Dec. 21, 1937. P. R. FECHHEIMER 2,102,840

CLOSING AND SEALING OF COLLAPSIBLE TUBES

Filed Feb. 12, 1934 3 Sheets-Sheet 1

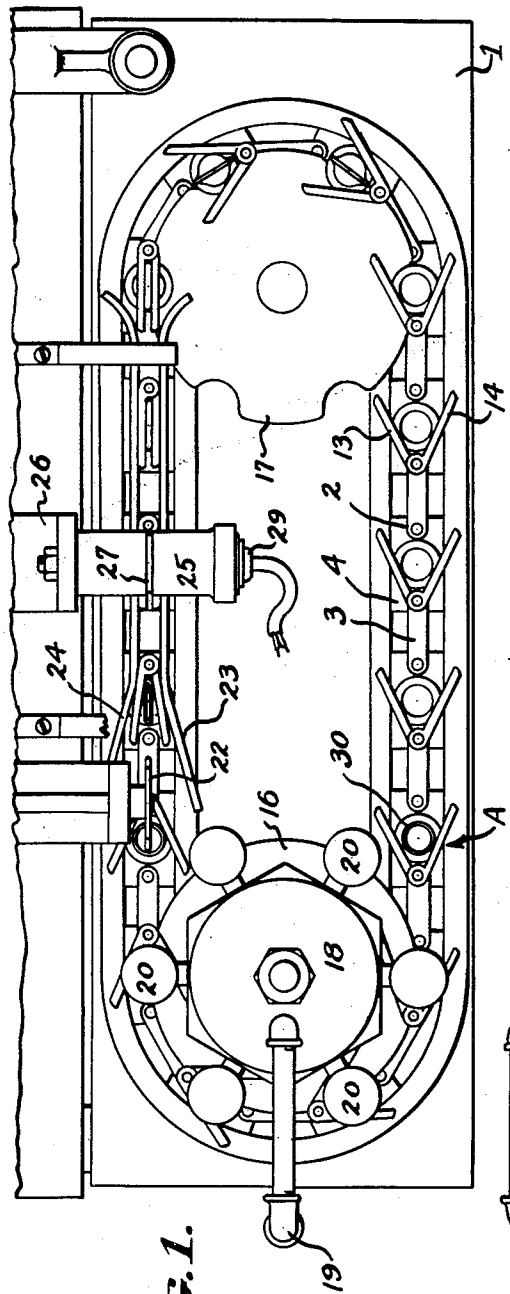


FIG. 1.

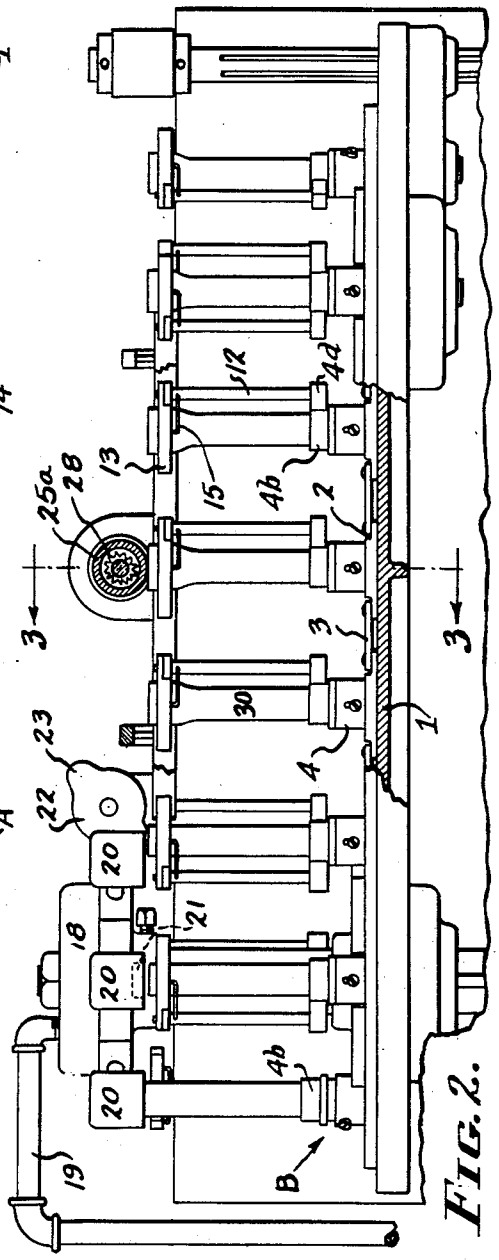


FIG. 2.

