Oct. 9, 1934. C. J. WESTIN 1,975,996

TUBE CLOSING MACHINE

Filed Aug. 4, 1932 3 Sheets-Sheet 1

Fig. 2.

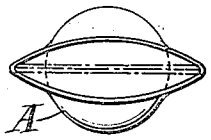


Fig. 1.

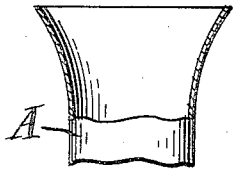


Fig. 3.

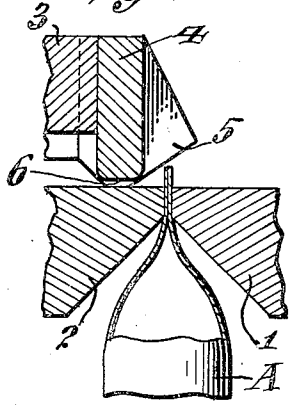


Fig. 4.

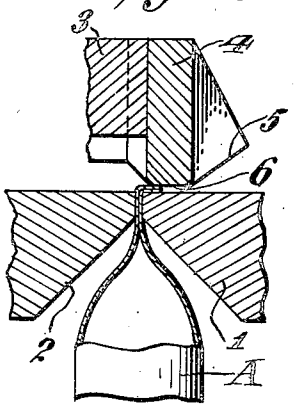


Fig. 5.

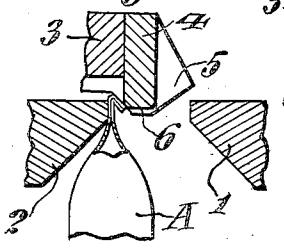


Fig. 6.

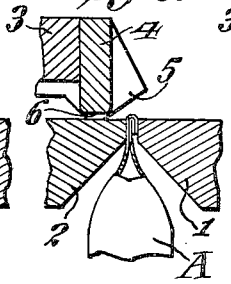


Fig. 7.

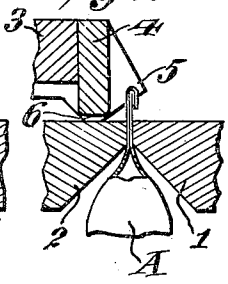


Fig. 8.

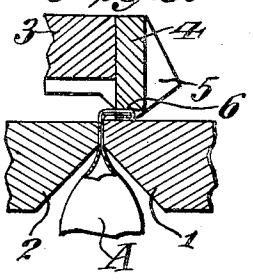


Fig. 9.

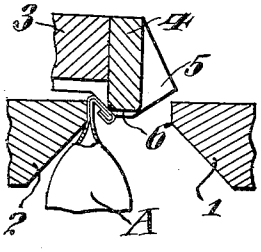


Fig. 10.

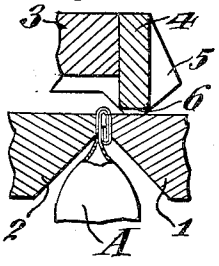


Fig. 11.

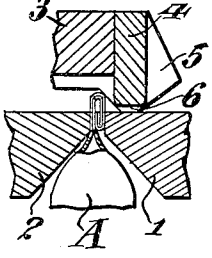


Fig. 12.

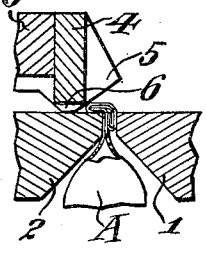


Fig. 13.

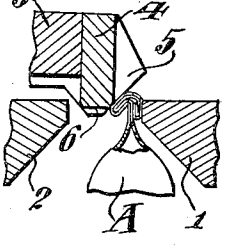


Fig. 14.

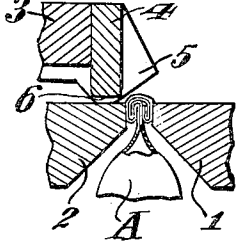
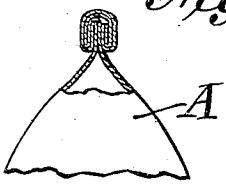


Fig. 15.



INVENTOR.

Charles J. Westin,

BY

Augustus B. Stoughton

ATTORNEY

Oct. 9, 1934. C. J. WESTIN 1,975,996

TUBE CLOSING MACHINE

Filed Aug. 4, 1932 3 Sheets-Sheet 2

Fig. 16.

