Sept. 10, 1963 W. W. HINZ ETAL 3,103,068

METHOD FOR INTERCONNECTING MALLEABLE TUBING AND FITTINGS THEREFOR

Filed Nov. 19, 1956 2 Sheets-Sheet 1

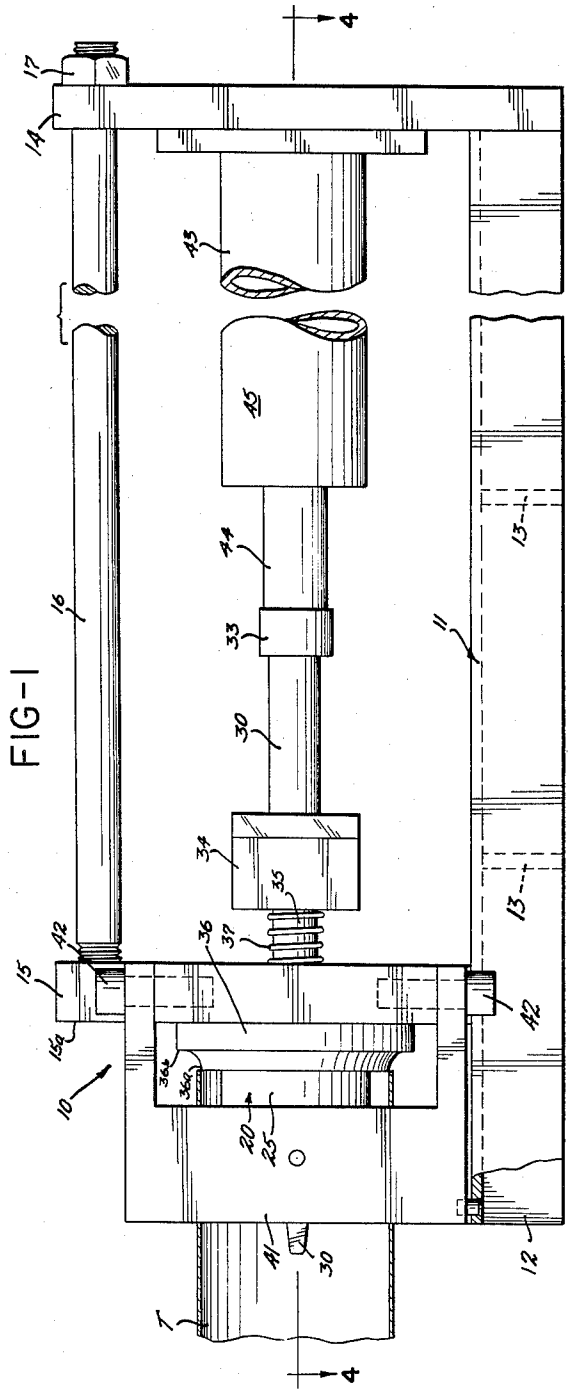


FIG-1

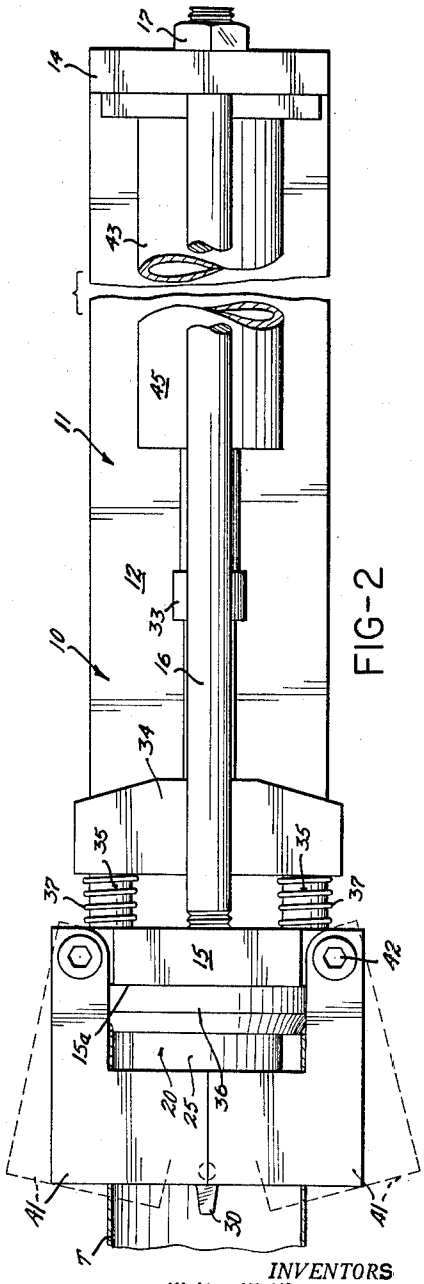


FIG-2

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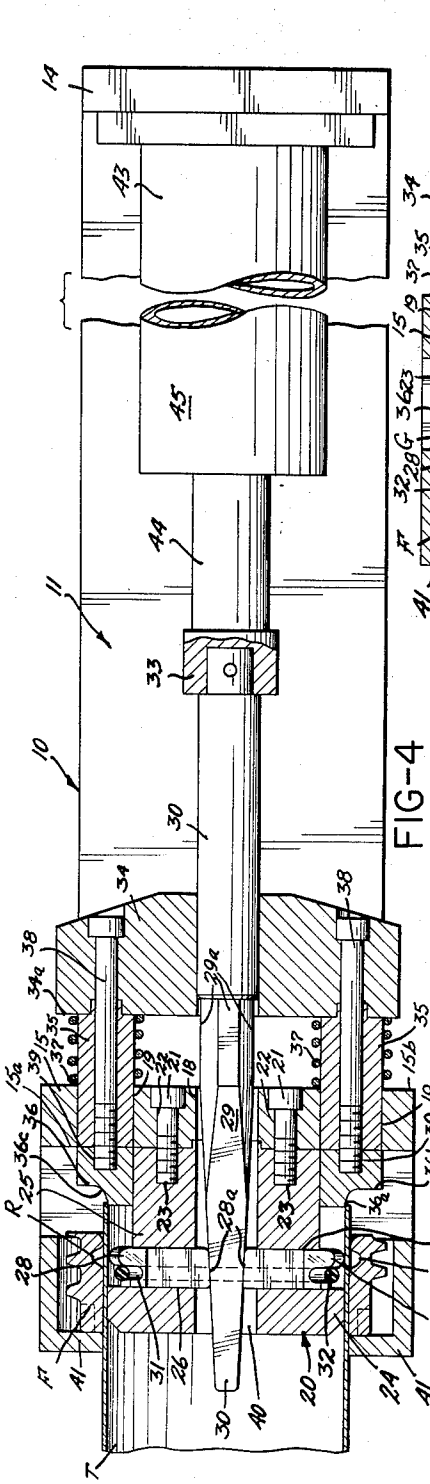


FIG-4

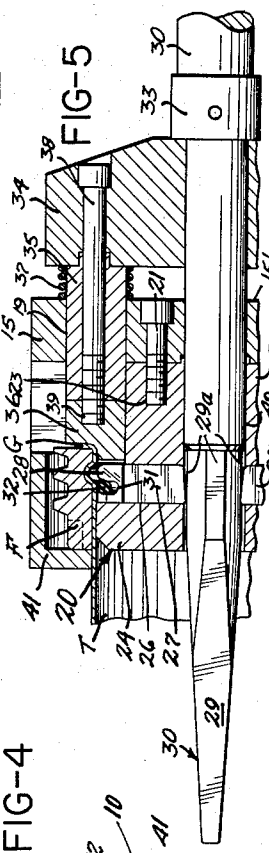


FIG-5

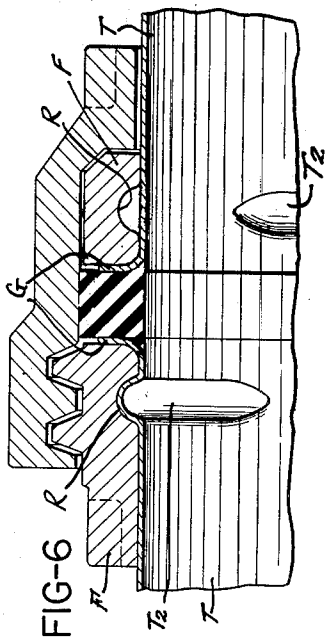


FIG-6

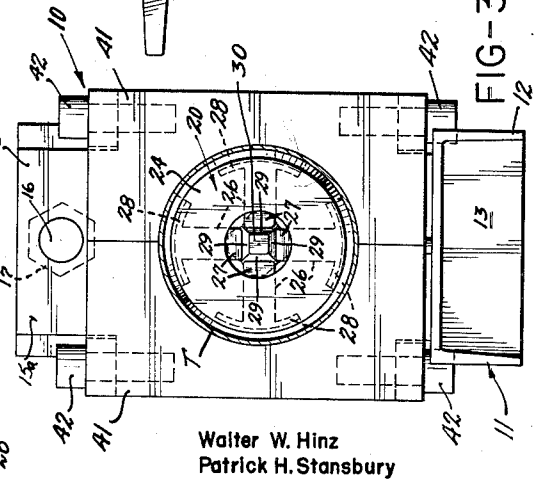


FIG-3

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METHOD FOR INTERCONNECTING MALLEABLE TUBING AND FITTINGS THEREFOR

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1 Claim. (Cl. 29—523)

The present invention resides in a method for interconnecting malleable tubing and fittings therefor by successive swaging steps and employing the action of one step to secure each tube against movement as a subsequent step is performed.