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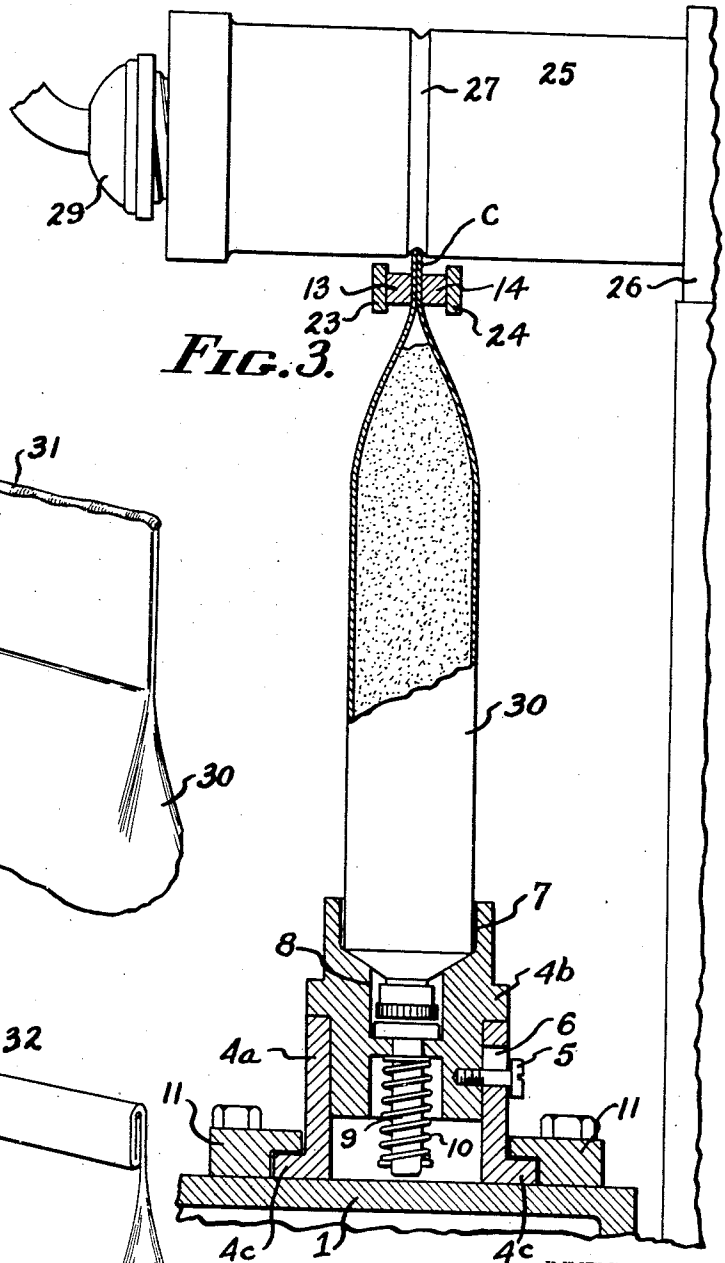


FIG. 3.

FIG. 4.

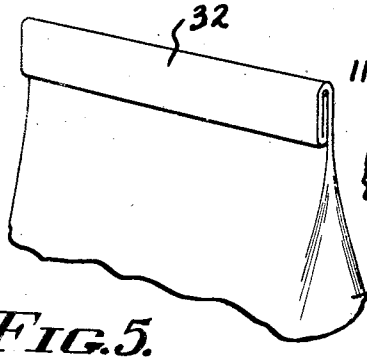


FIG. 5.