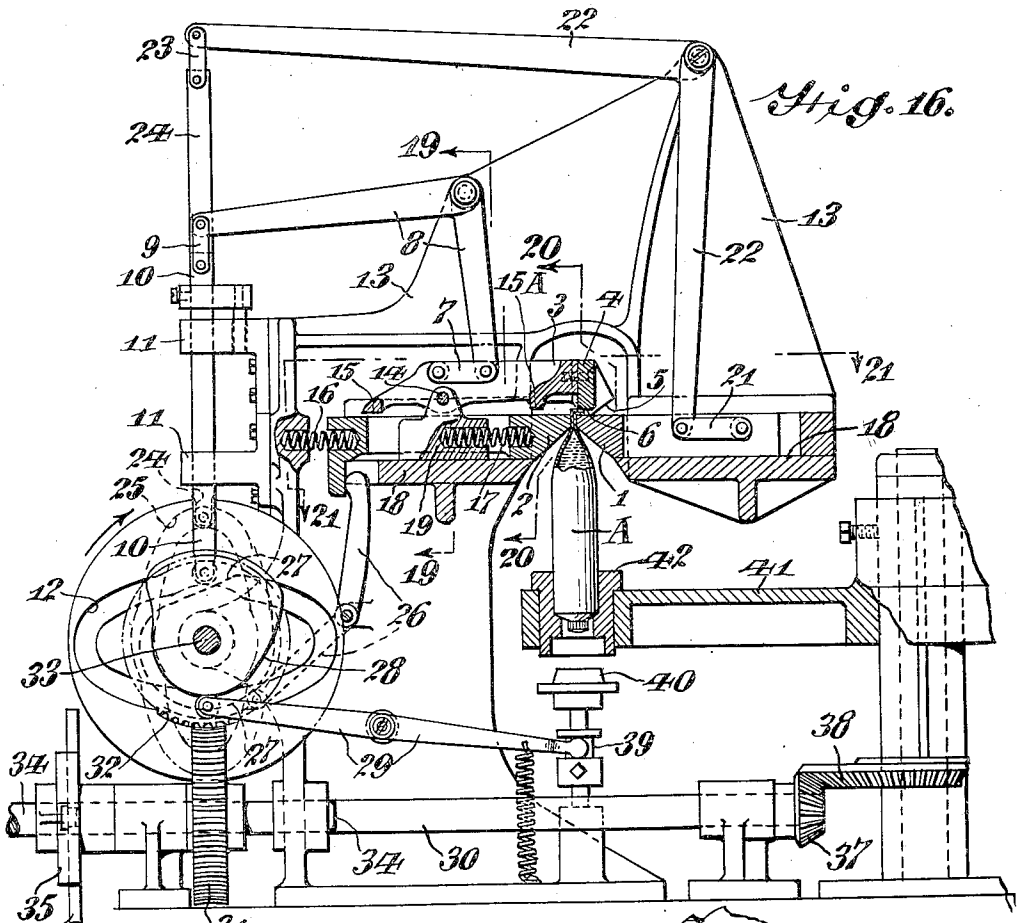
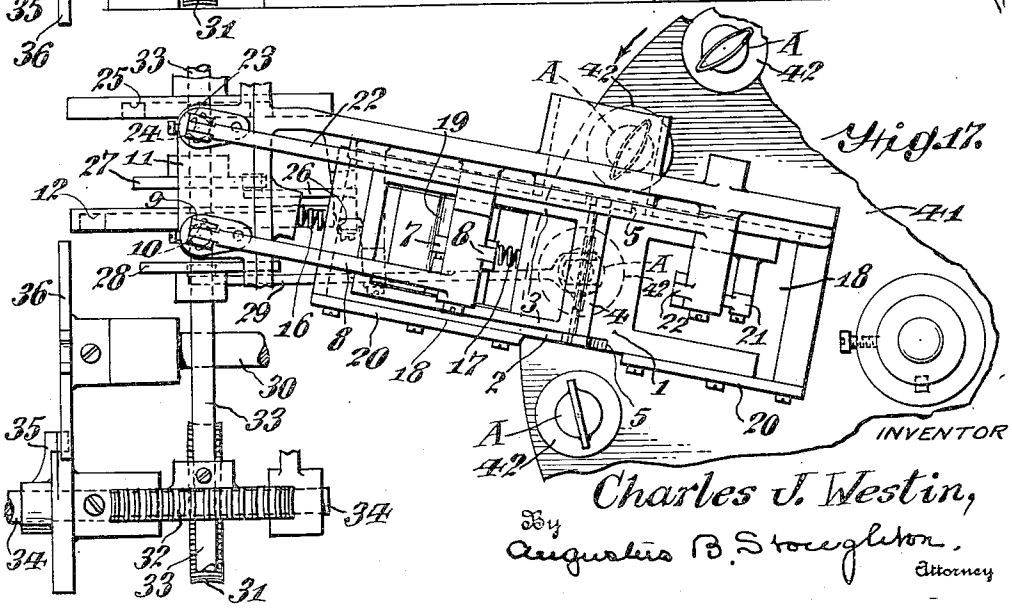


