

Oct. 3, 1939.

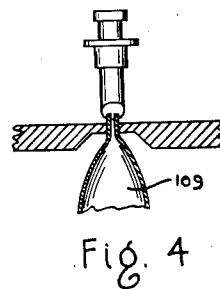
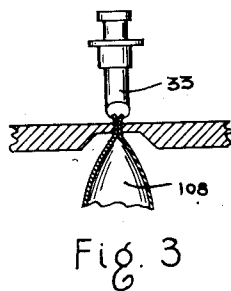
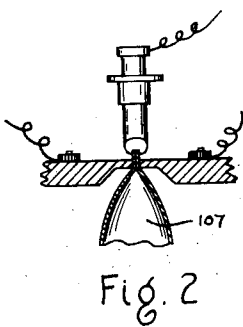
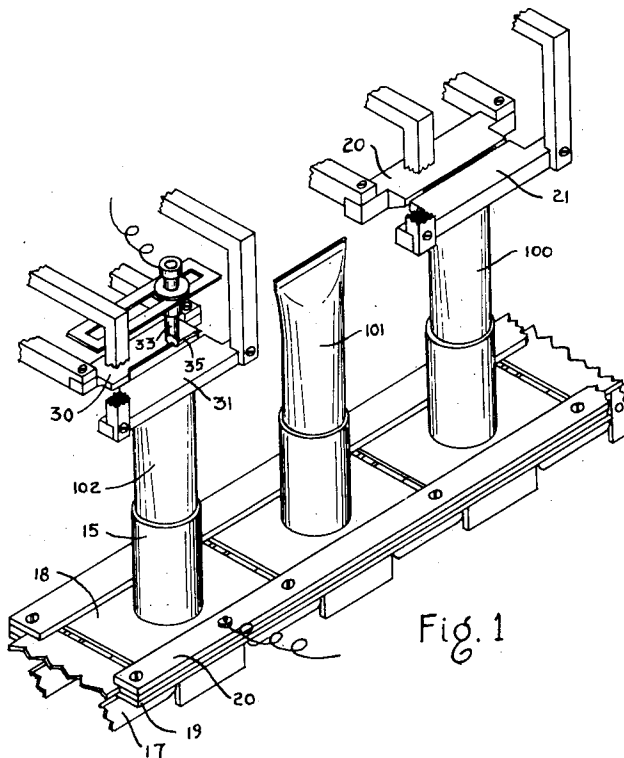
A. WAGNER

2,174,906

CLOSURE

Filed Feb. 4, 1937.

