, where a source of pressurized fluid is not readily available.

Accordingly, it would also be desirable to provide a collet
35 crimping machine having a self-contained source of

pressurized hydraulic fluid, thereby facilitating the use thereof in the field.

According to the present invention there is provided an apparatus for crimping a tubular fitting
5 onto the end of a hose comprising:

a die assembly adapted to be selectively engaged so as to crimp a tubular fitting onto the end of a hose;

a cylinder having a piston which is movable
10 between a first position and a second position;

a pusher; and

means for supporting the pusher for linear sliding movement relative to the piston between a retracted position, wherein the pusher is disposed between the
15 piston and the die assembly such that the piston can urge the pusher into engagement with the die assembly to crimp a tubular fitting onto the end of a hose when the piston is moved from the first position to the second position, and an extended position, wherein the
20 pusher is not disposed between the piston and the die assembly, such that the piston cannot urge the pusher into engagement with the die assembly to crimp a tubular fitting onto the end of a hose when the piston is moved from the first position to the second
25 position.

In a preferred embodiment, the apparatus comprises collet crimping apparatus which is self-contained and easily portable for use in the field. The apparatus includes a base having a hand-actuated hydraulic pump
30 assembly mounted thereon. A collet crimping machine is pivotably mounted on the base so as to be adjustable oriented at any desired angle. Means are provided for selectively retaining the collet crimping machine in a desired rotational position relative to the base. The
35 hydraulic pump assembly is connected to actuate the collet crimping machine. Thus, the collet crimping

machine has a self-contained source of pressurized hydraulic fluid, thereby facilitating the use thereof in the field where a source of pressurized fluid may not be readily available.

5 Preferably the pusher is secured to the machine to prevent loss, yet is slidably between extended and retracted positions. In the extended position, the pusher is disposed outwardly away from the collet crimping machine to permit easy replacement of a die
10 assembly. In the retracted position, the pusher is disposed within the collet crimping machine and precisely aligned with the other components thereof for use. The pusher may have an outwardly extending handle connected thereto to provide a convenient grasping
15 location for an operator to effect sliding movement of the pusher. Means may be provided for positively retaining the pusher in the retracted position for use.

For a better understanding of the present invention and to show more clearly how it may be
20 carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:-

Fig. 1 is an elevational view of the left side of an apparatus for crimping tubular fittings onto the end of a hose, wherein the pusher of the apparatus is shown
25 in an extended position.

Fig. 2 is an elevational view, partially broken away, of the front side of the apparatus shown in Fig. 1, wherein the pusher of the apparatus is shown in an extended position.

30 Fig. 3 is an elevational view of the right side of the apparatus shown in Fig. 1, wherein the pusher of the apparatus is shown in an extended position.

Fig. 4 is a side elevational view from the right of the apparatus similar to Fig. 3, wherein the pusher
35 of the apparatus is shown in a retracted position.

Fig. 5 is an enlarged side elevational view,

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partially in cross section, of the upper portion of the apparatus shown in Fig. 2.

Referring now to the drawings, there is

5 illustrated an apparatus for crimping tubular fittings comprising a portable collet crimping assembly, indicated generally at 10. The collet crimping assembly 10 includes a base plate 11 having upstanding left and right support brackets 12 and 13 secured

10 thereto, such as by welding. The left bracket 12 has an arcuate slot 12a formed therein for a purpose which will be explained below. A hydraulic pump assembly, indicated generally at 14, is also mounted on the base plate 11. The pump assembly 14 includes a fluid

15 reservoir 15, a cylinder 16 containing a movable piston (not shown), and a pivotable handle actuator 17. In operation, an operator may grasp and pivot the handle actuator 17 relative to the pump assembly 14 to cause movement of the piston within the cylinder 16,

thereby creating a flow of pressurized fluid from the fluid reservoir 15 to a flexible output conduit 18. The purpose for generating this flow of pressurized fluid will be explained below.