Fig. 17.



INVENTOR

Charles J. Westin,

By Augustus B. Stoughton.

Attorney

Oct. 9, 1934. C. J. WESTIN 1,975,996

TUBE CLOSING MACHINE

Filed Aug. 4, 1932 3 Sheets-Sheet 3

Fig. 18.

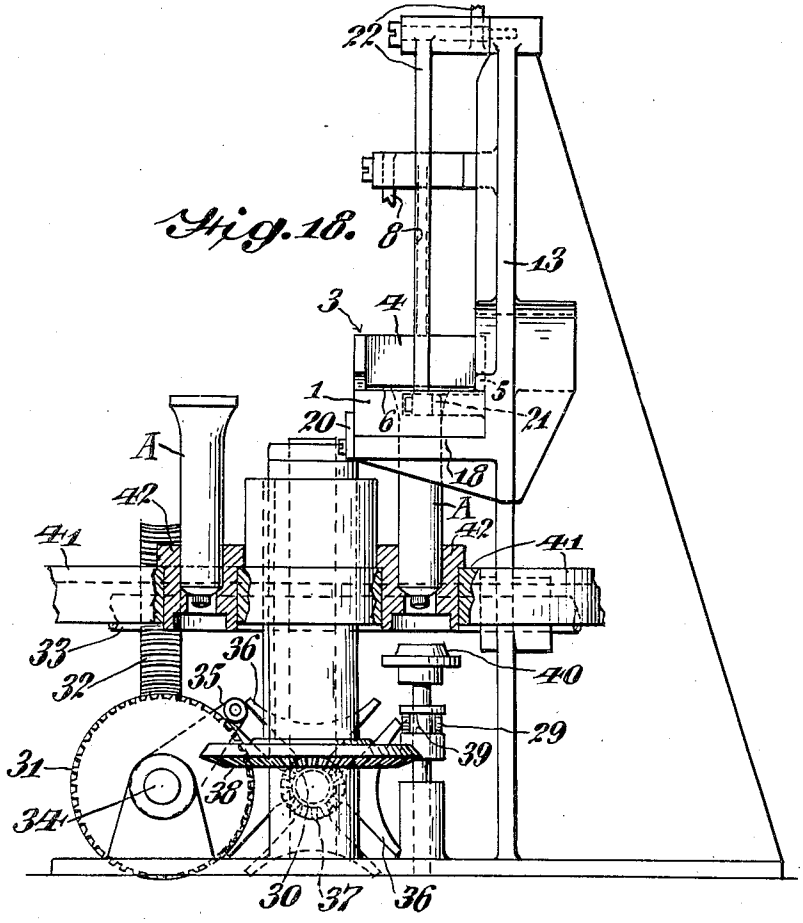


Fig. 19.

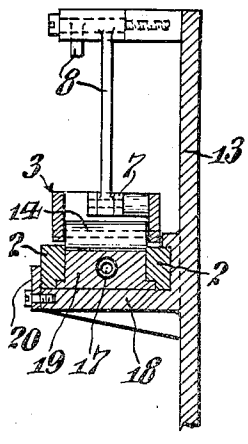


Fig. 20.