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CLOSING AND SEALING OF COLLAPSIBLE TUBES

Filed Feb. 12, 1934 3 Sheets-Sheet 3

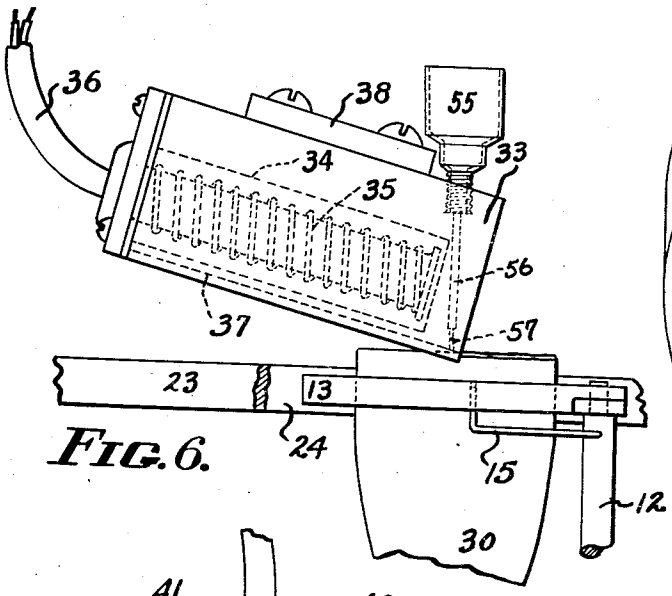


FIG. 6.

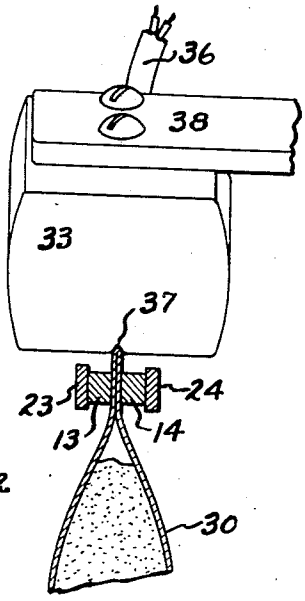


FIG. 7.

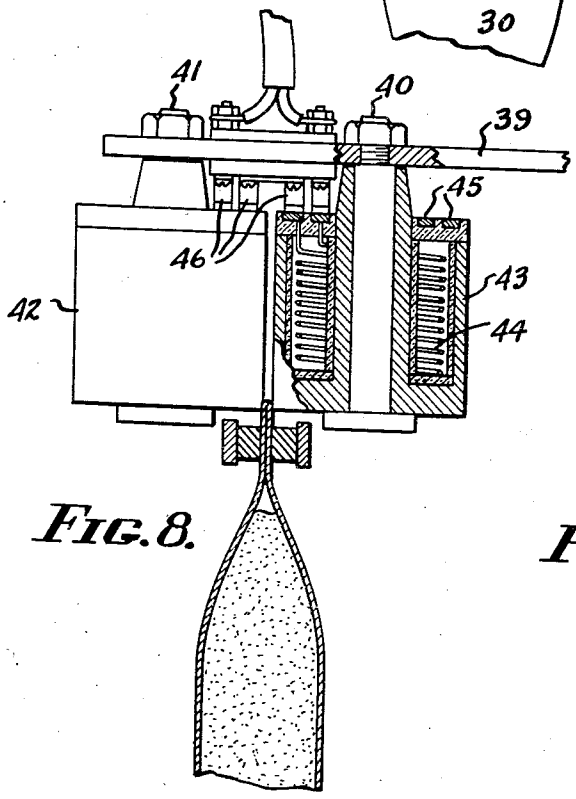


FIG. 8.

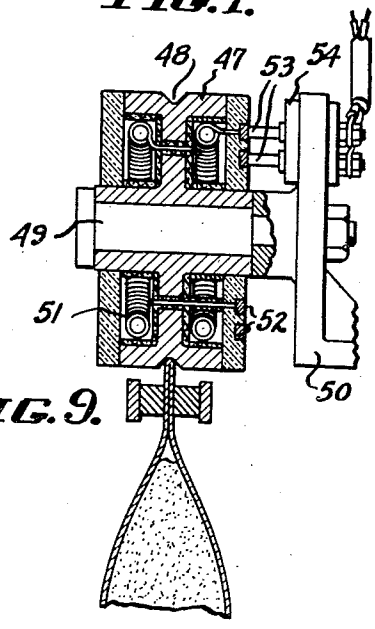


FIG. 9.

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Patented Dec. 21, 1937

2,102,840

UNITED STATES PATENT OFFICE

2,102,840

CLOSING AND SEALING OF COLLAPSIBLE TUBES

Paul R. Fechheimer, Cincinnati, Ohio, assignor to The Karl Kiefer Machine Company, Cincinnati, Ohio, a corporation of Ohio

Application February 12, 1934, Serial No. 710,824

4 Claims. (Cl. 113—112)

My invention relates to methods of handling metal collapsible tubes of the kind for example, in which tooth paste, creams and other viscous or liquid materials are packaged and sold, and in particular it has to do with the method of closing and sealing such tubes, adapted to be carried on in connection with other operations thereon and resulting in the formation of an improved and more economical closure therefor.

