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MEANS FOR FOLDING THE ENDS OF COLLAPSIBLE TUBES

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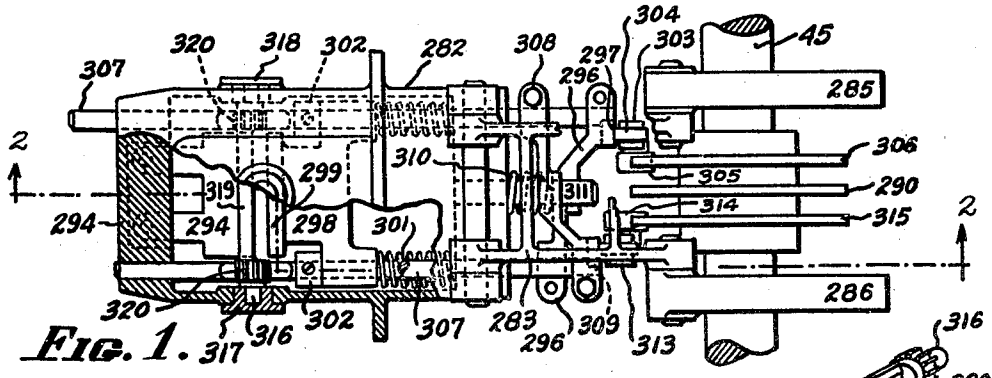


FIG. 1.

FIG. 3.

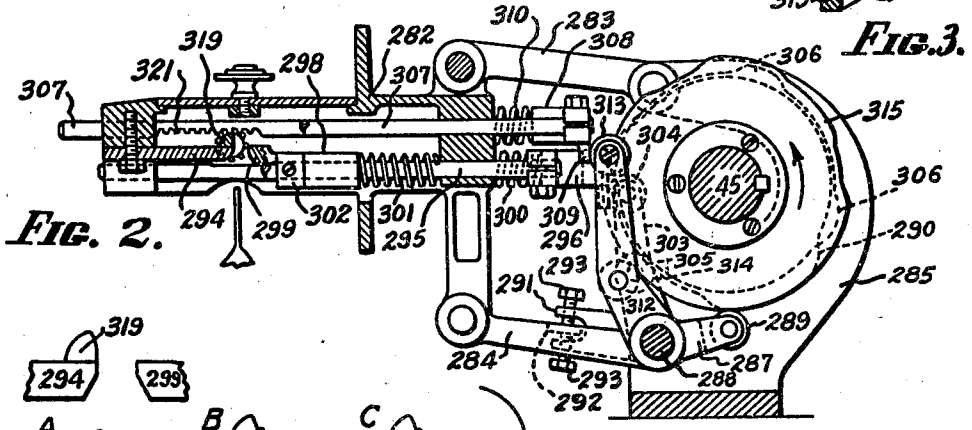


FIG. 2.

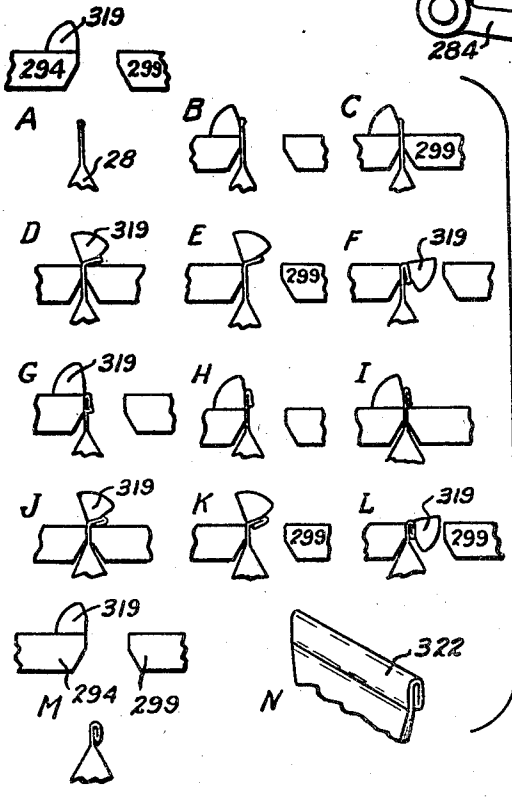


FIG. 5.

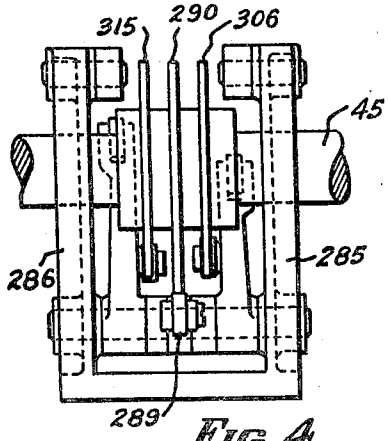


FIG. 4.