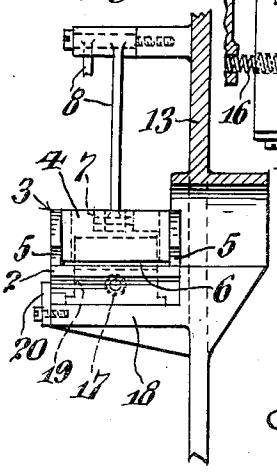
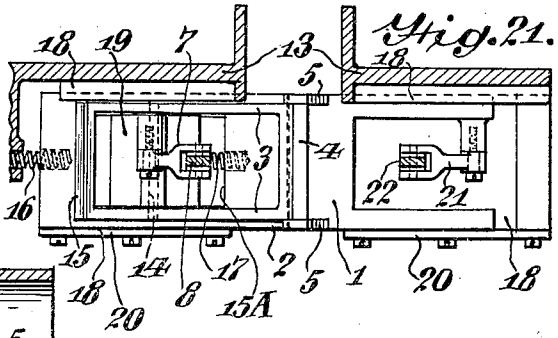


Fig. 21.



INVENTOR

Charles J. Westin,

BY

Augustus B. Stoughton.

Attorney

Patented Oct. 9, 1934 1,975,996

UNITED STATES PATENT OFFICE

1,975,996

TUBE CLOSING MACHINE

Charles J. Westin, Philadelphia, Pa., assignor to F. J. Stokes Machine Company, Philadelphia, Pa., a corporation of Pennsylvania

Application August 4, 1932, Serial No. 627,457

13 Claims. (Cl. 113—54)

This invention relates to mechanism for closing collapsible tubes with the new type of closure popularly known as the clipless closure. This type of tube is also known as the tube with the integral clip and is covered by Patent No. 1,852,225, granted to me on April 5, 1932.

The machine is similar in construction and operation to machinery manufactured previously but in order to produce the type of closure referred to, certain modifications and improvements have been made. It also embodies certain new features and improvements which are the result of years of experience and developmental work.

Formerly, a separate metal clip was used to reenforce the closure of the tubes. This separate piece of metal is now replaced by a similar clip made from the flat tube walls themselves. The economy effected by a clip produced in this manner is apparent as it eliminates the separately manufactured clip.

A feature of my invention consists in the provision of a reciprocating folder shoe adapted to fold the end of a tube in either direction of its movement.

A further feature of my invention consists in the provision of a lifting means for the tube synchronized with the closer jaws providing means for lifting the tube to two or more different levels in relationship to the folding and closing mechanism.

Yet another feature is a folder shoe pivotally mounted on one of the closer jaws and movable to fold the end of a tube projecting from between the jaws or movable into position between said jaws to fold the end of a tube against one of the jaws.

My invention includes a tube closing or sealing method of the character hereinafter described.

My invention also resides in the method hereinafter described which generically is similar to that described in my aforesaid patent.

For a further exposition of my invention reference may be had to the annexed drawings and specification at the end whereof my invention will be specifically pointed out and claimed.

In the drawings,

Fig. 1 is a side view of the end of a tube with parts broken away vertically.

Fig. 2 is a plan view of the open end of a tube ready for folding with dotted lines showing the parts after the initial fold.

Figs. 3 to 14, inclusive, are detail views in vertical cross sections of parts of the machine and tube in the successive positions which they occupy during the folding operation.

Fig. 15 is a side view of the end of a tube with parts broken away vertically after the fold has been made.

Fig. 16 is a side view with parts in vertical cross section of parts of the machine.

Fig. 17 is a plan view of parts of the machine.

Fig. 18 is an end view of parts of the machine.

Fig. 19 is a vertical cross section on line 19—19 of Fig. 16.

Fig. 20 is a vertical cross section on line 20—20 of Fig. 16, and

Fig. 21 is a horizontal cross section on line 21—21 of Fig. 16.

Referring to the drawings,

Fig. 1 is a front view showing the open end of the tube preformed or elongated. This operation is performed before the tube is carried between the closing jaws 1 and 2, Fig. 16. Fig. 2 shows the open end of the tube with the walls flattened against themselves. It should be noticed that the flattened portion of the tube extends a certain distance above the faces of the jaws 1 and 2, as seen in Fig. 3, which distance is determined by the width of the fold desired.