One object of my invention is to provide a method of sealing collapsible tubes by welding to join the bottom edges of the tube, whereby economy of operation is effected. Hitherto it has been the general practice after the filling of a collapsible tube, which is done from the bottom thereof, to flatten the tube so that its bottom edges are contiguous and lie in parallel planes, and then to fold these edges over upon themselves a plurality of times, afterward frequently holding the fold together by means of a clip of stiffer metal fastened thereto, or by locking this fold by means of a crimp or folding back of the corners. These methods of sealing, while effective for most purposes, are sometimes uneconomical because they involve added cost, but more importantly, they do not provide a hermetic seal for the bottom of the tube. This becomes of importance, for example, where tubes containing liquefiable paste are shipped into warm or torrid climates, or are stored under elevated temperatures. Where the contents of the tube become liquefied, or where for any reason a pressure is built up inside the tube, the contents are frequently forced outwardly through the bottom closure and serve to stain and destroy the appearance and serviceability of the tube itself, and of the wrappings or package in which it is contained.

It therefore appears as another object of my invention, to provide for the sealing of the bottom of collapsible tubes so as to provide a liquid and gas tight joint in the nature of a hermetic seal.

Still another object of my invention is to provide a means and method for the continuous welding of the bottom edges of a collapsible tube which fits in well with the operations of filling and juxtapositioning the bottom edges of the tube, whether this be done by continuous or step by step processes, but which is particularly adapted to continuous processes of filling, closing and sealing.

These and other objects of my invention, which will be set forth hereinafter, or will be apparent to one skilled in the art upon reading these specifications, I accomplish by that series of process steps and by and in the constructions which I hereinafter disclose in exemplary embodiments.

Reference is made to the drawings, wherein:—

Figure 1 is a plan view of a closing and filling machine embodying my invention.

Figure 2 is an elevational view thereof.

Figure 3 is a sectional view along the lines 3—3 of Figure 2.

Figure 4 shows the bottom end of a tube sealed by welding, and the bead formed thereby.

Figure 5 is a view showing such a welded tube with its bottom folded in a simple fold.

Figure 6 is a side view of another stationary type of welding tool in its relation to the bottom of a tube.

Figure 7 is an end view thereof.

Figure 8 is a view with parts in section of a type of sealing device in which juxtaposed rollers are employed.

Figure 9 is a partial sectional view of a type of sealing device in which a single rotatable roll is employed.

It will be understood that after the filling of a collapsible tube, which is usually done through the open bottom thereof, while the tube is in an inverted position, the bottom edges of the tube are spread so as to form a fish tail, and so as to bring these bottom edges together flatwise, so that they lie in parallel planes. They are then held in this position by clamp members engaging the side walls of the tube from either side. The welding together of the juxtaposed bottom edges of the tube presents in practice, some serious problems. The metal of the tube edges is very thin and quite likely to burn through. Thus, if heat were applied to the clamping members engaging the juxtaposed bottom edges, while a weld might be effected therebetween the tube walls have a tendency to burn through at the edges of the heated members. I have found, however, that it is possible to do commercially successful and reliable welding by the procedure hereinafter to be outlined in detail. This procedure involves in the main, the clamping of the edges of the bottom of the tube so as to hold these edges in juxtapositioned relationship, but in such a way as to leave these edges projecting a short distance beyond the clamping means. If this is done and if the clamping means themselves are not relied upon to do the welding, successful welding can be carried on at the end of the tube in that portion thereof which projects freely above the clamping devices. I have found more-

over, that it is preferable to carry on this welding in a continuous and progressive manner by starting with a tool at one end of the juxtaposed edges and progressively forming a weld therealong, finally reaching the other end of the juxtaposed edges. In other words, it is preferable, although not a limitation upon the broader aspects of my invention, to carry on the welding with a tool which has, practically speaking, a point contact with the work, and by moving the work and the tool relatively to each other during the progress of the welding operation.