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MEANS FOR FOLDING THE ENDS OF COLLAPSIBLE TUBES

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Original application November 11, 1937, Serial No. 174,079. Divided and this application January 13, 1943, Serial No. 472,228

6 Claims. (Cl. 113—54)

Our invention relates to the filling and sealing of the collapsible tubes of commerce, particularly where the tubes are sealed by interfusion of the tube walls. This is a division of our copending application Serial No. 174,079, filed November 11, 1937, which issued into Patent No. 2,336,355 on December 7, 1943.

The objects of the present invention comprise the provision of a novel folding device, and also comprise specific inventions and improvements in such devices, as well as a new organization and assembly of parts.

This object, and more specific ones which will be apparent to one skilled in the art upon reading this specification, we accomplish by that certain construction and arrangement of parts of which we shall now describe an exemplary embodiment. Reference is made to the accompanying drawing wherein:

Figure 1 is a plan view with parts in section of a tube-end folding device.

Figure 2 is a vertical section taken along the line 2—2 of Figure 1.

Figure 3 is a perspective view of a rotary tube-end folding element.

Figure 4 is an end view of an operating cam arrangement.

Figure 5 shows in consecutive stages the operation of folding the tube end.

The general as well as the specific organization of an exemplary filling and sealing machine to which the present invention may be applied will be found in our said copending application. The utility of the filling means herein described and claimed is not, however, confined to such a machine, but may be separately employed or employed with other means for filling and closing collapsible tubes or without sealing, as by welding.

Our folding mechanism is illustrated in Figures 1 to 5, inclusive. It will be understood that our folding means will form part of a machine comprising a suitable base or bed on which a power or drive shaft 45 is mounted in suitable bearings or supports. The machine itself is not shown in the illustrations since its form may be widely varied and since it may contain elements for operating upon collapsible tubes other than the elements herein specifically described and claimed. There will also normally be provided in connection with the machine means for bringing to the apparatus hereinafter described collapsible tubes, in filled condition and bottom end up. Such means may be like those described in our patent to which reference has been made. After the filling of the collapsible tubes, their ends will be flattened or fish-tailed as will be understood. This is usually accomplished by means of spreaders entering the ends of the tubes and partially fish-tailing them whereupon the walls are completely juxtaposed by clamping means engaging the tube and from either side. Means for fish-tailing the ends of collapsible tubes have not herein been shown and do not form a limitation on the structure which we claim in this case. The tubes, after fish-tailing, may be sheared and sealed as by welding, as also taught in the patent mentioned. Apparatus for these operations is also not herein shown, but it may be apparatus driven from the power shaft 45.

Our mechanism comprises a head 282, which raises and lowers. A pair of frames 283 and 284 are pivoted to the head and are also pivoted to supports 285 and 286. This arrangement permits raising and lowering of the head while maintaining it in a horizontal plane. A lever 287 pivoted as at 288 carries a cam follower 289 which bears against a cam 290 on the shaft 45. The other end of the lever arm is forked as at 291 and embraces an abutment 292 on the frame 284. Adjustment means 293 may be provided, if desired. The cam 290 thus operates to raise and lower the head 282.

A forward clamping jaw 294 is fixed to the head. A pair of rods 295 are slidably mounted in the head, and at the rear are connected by a bridge 296, having a bearing portion 297. A carriage 298 is slidably mounted upon the rods 295 and bears a rearward clamping jaw 299. A compression spring 300 on a suitable stud engages between the head and the bridge 296. Compression springs 301 also engage between the head and the carriage 298. Collars 302, fixed on the rods 295, permit the rods to pull the carriage back.

A lever 303, pivoted as at 288, engages the surface 297 by means of a roller 304. The lever arm also carries a cam follower 305, bearing against a cam 306 on the shaft 45. The cam 306 thus controls the movements of the rods 295 and actuates the clamping means. The clamping pressure is, of course, determined by the springs 301 and not by any force applied to the rods 295.

An upper pair of rods 307 is also slidably mounted in the head. The rear ends of these rods are connected by a bridge 308 having a bearing surface 309. A compression spring 310 on a stud 311 engages between the head and the bridge.

A lever arm 312 is pivoted as at 288 and bears against the surface 309 by means of a roller 313.

It also carries a cam follower **314** which bears against a cam **315**.

A transverse shaft **316** is mounted in the head on bearings **317** and **318**. This shaft in its middle portion is segmental in cross section as shown at **319**. At its ends it is provided with pinion teeth as at **320**. The rods **307** are provided with rack teeth **321** which mesh with the pinion teeth. Thus the effect of the longitudinal movement of the rods **307**, is to rotate the shaft **316**. The extreme range of the movement of the shaft is an arc of 180 degrees.