As seen in Fig. 3, folder shoe 3 is at a point over closer jaw 2 and moves to the right over the tube bending this flat against the top face of the jaw 1 as indicated in Fig. 4. At this stage closing jaw 1 moves away to the right from 2, allowing folder shoe 3 to drop down and continue the bending of the tube as indicated in Fig. 5. The first fold described in the patent as "an inturned end portion—terminal bend or tuck", is completed, as shown in Fig. 6, by jaw 1 moving to the left. Now jaws 1 and 2 open and the tube is lifted up between them as shown in Fig. 7.

Up to this point the method of folding and handling the tube is identical with the method used in producing the old double fold. Where in the old type of fold the distance which the tube was lifted above the jaws would be equal to the width of the first fold, it is in this case lifted twice the width of the first fold above the jaws, as shown in Fig. 7. The portion of the tube extending above the jaw is then bent over in a similar manner to operation shown in Fig. 4, but a difference will be noticed by observing Fig. 8. The results obtained by continuing the bending operation of the fold until the terminal fold of Fig. 6 is flat against the standing part of the tube is shown in Fig. 9 and Fig. 10. It should be noted at this point that the folder shoe 3 was in

a position over jaw 2 when starting the two folds just described and made the folds while moving from left to right. In Fig. 10, however, the folder shoe 3 is over jaw 1 when the tube is lifted for its third position and as the folder shoe moves to the left, as shown in Fig. 12, it bends the thus far finished portion of the fold back on top of jaw 2, thus reversing the fold so far made and producing the intermediate reverse bend or tuck referred to in the claims of the patent. Continuing the bending operation, as indicated in Fig. 13, completes the closure as shown in Fig. 14.

One of the new and novel features in the invention consists in using folder shoe 3 to perform the folding operation in two opposite directions. I do not, however, intend to be limited to the use of the one folder shoe as it is both feasible and practical to have one folder for each closer jaw synchronized to perform the folding in proper sequence.

Previous to the invention of the new type of closure the bends and folds were all made in the same direction as shown in Figs. 3, 4, 7 and 8 and the first series of folds were repeated a second time to produce the old double fold. In Figs. 7, 8, 9 and 10 (the second series of bends) the same identical method and sequence of operation is followed to this point in making the integral clip, excepting that the tube as shown in Fig. 7 extends higher in order to make this bend approximately twice as long as the old standard one.

The third series of bends begins by placing folder shoe 3 in a position over closer jaw 1, Figs. 10 and 11 when the tube is lifted up the desired distance, which in this case would be equal to the width of the closure. It will be noted that the single or second fold is in such a position that the inturned bent portion is approximately level with the face of the closer jaw which is assumed to be about the center of the single fold. As the folder shoe 3 slides from right to left it bends the second or single fold over onto closer jaw 2, Fig. 12. Closer 2 moves out of the way permitting folder 3 to drop down between the closers, but this time on the opposite side of the tube to that of the first and second bends, continuing the bending as in Fig. 13. The tuck and closure is finished as shown in Fig. 14. Thus, as described above, the reverse bend or tuck specified in the various claims of the patent is taken in the side of and pressed or flattened against the opposite side of the standing part of the tube while the inturned end portion is flat against the other side, providing an even number of folds each side of the standing part of the tube, as is shown in Fig. 15.

Fig. 16 shows the complete machine in which 41 is a table having a step-by-step movement. For the sake of description a round table is shown which has a revoluble step-by-step movement in the direction indicated by the arrow. In place of this table or dial 41 any type of conveyor, such as a belt may be used having provision to receive and carry the tube "A". The tubes "A" or a progression of tubes are carried in cups 42 which are seated on the table or conveyor 41. The cups 42 are made with a suitable recess to support the tubes "A" as they are conveyed from one position to another. The dial 41 may be operated through gearing 37 and 38 driven by means of shaft 30, Geneva drive 35 and star 36 having the Geneva drive 35 fastened on the main drive shaft 34. On shaft 34 may be mounted a coupling (not shown) for connecting the shaft to a motor or a pulley for belt drive. Dial 41 is keyed to the hub of bevel gear 38 and is adjustable up and down for longer or shorter tubes. It is ordinarily at a level which places the tube, when conveyed between the closer jaws 1 and 2, in the position shown at Fig. 3. Located at the closing and folding station under the dial is a lifter 40 which is operated by a cam 28 through a lever 29 so as to lift the tube cup 42 off its seat on dial 41 and place the tube "A" in the position shown in Fig. 7 and Fig. 11. Lifter 40 thus will take three distinctive positions in relationship to the folder jaws, the first position being as shown in Fig. 16 when out of the way to permit the dial to rotate in placing tubes between the folder jaws. The lifter is adjustable to conform with the elevation of dial 41 and the length of tube by the capscrew in collar 39.