5 The collet crimping assembly 10 further includes a collet crimping machine, indicated generally at 20, which is pivotably mounted on the support brackets 12 and 13. The collet crimping machine 20 includes left and right side brackets 21 and 22 which are pivotably connected to the
10 left and right support plates 12 and 13, respectively, by pivot pins 21a and 22a. Thus, the collet crimping machine 20 is supported on the support brackets 21 and 22 for rotation about an axis which extends through the aligned pivot pins 21a and 22a. This axis of rotation is
15 preferably co-axially aligned with the center of gravity of the collet crimping machine 20. Thus, the collet crimping machine 20 pivots easily about the axis of rotation.

Means are provided for selectively retaining the collet crimping machine in a desired rotational position
20 relative to the base plate 11. In the illustrated embodiment, this means for selectively retaining includes a knob 20a having a threaded shank (not shown) extending outwardly therefrom. The threaded shank of the knob 20a extends through the arcuate slot 12a formed in the left
25 support plate into threaded engagement with a correspondingly threaded aperture (not shown) formed in the left side bracket 21. When tightened, the knob 20a causes the left support plate 12 to frictionally engage the left side bracket 21. As a result, the collet crimping machine
30 20 is prevented from rotating relative to the base plate 11. Upon loosening of the knob 20a, the collet crimping machine 20 may be rotated to a desired angular disposition relative to the base plate 11. The limits of such relative rotation are defined by the extent of the arcuate slot 12a,

inasmuch as the threaded shank of the knob 20a extends therethrough.

The upper ends of the side brackets 21 and 22 are connected to the opposed sides of a cylinder ring 23, such as by welding. As best shown in Fig. 5, the inner surface of the cylinder ring 23 is formed having an internal thread. This internally threaded surface of the cylinder ring 23 is cooperates with a lower externally threaded outer surface of a cylinder housing 24. A hydraulic fitting 25 is threaded into an aperture formed through the upper portion of the cylinder housing 24. The fitting 25 provides for fluid communication between the flexible conduit 18 of the pump assembly 14 and the interior of the cylinder housing 24. Thus, when the pump assembly 14 is actuated by movement of the handle actuator 17, pressurized hydraulic fluid is introduced into the upper end of the cylinder housing 24.

A piston 26 is disposed within the interior of the cylinder housing 24 for sliding movement. A conventional seal assembly 27 is provided in an outer circumferential groove formed in the piston 26. The seal assembly 27 provides a relatively fluid tight seal between the piston 26 and the inner surface of the cylinder housing 24, while permitting relative movement. When pressurized hydraulic fluid is introduced into the interior of the cylinder housing 24 as described above, the piston 26 is urged downwardly within the cylinder housing 24. A return spring 28 is provided for urging the piston 26 upwardly within the cylinder housing 24 when the pressurized fluid is removed therefrom. The return spring 28 is disposed within a counterbore 26a formed in the piston 26. The return spring 28 reacts against a retainer plate 29 which is secured to the lower end of the cylinder ring 23 by a plurality of threaded fasteners 29a.

A slide plate 30 is secured to the lower end of the piston 26 by a plurality of threaded fasteners (not shown). Thus, the slide plate 30 moves upwardly and downwardly with the piston 26 as described above. The slide plate 30 has an elongated slot 31 formed therethrough. Also, the slide plate 30 has a generally semi-spherical recess 32 formed in the lower surface thereof, adjacent to the slot 31. A pusher 33 is supported beneath the slide plate 30 for upward and downward movement therewith. To accomplish this, a slide flange 34 is disposed above the slide plate 30. The slide flange 34 includes an upper portion which is disposed adjacent (and is adapted to slide along) the upper surface of the slide plate 30. The slide flange 34 further includes a depending portion 34a which extends into the elongated slot 31 of the slide plate 30. The pusher 33 is connected to the slide flange 34 by one or more threaded fasteners 35, which also extend through the slot 31.

The slide plate 30 is only loosely engaged between the upper portion of the pusher 33 and the lower surface of the slide flange 34. Thus, the pusher 33, the slide flange 34, and the threaded fasteners 35 may be moved as a unit laterally relative to the slide plate 30 and the remainder of the collet crimping apparatus 10. The depending portion 34a of the slide flange 34 is provided to guide the slide flange 34 (and the pusher 33 secured thereto) for sliding movement along the slide plate 30. The limits of such lateral movement are defined by the engagement of such depending portion 34a with the ends of the elongated slot 30a formed through the slide plate 30.