I have illustrated in Figures 1 and 2, an exemplary filling and closing machine which happens to be of the continuous motion type. My invention is not, however, limited to this type, but is clearly applicable to machines having a step by step motion, or to filling and closing operations which are carried on as separate steps or discontinuously. In the particular embodiment shown, the machine is built up on a frame work 1, upon which in a suitable track a continuous chain indicated generally at 2, is caused to move. This chain may comprise intermediate lengths 3, and holding means for collapsible tubes indicated generally at 4. These holding means are more specifically illustrated in Figure 3, where it will be seen that they comprise a base member 4a, and a holder member 4b, slidably inserted therein, and held by a set screw 5, operating in a slot 6 in the base member 4a. The holder 4b is hollowed out as at 7 and 8, to accept the top of a collapsible tube when the tube is in inserted position, and the holder may likewise be provided with a kick-out device comprising a plunger 9, and a spring 10, serving to hold the plunger in depressed position. The base member 4a has ears thereon 4c, which engage the track members 11 on the base 1.

As shown, most clearly in Figures 2 and 6, the holder member 4b has a projection 4d at its side, to which is attached a vertical rod 12. This rod bears at its upper end a pair of clamping jaws 13 and 14, hinged thereto, and urged to an outwardly extending or angular position as shown, by a spring member 15.

At each end of the table or frame 1, I have shown sprocket members 16 and 17 around which the chain 2 passes. It will be understood without further description, that these sprocket members, or one of them at least, are suitably driven. Empty collapsible tubes may be inserted into the holders at the point marked A on Figure 1. Above the sprocket 16 there may be an automatic filling head 18, fed with the plastic material through a pipe 19, and bearing filling spout members 20. A particular description of this mechanism is not required. As the tubes pass through this machine they come under the filling spouts 20, which are raised to receive them as at 21. The holder members 4b are caused to move upwardly by a cam or the like, not shown, so as to assume the position indicated at B in Figure 2, in which position the ends of the tubes are inserted into the recesses 21, in the filling spouts. The tubes are then filled as will be readily understood without further description, and when so filled they pass from beneath the filling spouts and are acted upon by some device which spreads or fishtails the bottom end of the tube. I have shown an exemplary device for this purpose, consisting of a disc member 22, suitably mounted upon a driven shaft, and suitably timed by this shaft so that projections 23 on the disc, enter the tops of the tubes and spread them sufficiently so that the edges can be brought into juxtaposition by the action of the clamp members 13 and 14.

During the further course of the progress of the tube, track members 23 and 24 engage the clamp members 13 and 14 and bring them together about the fishtailed tube end. In this way the tube edges are brought to lie against each other in parallel flat planes. In Figure 3 it will be seen how the clamping members 13 and 14, held together by the track members 23 and 24, engage the end of the tube, and it will also be seen how a free portion of the tube ends projects above the clamping members 13 and 14, as at C.

The tube so disposed and held is caused to pass beneath a welding device of cylindrical form, indicated at 25, in Figures 1, 2 and 3. This member is held above a suitable bracket 26. It is grooved as at 27 in that portion of its surface which is to contact the juxtaposed edges of the tube bottom. It is convenient to make the groove 27 an annular groove extending circumferentially about the surface of the welding member 25. If any portion of this groove becomes fouled or otherwise unsuitable, it will thus be possible to rotate the welding member slightly in the bracket 26, so as to present to the tube edges a fresh portion of the groove. I have shown in Figure 2, that the welding member 25 may comprise an outer casing 25a, and an interiorally disposed electric heating coil 28, and I have shown in Figures 1 and 3, means for an electrical connection to this coil, indicated broadly at 29.

It will be understood however, that the way in which the welding member is heated is not a limitation upon my invention. It is convenient and economical to use electrically heated members, but members otherwise heated may be used as well as, in some instances, means for generating electric heat in the tube walls, or means for applying a flame thereto. Thus in Figure 7 one terminal of an electric circuit may be connected to the clamps 13 and 14 and the other to the tool 33. In the claims which follow, the term welding, unless modified by a specific limitation, is to be understood as including any means for causing interfusion of the top walls themselves. It is also possible to add metal to the weld being made. One way in which this may be done is by feeding solder, or the like, from a cup 55, (Figure 6) attached to the tool, and in which the solder is maintained liquid by the heat of the tool. A passage 56, having an outlet 57 leads to the groove 37; but the outlet is so restricted that the solder will not run out of it when the tool is not in contact with the work.