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

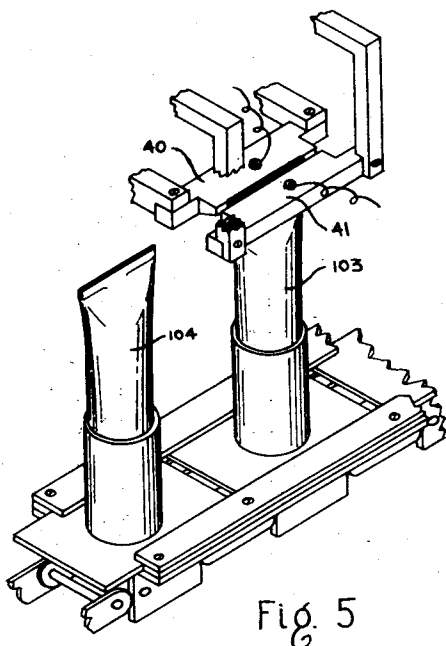


Fig. 5

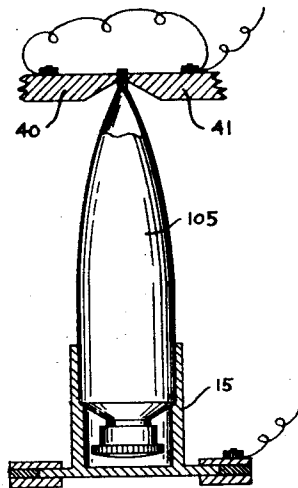


Fig. 6

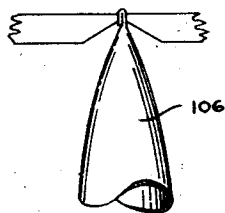


Fig. 7

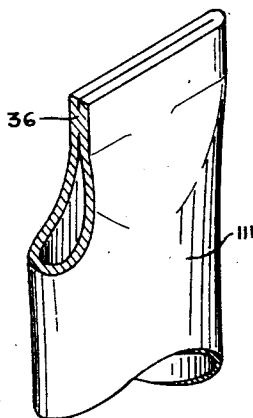


Fig. 9

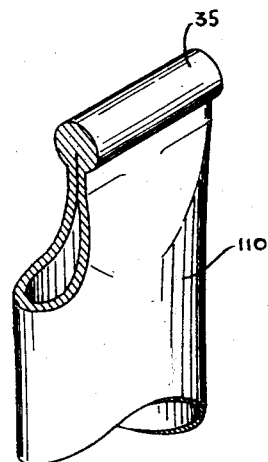


Fig. 8

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UNITED STATES PATENT OFFICE

2,174,906

CLOSURE

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Application February 4, 1937, Serial No. 123,996

3 Claims. (Cl. 219—4)

This invention relates to collapsible soft-metal tubes; more particularly, to improved closures for such tubes, and methods and apparatus for hermetically sealing such closures.

As used herein, the term "soft-metal" includes tin, lead, aluminum, and other metals capable of being extruded; and the term "closure" embraces the whole structure whereby the open end of a tube is sealed, among the forms of which structure are: (1) that in which the opposite walls of the tube are juxtaposed at their open ends; and (2) that in which an added part is superimposed upon or introduced into, and in juxtaposition with, the open end of the tube.

Many attempts have heretofore been made to render leak-proof the common collapsible soft-metal tube closure, effected by juxtaposing and folding the opposite walls of the open end of a filled tube. Numerous expedients have been resorted to: e. g., additional and/or reversed folding; casting a fusible-alloy plug over and between the convolutions of the folds; crimping the folds; superimposing upon the folds a hard-metal U-shaped clip; and applying a cement coating to a small area inside and/or outside the open end before folding. These, however, have been unsatisfactory because ineffective, costly, troublesome, and/or otherwise objectionable.

It is the object of this invention to provide a collapsible soft-metal tube having a reliably tight closure, and a simple and inexpensive method and efficient apparatus for making such a closure.

In the practice of this invention, the closure of a collapsible soft-metal tube is hermetically sealed by electrically welding together juxtaposed portions—preferably the edges of the opposite walls—thereof; with apparatus comprising means for passing an electric current through such juxtaposed portions and preferably also means for effecting such juxtaposition; the current employed being preferably one of low voltage.

The understanding of the object, advantages, and practice of the invention will be facilitated by reference to the following specification and the accompanying drawings, wherein:

Figure 1 is a perspective view of one embodiment of apparatus for pressing together, and electrically welding together, the edges of the opposite walls of collapsible soft-metal tubes, in accordance with the invention;

Figure 2 is a sectional view through a tube in a modified welding circuit;

Figures 3 and 4 are sectional views through tubes whose opposite-wall edges are in different

degrees of juxtaposition, in welding circuits like that of Figure 1;

Figure 5 is a perspective view of apparatus including a resistance-welding circuit;

Figure 6 is a sectional view through a tube in a modified resistance-welding circuit;

Figure 7 is a side view of a folded-closure tube in a resistance-welding circuit; and

Figures 8 and 9 are fragmentary perspective views, with portions broken away to show the weld more clearly, of tubes sealed by apparatus such as that of, respectively, Figures 1 to 4 and Figures 5 and 6.