The cams **290**, **306** and **315** are so shaped as to provide the sequence of operations illustrated in Figure 5. As shown at A, when the tube **28** has moved into position, the head is raised and the clamping jaws **294** and **299** lie above it. The next step shown at B is lowering of the head so that the tube end enters between the jaws and projects above the jaws by the width of a fold. At C the movable jaw **299** has been moved into position. At D the segmental member **319** has been rotated approximately a quarter of a turn initiating a fold. At E, the movable jaw **299** is withdrawn. At F, the fold is completed by further rotation of the member **319**. At G, the member **319** is returned to its original position. At H, the head is further lowered so as to cause the folded portions of the tube end to project above the jaws. At I, the clamping members are reengaged. At J, another fold has been initiated, the member **319** having made another quarter turn. At K, the movable jaw **299** is again withdrawn. At L, the second fold is completed by further rotation of the member **319**. The final movement is shown at M, the member **319** having returned to its original position, and the head being raised to release the tube. The appearance of the folded end of the sealed tube is shown at **322** in stage N of Figure 5.

We may prefer to include an additional operation between those illustrated at L and M. This would consist in again operating the clamp member **299** to drive the fold **322** securely home, having of course first rotated the segment **319** to an unobstructing position.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In a machine for folding the ends of collapsible tubes, a base, a shaft journaled on said base, a head mounted on said base, a fixed jaw in said head, a cooperating movable jaw mounted in said head for reciprocation, a segment-shaped folding member rotatably mounted in said head and so placed that in one position, one of its faces will substantially coincide with a face of said fixed jaw, means in said head for moving said movable jaw, a cam on said shaft for actuating said moving means, means in said head for rotating said folding member, and a second cam on said shaft for moving said rotating means, the said cams being so shaped and timed as to move said movable jaw toward said fixed jaw to clamp the end of a tube therein, thereupon to rotate said folding member approximately 90°, thereupon to move said movable part away from said fixed jaw, and thereupon to rotate said folding member through approximately a second 90°.

2. The structure claimed in claim 1 wherein said head is mounted with respect to said base for reciprocatory movement, and wherein said shaft bears a third cam for producing reciprocatory movement of said head.

3. The structure claimed in claim 1 wherein said head is mounted with respect to said base for reciprocatory movement, and wherein said shaft bears a third cam for producing reciprocatory movement of said head, the said last mentioned cam being shaped to provide three positions for said head and said first and second mentioned cams being so shaped as to provide for a repetition of the recited cycle of jaw and folding member movements within one revolution of said shaft.

4. In a machine for folding the ends of collapsible tubes, a base, a shaft journaled with respect to said base, supports on said base, a head mounted with respect to said supports by means of a pair of frames whereby said head is reciprocable with respect to said base in a substantially rectilinear path, a cam on said shaft and cam follower means in connection therewith to impart movement to one of said frames whereby to move said head, a fixed jaw in said head, a movable, slidably mounted jaw in said head, means slidable in said head for moving said movable jaw, a second cam on said shaft, cam follower means in connection therewith having contact with said moving means for said movable jaw irrespective of the position of said head, a shaft having an intermediate segment-shaped folding portion journaled in said head in such position that the apex of said segment-shaped folding portion follows an edge of said fixed jaw, pinion means on said shaft, a rack engaging said pinion means and slidably mounted in said head, a third cam on said shaft and cam follower means in connection therewith and adapted to bear against said rack irrespective of the position of said head.

5. In a machine for folding the ends of collapsible tubes, a vertically reciprocable head, a fixed jaw mounted in said head, a movable jaw mounted in said head for movement toward and away from said fixed jaw whereby to exert a clamping and releasing action on the ends of collapsible tubes, and a rotatable segment shaped member for folding the ends of said collapsible tubes, means for operating said head so as to reciprocate it, means for operating said movable jaw so as to cause it to exert said clamping and releasing actions, means for operating said segment shaped member to rotate it in opposite directions about an axis line located adjacent an edge of said fixed jaw, and control means for enforcing a series of operations of said operating means whereby to bring said head down over the end of a collapsible tube so that an end portion thereof projects above said jaws, next to cause said jaws to clamp said tube, next to rotate said segment shaped member through approximately 90° to form approximately a 90° fold in the end of said tube, next to move said movable jaw to releasing position, and next to rotate said segment shaped member further in the same direction approximately 90° so as to complete the fold, and ultimately to return said several elements to initial position.

6. The structure claimed in claim 5 in which said control means includes means for further lowering said head and repeating said operations to form a double fold prior to the return of the said elements to initial position.

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