Thus, the pusher 33 may be moved between an extended position (illustrated in Figs. 1 through 3) and a retracted position (illustrated in Figs. 4 and 5). In the extended position, the pusher 33 is disposed outwardly away from the piston 26. In the retracted position, the pusher 33 is disposed directly beneath the piston 26. A handle 36 is

connected to the pusher 33 for movement therewith. The handle 36 extends laterally outwardly from the collet crimping machine 20 and provides a convenient grasping location for an operator to effect sliding movement of the pusher 33. The purpose for mounting the pusher 33 on the collet crimping machine 20 in this manner will be explained below.

Means are provided for positively retaining the pusher 33 in the retracted position. In the illustrated embodiment, such means includes a stepped counterbore 33a formed in the upper surface of the pusher 33. A ball 37 and a spring 38 are disposed within the counterbore 33a. The spring 38 urges the ball 37 upwardly against the lower surface of the slide plate 30. When the pusher 33 is disposed in the retracted position, the ball 37 is urged by the spring 38 into the semi-spherical recess 32 formed in the lower surface of the slide plate 30. Thus, the pusher 33 is positively retained in the retracted position. Also, when the pusher 33 is moved from the extended position to the retracted position, the ball 37 snaps into engagement with the recess 32. This engagement provides a tactile indication to the operator that the pusher 33 is properly positioned for engagement by the piston 26, as will be explained below.

The collet crimping machine 20 further includes a die assembly, indicated generally at 40. The die assembly 40 includes a die ring 41 which is secured to the lower ends of the left and right support brackets 21 and 22, such as by welding. The inner surface of the die ring 41 is tapered, as shown at 41a in Fig. 2. A plurality of collet segments 43 are disposed in an annular array within the tapered inner surface 41a of the die ring 41. The die assembly 40 further includes a spacer ring 44 which is disposed above the collet segments 43. The spacer ring 44 is sized to be engaged by the lower end of the pusher 33

when the pump assembly 14 is actuated to move the piston 26, as described above.

As is known in the art, the die assembly 40 is provided to crimp a fitting onto the end of a hose. To
5 accomplish this, the hose having the fitting loosely carried thereon is inserted within the collet segments 43 of the die assembly 40. Then, the pump assembly 14 is actuated by movement of the handle actuator 17 so as to cause the piston 26 and the pusher 33 to moved downwardly
10 into engagement with the die assembly 40. Because of the cooperation of the collet segments 43 with the tapered inner surface 41a of the die ring 41, the fitting is crimped onto the end of the hose.

As described above, the collet crimping apparatus 10
15 is preferably adaptable for use in crimping fittings of various sizes onto hoses of various sizes. To accommodate these different sizes, a plurality of differently sized groups of collet segments 43 are provided for use with the die ring 41 and the spacer ring 44 of the die assembly 40.
20 These differently sized collet segments 43 permit the collet crimping machine 20 to be used with a number of differently sized fittings and hoses. Thus, it is important that the collet segments 43 and the spacer ring 44 be easily removable from the collet crimping machine 20
25 to facilitate change from size to size.

The slidable pusher 33 of this invention facilitates this changing of the collet segments 43. As described above, when in the extended position, the pusher 33 is disposed outwardly away from the piston 26. As a result,
30 easy access is provided to the collet segments 43 and the spacer ring 44. Thus, the set of collet segments 43 can quickly be removed and replaced with another set of collet segments of different size. When in the retracted position, the pusher 33 is disposed directly beneath the
35 piston 26 for use in the crimping operation. Throughout

this entire process, the pusher 33 remains secured to the collet crimping machine 20, thereby preventing the accidental loss thereof.

Because the pump assembly 14, the fluid reservoir 15, and the crimping machine 20 are all mounted on the base plate 11, it will be appreciated that the collet crimping apparatus 10 is a totally self-contained unit which is readily portable and easily adapted for use in the field. A generally L-shaped carrying handle 50 is provided for moving the collet crimping assembly 10 from location to location. The handle 50 is secured to a mounting plate 51, such as by welding. The mounting plate 51 is secured to the upper end of the left side bracket 21 of the collet crimping machine 20, such as by welding.