Heretofore it has been customary to apply fittings to tubing by one of several methods such as: by welding the fittings thereto; by impact swaging the tube to the fitting by means of a manually operated hammer; by pressing the fitting into or on the pipe under great pressure; by roll forming the tube to the fitting; and various combinations of the aforementioned methods. The time consumed in practicing the aforementioned methods and in some cases the expense of so doing, in addition to the machinery required, renders these methods undesirable.

The present invention seeks to overcome these several undesirable features and provides a method for interconnecting malleable tubing and fittings therefor with a minimum expenditure of time and money and also provides a method which contemplates the use of a relatively simple and inexpensive machine for accomplishing the desired objects.

Accompanying this specification are exemplifying drawings which disclose one physical embodiment of an apparatus adaptable to the practice of the method disclosed herein. It will be understood however that other devices and apparatus may be employed to practice the method disclosed herein and to result in the same function. It is therefore neither the desire nor intention of the inventors to limit the invention to be practiced only by the apparatus disclosed in the drawings, but it is our desire to secure to ourselves the claim, as appended hereto and forming a part hereof, limited only by the pertinent prior art.

In the accompanying drawings,

FIGURE 1 is a side elevation of the improved apparatus for interconnecting malleable tubing and fittings;

FIGURE 2 is a top plan view of the same;

FIGURE 3 is an end elevation at the leftward or head end of the apparatus as seen in FIGURES 1 and 2;

FIGURE 4 is a longitudinal horizontal cross section substantially at line 4—4 of FIGURE 1;

FIGURE 5 is a fragmentary horizontal cross section of the head portion showing the actuated position of the driving member; and,

FIGURE 6 is a fragmentary vertical cross section of fittings secured to the ends of contiguous tubes, the fitting elements being interconnected.

Referring now in greater detail to the drawings, we have indicated the apparatus for interconnecting malleable tubing and fittings therefor in its entirety by the numeral **10**. The apparatus includes a frame **11** having a longitudinally extending base member **12** which, as clearly seen in FIGURE 3, is made from a length of channel metal and has a plurality of laterally extending webs **13** secured therein to form a rigid inflexible base member **12**.

At the rearward or rightward end of the apparatus **10** as seen in FIGURE 1, we provide a rear stationary member **14** which is welded or otherwise secured to the base member **11** and extends in a vertical plane disposed at right angles to the longitudinal dimension of the base member **12**.

A front stationary member **15** is also secured to the

base member **12** spaced rearwardly from the extreme front end thereof, and the upper ends of the front and rear stationary members **15** and **14** are secured to each other by means of a tie-rod **16** which is threadedly engaged in the front member **15** and extends through an aperture in the rear member **14** where it is provided with a cooperating nut **17** and forms a rigid frame **11**.

As seen in FIGURE 4 of the drawing the front stationary member **15** is provided with a plurality of openings **18** and **19**—**19**. These openings constitute journals through which members are slidingly carried for rectilinear movement.

It will also be noted that the front stationary member **15** on its front face **15***a* carries a swaging head **20** secured by bolts **21** extending through bolt holes **22** formed through the front stationary member **15**, and said bolts **21** thread into internally threaded sockets **23** formed in the swaging head **20**. At its front or outer end the head **20** is provided with an annular flange **24** which is substantially the same size and circumference as the internal diameter of the tube T with which it is to cooperate to secure the fitting thereto. Therefore the tube fits over the flange **24** in close tolerance as shown.

Extending rearwardly from the annular flange **24** the head is provided with a reduced cylindrical extension **25** in which the internally threaded sockets **23** are formed. At the juncture of the annular flange **24** and the reduced cylindrical extension **25** the head is provided with radial ways **26** hereshown to be four ways disposed 90 degrees from each other but which obviously may be more or less as found desirable. These ways **26** contain pressure members **27** which have cross heads constituting swaging dies **28** at their outer ends. It is thus seen that the pressure members and swaging dies are disposed for movement radially of the head with the inner end faces **28***a* of each pressure member disposed to contact one cam face **29** of the driving member **30**. It is to be noticed that the swaging dies **28** of the pressure members **27** have relieved portions **31** adjacent to the swaging portions. Disposed in the relieved portions **31** we provide a resilient O ring **32** the resiliency of which urges the pressure members inwardly against the cam faces **20** of the driving member **30** to withdraw the swaging dies from the tube T after the swaging movement is completed and the driving member is withdrawn. Obviously, a coiled spring or other yieldable means may be employed to maintain the pressure members in their inward positions if desired.