The closer jaw 1 is connected to a bell lever 22 through link 21. The bell lever 22 is connected through link 23 to plunger 24 which is operated by cam 25, mounted on shaft 33. The closer jaws 1 and 2 are supported in the housing 13 by slideways indicated at 18 and held in place by the gibs 20. On closer jaw 2 is mounted the folder shoe 3 in such a way that by means of the fulcrum 14 it swivels on this fulcrum and will tip down between the folder jaws as indicated in Figs. 5, 9 and 13 when these parts take the proper relationship for this movement. The connection to the cam 12 controlling the movement of the folder shoe 3 and closer jaw 2 is through link 7, bell lever 8, link 9 and plunger 10. Fulcrum 14 is part of sliding block 19 which is housed in a recess of closing jaw 2. The closer jaw 2 is pressed forward against jaw 1 by the combined action of springs 16 and 17 unless its movement is limited by lever 26 controlled by cam 27. Spiral spring 17 serves four purposes: First, its action is combined with that of spring 16 in forcing jaw 2 forward to close the open end of the tube and press the folds and the tucks tight against the standing part of the tube; second, regardless of the force exerted by the bell lever 8 through folder 3 and slide 19 on jaw 2 through spring 17, it allows for the variations in wall thickness or number of folds placed between jaws 1 and 2; third, in view of the position of fulcrum 14 in relation to bell lever link 7 and the connection between link 7 and folder shoe 3, spring 17 has a tendency to hold the face 6 of the folder 3 down on the face of closers 1 and 2 at all times, and, if the support of one of the closers is withdrawn from under it, the closer jaw will swing on fulcrum 14 so that face 6 drops down to perform its function between the jaws; four, spring 17, providing a yieldable connection, permits the withdrawal of jaw 2 by lever 26 without disturbing the relative position of folder 3 excepting for its swiveling action. Spring 16 could be eliminated by providing a rigid connection between jaw 2 and lever 26 and controlling the action of lever 26 by means of a closed cam, but the use of a spring makes a simpler and more flexible arrangement.

On folder shoe 3 is fastened a hardened shoe 4 which is recessed along the greater portion of its bottom face 6, only leaving narrow ribs at the extreme ends for supporting the shoe. The edges of the recess are provided with rounded corners and are of a depth found through experience to give the desired pressing or ironing effect on the tube in folding it without any danger of shearing off the tube or squeezing it too tight, which would weaken the walls at this point. On the other hand the relationship between the power of spring 17 and the connection of link 7 with fulcrum

14 is so proportioned that it provides sufficient pressure of a yielding nature for pressing or ironing the fold, but at the same time allows for the variation in thicknesses of folds or the number of folds passing through the recess. The ribs 5 on shoe 4 are inclined upward from face 6 to permit the folder to drop between the closer jaws at the proper moment, but on the other hand these extensions of shoe 4 serve the purpose of a safety device and act as cams to lift the folder if the closer should come together while the folder is dropped between the two closers. The swiveling motion of folder 3 is limited on the one side by face 15 and on the other side of the fulcrum by face 15A.

All the cams which control the movement of the closing and folding mechanism are mounted on shaft No. 33 which is driven through spiral gears 31 and 32 from the main drive shaft 34 and are thus timed and synchronized with the intermittent step-by-step motion of the dial or table 41.

This closing machine may be an independent unit receiving filled tubes from a filling machine on the one side and delivering closed tubes to a corrugating machine on the other side. The natural and more efficient arrangement, however, is to make it a part of a complete machine in which the described mechanism would only be a small attachment of a machine also provided with filling and corrugating units. In a complete machine of that type, empty tubes would be placed in the cup 42 of table 41, conveyed past the filling unit receiving their charge of material, then passed through the closing mechanism and the corrugating attachment, and finally ejected as a completed product.