Throughout the several views, I have indicated collapsible tubes being worked upon broadly by the numeral 30. It will be noted that the machine in Figures 1 to 3 illustrates a preferred method of operation in which the welding is carried on in a progressive manner from one end of the tube bottom edges to the other end. I have found that more positive results can be secured more easily in this way. Figure 4 indicates that the welding operation preferably results in the production of a slight bead of consolidated metal indicated at 31. In Figure 5 I have shown at 32 a simple fold produced in the metal of the tube end. This is by no means as complicated a fold as is ordinarily made, nor does it take as much length of tube. The bead

in part serves to stiffen the bottom of the tube, but the fold is advisable for further stiffening, and also to take up the lengths of the tube which extend between the clamping members 13 and 14, and the place where the welding is accomplished.

I have shown in Figures 6 and 7, another type of welding device which comprises a stationary block-like tool 33. This tool is hollowed out internally as at 34, to accommodate a resistance heater 35, to which connection is made as at 36. The tool is likewise grooved as at 37, which grooving, as in the case of the first tool described, facilitates the welding operation, and the formation of a bead. The tool 33 may be supported by a bracket 38, in a desired relationship to the work.

In Figures 8 and 9, I have shown exemplary types of rotative welding devices. A rotative welding device while it is somewhat more complicated to construct, has a certain advantage in that it can move with the work and present clean edges thereto during the progressive welding operation. Moreover, the rotation serves to carry away excess metal and dross. In Figure 8 a bracket 39 supports shafts 40 and 41 upon which rollers 42 and 43 are mounted. These rollers are so positioned as to contact only the upper edges of the tube bottom as shown. They have the advantage of forcing these edges more closely together, if necessary. The rollers may be hollowed and provided with electric heating elements 44, and if so provided, they will likewise have slip rings 45 contacted by brushes 46, for the purpose of supplying electric current thereto. It will be clear that the rolls may be driven if desired, or may be allowed to idle.

In Figure 9 I have shown a single roll 47 grooved as at 48, and mounted upon a horizontal shaft 49, in a bracket 50 above the work. This roll likewise is provided with a heating element 51, and slip rings 52 which are contacted by brushes 53 mounted on an insulating block 54 on the bracket. The operation of this structure will be clear without further description.

It will be understood that the embodiments of my invention which I have hereinabove described are exemplary only and that modifications may be made in my invention without departing from the spirit thereof.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. A method of sealing a metallic collapsible tube or like thin-walled container by interfusion, which comprises supporting juxtaposed wall portions in such a way that the edges thereof are free, bringing a heated tool into contact with said edges so as to melt and interfuse said edges in an area adjacent said tool, and moving said tool and said edges relative to each other so as to cause said area of molten metal to traverse said edges, the molten metal in said area forming by its surface tension a bead of substantially greater width than said juxtaposed edges, said bead being essentially located beyond any supporting means, the tube so sealed being shorter by substantially the amount of metal in said bead than the tube before sealing.

2. A method as set forth in claim 1 in which wall portions of said tube are juxtaposed by flattening said tube.

3. A method of sealing a metallic collapsible tube or like thin-walled container by interfusion, which comprises juxtaposing the wall portions to be welded and clamping said juxtaposed wall portions in such a way that the edges thereof are free, bringing a heated tool into contact with said edges so as to melt and interfuse said edges in an area adjacent said tool, and moving said tool and said edges relative to each other so as to cause said area of molten metal to traverse said edges, the molten metal in said area forming by its surface tension a bead of substantially greater width than said juxtaposed edges, said bead being located beyond the area of clamping pressure, the tube so sealed being shorter by substantially the amount of metal in said bead than the tube before sealing.

4. A method of sealing a metallic collapsible tube or like thin-walled container by interfusion of edge portions thereof, which comprises flattening an end of said tube to bring the wall portions into juxtaposition, clamping said wall portions between clamping members so as to leave an appreciable length of a juxtaposed edge portion of said tube projecting therebeyond, bringing into contact with said edge portions away from said clamping members a tool heated to a temperature above the fusion point of the material of said tube so as to melt said material in an area adjacent said tool and lying in part between said tool and said clamping members but essentially out of contact with said clamping members, and relatively moving said tube and tool so as to cause the area of molten metal to travel along said edge portions with and surrounding the contact of said tool with said tube, the molten metal in said area forming by its surface tension a bead of substantially greater width than said juxtaposed side walls, the tube so sealed being shorter by substantially the amount of metal in said bead than the tube before sealing.

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