This invention may be used, for example, on collapsible-tube-filling machines of the type described and shown in Patent No. 1,576,480, only the conveyor chain of which is shown in Figure 1. The conveyor chain 17 has attached thereto base plates 18, each of which slides between the bottom guide plates 19 and ribs 20; to each base plate 18 there is fixed a cylindrical holder 15 for a filled tube 100, 101, 102; the tubes are intermittently advanced one at a time, through the flattening station 20, 21 and the welding station 30, 31, where, respectively, the opposite walls of each tube are juxtaposed and welded together. Thus, tube 100 is in the flattening station, where jaws 20 and 21 squeeze into mutual contact the edges of the opposite walls of the tube, at its open end. Then the tube is carried to the position shown by tube 101, and finally to that of tube 102, which is held in jaws 30 and 31 a little below the upper edge of its juxtaposed sides, while carbon electrode 33, preferably presenting a face making an acute angle with the edge of the tube, is moved (by means of suitable actuating mechanism) along this upper edge and completes a circuit through tube 102, welding thereon a bead 35, which hermetically seals the closure of the tube. As shown in the drawings, neither the jaws 30 and 31 nor the electrode 33 form, or mold, the bead 35. Six volts is a convenient potential to use with this apparatus.

Manifestly the flattening station can be dispensed with, its function being transferred, upon suitable adjustment, to the jaws of the welding station.

The welding circuit of Figure 2 is such that the current passes through only the juxtaposed portions of the tube rather than through the whole tube.

Mutual contact of the walls of the tube at its open end, before being welded together, is preferable but unessential. For example, tube 108, Figure 3, with its opposite walls in contact at

one portion but spread apart at the edges, may be hermetically sealed by means of carbon electrode 33; and, as in tube 109, Figure 4, a small (preferably uniform) space between the juxtaposed walls will not prevent the formation of a sealing weld.

In the apparatus shown in Figure 5, the seal is effected by the jaws which juxtapose the walls of the tube, seam-welding them together near the edge. The tube is held in a circuit including the jaws 40 and 41, which are insulated from each other, and a welding current is passed for a predetermined time interval through the juxtaposed walls of the tube, fusing them together without forming a bead.

Alternatively, the jaws 40 and 41 may be connected as one electrode, as in Figure 6, the cylindrical tube-holder 15 serving as the other electrode, and the welding current flowing lengthwise of the tube. When tube 105 is placed in the circuit, its walls are clamped between the jaws 40, 41, and a welding current is passed through it to fuse the juxtaposed portions together.

Tube 106 of Figure 7 is similar to the other tubes, except that its closure is of the folded type; it is seam-welded in the indicated manner.

Figures 8 and 9, respectively, show tubes 110 and 111 bead-welded and seam-welded at 35 and 36.

Mechanical and electrical movements and parts—inter alia wiring, jaws, sliding and rotary electrodes, timing devices, insulating means, and the like—utilized in connection with the apparatus of the invention but familiar to those skilled in the art, have not been described in detail.

It is to be understood that the foregoing examples are merely illustrative and not limitative of this invention, which may be variously otherwise embodied—as by accomplishing the weld with added metal instead of autogenously—without exceeding the scope of the appended claims.

I claim:

1. In an apparatus for welding the closure of a collapsible soft-metal tube at its open end, a pair of jaws for juxtaposing portions of the opposite walls of the tube, an electrical circuit, a second pair of jaws in the electrical circuit, means for inserting the juxtaposed portions between the second pair of jaws, and an electrode for completing the circuit through the juxtaposed portions of the tube.

2. In an apparatus for sealing a collapsible soft-metal tube having a flattened open end, stationary means for supporting the flattened open end of the tube during welding, an electrode presenting a non-grooved face to the extreme edges of the flattened open end of the tube, and means for effecting a flow of welding current between the electrode and the extreme edges of the flattened open end of the tube.

3. In an apparatus for sealing a collapsible soft-metal tube having a flattened open end, stationary means for supporting the flattened open end of the tube during welding, an electrode presenting a flat, oblique face to the extreme edges of the flattened open end of the tube, and means for effecting a flow of welding current between the electrode and the extreme edges of the flattened open end of the tube.

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