If desired, a conventional grip 54 may be mounted on the end of the handle 50. The grip 54 of the handle 50 is preferably located directly above the center of gravity of the collet crimping apparatus 10. As mentioned above, the collet crimping machine 20 is supported on the support brackets 21 and 22 for rotation about an axis which is preferably co-axially aligned with the center of gravity of the collet crimping machine 20. Thus, regardless of the angular orientation of the collet crimping machine 20, the handle 50 can be grasped to conveniently pick up and move the entire collet crimping apparatus 10 from location to location.

In operation, the portable collet crimping apparatus 10 can be transported to a desired location by means of the carrying handle 50. Once properly located, the angular disposition of the collet crimping machine 20 can be adjusted relative to the base plate 11 by loosening the knob 20a. The collet crimping machine 20 is rotated to a desired angular disposition, then the knob 20a is tightened to maintain it in that position. Next, the pusher 33 is moved to the extended position by pushing on the handle 36.

As a result, the pusher 33 and the slide flange 34 are moved relative to the slide plate 30 and the remainder of the components of the collet crimping assembly 10.

As described above, access to the collet segments 43 is permitted when the pusher 33 is in the extended position. Thus, while the pusher 33 is in the extended position, the appropriately sized collet segments 34 are inserted within the die ring 41, and the spacer ring 44 is replaced above the collet segments 34. Then, the handle 36 is grasped so as to move the pusher 33 from the extended position to the retracted position. As mentioned above, when the pusher 33 is moved from the extended position to the retracted position, the ball 37 snaps into engagement with the recess 32 to positively retain the pusher 33 therein and to provide a tactile indication to the operator.

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CLAIMS

1. Apparatus for crimping a tubular fitting onto the end of a hose comprising:

5 a die assembly adapted to be selectively engaged so as to crimp a tubular fitting onto the end of a hose;

a cylinder having a piston which is movable between a first position and a second position;

a pusher; and

10 means for supporting the pusher for linear sliding movement relative to the piston between a retracted position, wherein the pusher is disposed between the piston and the die assembly such that the piston can urge the pusher into engagement with the die assembly
15 to crimp a tubular fitting onto the end of a hose when the piston is moved from the first position to the second position, and an extended position, wherein the pusher is not disposed between the piston and the die assembly, such that the piston cannot urge the pusher
20 into engagement with the die assembly to crimp a tubular fitting onto the end of a hose when the piston is moved from the first position to the second position.

2. Apparatus as claimed in claim 1, wherein
25 movement of the piston between the first and second positions defines a first direction and wherein movement of the pusher between the retracted and extended positions defines a second direction, the second direction being generally transverse to the
30 first direction.

3. Apparatus as claimed in claim 1 or 2, further including means for retaining the pusher in the retracted position.

4. Apparatus as claimed in any one of the
35 preceding claims, wherein the means for supporting includes a slide plate secured to the piston and means



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for slidably supporting the pusher on the slide plate.

5. Apparatus as claimed in claim 4, wherein the means for slidably supporting includes a slot formed through the slide plate and means connected to the pusher and extending through the slot for slidably supporting the pusher on the slide plate.

6. Apparatus as claimed in claim 5, wherein the means connected to the pusher includes a slide flange disposed on a side of the slide plate opposite the pusher and means extending through the slot for connecting the slide plate to the pusher.

7. Apparatus as claimed in claim 6, wherein the means extending through the slot for connecting the slide plate to the pusher includes a threaded fastener.

8. Apparatus as claimed in claim 6 or 7, wherein the slide flange includes a portion which extends into the slot in the slide plate to guide the movement of the pusher between the retracted and extended positions.

9. Apparatus as claimed in any one of the preceding claims, wherein the means for slidably supporting also supports the pusher on the piston for movement therewith between the first and second positions.

10. Apparatus for securing a tubular fitting to the end of a hose, substantially as described herein with reference to, and as shown in, the accompanying drawings.