It will be noted that the driving member cam faces **29** are somewhat pyramidal and terminate inwardly in axially parallel surfaces **29***a* so that during the initial forward movement of the driving member **30** the inner faces **28***a* of the pressure members **27** are contacted by the cam faces **29** and thus force the pressure members outwardly where the swaging dies swage the tube T into the recess R of the fitting F by forming depressions as shown at T2 of FIGURE 6 at spaced intervals about the circumference of the tube T. At the base of the pyramidal cam faces **29** the axially parallel faces **29***a* pass under the pressure member faces **28***a* and permit continued forward movement of the driving member **29** without imparting additional outward movement of the pressure member **27**.

Simultaneously with the terminal movement of the driving members **30** a stop collar **33** rigidly carried by the driving member **30** contacts the cross head **34** and carries the cross head **34** forwardly therewith. Extending from the front face **34***a* of the cross head **34** are guide bars **35** which are axially parallel to the axis of the driving member **30** and these guide bars **35** are journaled in the journals **19** of the front stationary member **15**, extend therethrough and have secured on their forward ends an annular flanging swage **36**. It will be noted that the compression springs **37** disposed between that front face **34***a*

of the cross head **34** and the rear face **15***b* of the front stationary member **15** encircle the guide bars **35** and bias of the cross head rearwardly to yieldably maintain the flanging swage **36** at its rearward position in face to face engagement with the front face **15***a* of the front stationary member **15**.

The flanging swage **36** is seen to have an annular forwardly projecting wall **36***a* and spaced rearwardly therefrom a radially extending flat wall or shoulder **36***b*, the walls being interconnected by an arc at **36***c* sufficient to cause forward movement of the flanging swage **36** to effect a radially extending flange G.

It is to be noted that the tube T and its cooperating fitting F are held against axial movement by the swaging dies **28** which have depressed at spaced intervals portions T2 of the tube T into the annular recess R while the flanging swage **36** performs its step in the complete method. We thus obviate the necessity of providing clamping means for holding the tube T and therefore provide a better and more efficient method which lends itself to practice in a number of various ways including the relatively inexpensive apparatus disclosed herein.

It will be noted that the flanging swage **36** is held to the ends of the guide bars **35** by means of axially extending bolts **38** which pass through the cross head **34** and axially through the guide bars **35** and are threadedly engaged in sockets **39** formed in the flanging swage. Therefore as the cross head **34** is shifted rearwardly by means of springs **37** the flanging swage **36** is also shifted rearwardly away from the flange G formed on the end of the tube.

It will also be noted that the flanging swage **36** has a close sliding engagement with the reduced cylindrical extension **25** of the head **20** and therefore it is supported in concentric relation thereto against radial displacement.

A central bore **40** extends through the head **20** in alignment with the journal **18** to admit the driving member **30** for the purpose hereinbefore described.

It will be further noted that front stationary member **15** is provided with semi-cylindrical jaws **41** which encircle the tubing T and hold the fittings F during the swaging movement of the several parts. These jaws are pivotally supported at **42** on vertical axes so that they may be swung away to remove and insert fittings during operation of the device.

A power means **45** is supplied in the frame **11** and is here seen to comprise a cylinder **43** resting upon or supported by the rear stationary member **14**. The power means **45** has a piston rod **44** disposed in axial alignment with the driving member **30** for the purpose of actuating said member through its rectilinear movements. A conventional manually controlled source of fluid under pressure is provided for actuating the power means **45**.

Having thus clearly disclosed and described our invention we claim as new and desire to secure by Letters Patent of the United States the following:

A method for use in securing to the end portion of a malleable initially cylindrical tube a fitting having a central bore adapted to receive the tube in close tolerance, said fitting having an internal depression axially spaced from an annular end face thereof, which includes disposing an end of said tube in said bore with its marginal edge portion extending beyond said end face a predetermined amount, swaging at least a portion of said tube into said depression; and from within the tube at said swaged portion immovably holding said interconnected tube and fitting while swaging said marginal edge portion into an outwardly flared flange.

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