I do not intend to be limited in the practice of my invention save as the scope of the prior art and of the attached claims may require.

I claim:

1. In a machine of the type described, means for conveying a plurality of tubes having open ends, means for closing the open ends of the tubes, means for making an inturned end, means for bending the standing part of the tube a distance equal to twice or approximately twice the desired width of fold over on the one side and pressing the inturned end against that side of the standing part of the tube, means for lifting the tube a predetermined distance or about half of the fold just made and clamping the tube in that position, means to make a reverse bend or tuck in the flattened and folded part of the tube, means for releasing the tube from the clamped position and continuing the bending of the tuck thus taken, and means to finish the reverse bend by flattening it against the side of the tube.

2. In a tube closing machine of the type described, the combination of: means for conveying a plurality of tubes having open ends, means for closing the open ends of said tubes and for clamping the flattened portion of the tube between the closing means, means to bend and double on itself a portion of the flattened tube a distance approximately equal to the finished closure, means to relieve the tube from its clamped position and elevate the tube a distance equal to approximately twice the width of a finished closure and to clamp the tube again in that position, means to bend the portion thus measured off against the closing means towards the side where the terminal end is bent and flattened, means to continue the bending action to complete the single fold and flattening the terminal end against the standing part of the tube, means to relieve the tube from its clamped position and elevate the tube a distance equal to the finished closure and clamp the tube in that position, means to bend the single fold of the tube in a reverse direction against the closer and clamping jaw, and means to continue the bending until a tuck is made and folded tightly against the side or standing part of the tube opposite to the side which has the terminal bend.

3. In a machine of the type described, means for conveying a tube through the machine, a pair of reciprocating closer jaws mounted adjacent the level of the end of said tube, means for reciprocating said closer jaws to clamp said tube therebetween and to release said tube, a folder shoe mounted adjacent said jaws, means for actuating said shoe to fold a portion of said tube projecting from said jaws while clamped, and means operating in timed relation to said jaws for moving said shoe between one of said jaws and the tube in contact with a fold to continue bending and for thereafter moving said shoe between the other of said jaws and the tube in contact with another fold to continue bending thereof.

4. In a machine of the type described, means for conveying a tube through the machine, a pair of reciprocating closer jaws mounted adjacent the level of the end of said tube, means for reciprocating said jaws, a sliding block adjacent one of said closer jaws and movable therethrough, a folder shoe pivotally mounted on said block, means for reciprocating said sliding block to effect successive folds of portions of the tube projecting from said jaws, and means operating in timed relation to said block for effecting pivotal movement of the shoe to move it between one of said jaws and the tube in contact with a fold for one stroke of the block and to move it between the other of said jaws and the tube in contact with another fold for another stroke of said block.

5. A tube closing machine comprising tube conveying means, means for flattening the open ends of tubes carried by said conveying means, means for bending the flattened end portion of each of said tubes at a plurality of spaced points to produce a plurality of adjacent folds, and means for bending said flattened end portion between the bends defining said folds to form one or more folds overlying each side of the unfolded flattened end portion, said last-named three means including common clamping and folding elements.

6. A tube closing machine comprising tube conveying means, means for flattening the open ends of tubes carried by said conveying means, means for bending the flattened end portion of each of said tubes at a plurality of spaced points to produce a plurality of adjacent folds substantially on one side of the unfolded flattened end portion of said tube, and means for bending said flattened end portion between the bends defining said folds to bring one or more of said folds on the opposite side of the unfolded flattened end portion, said last-named three means including common clamping and folding elements.

7. A tube closing machine comprising conveying means, means for flattening the open ends of tubes carried by said conveying means, means for bending the flattened end portion of each of said tubes at points spaced from the open end thereof by distances substantially equal, respectively, to the width of the finished fold and to three times said width to produce a pair of adjacent folds, and means for bending said flat-

tened end portion substantially midway between the bends defining said folds to form equal folds on each side of the unfolded flattened end portion, said last-named three means including common clamping and folding elements.

8. A tube closing machine comprising tube conveying means, means for flattening the open ends of tubes carried by said conveying means, means for bending the flattened end portion of each of said tubes at a plurality of spaced points in the same direction to form a plurality of adjacent folds, and means for bending in the opposite direction said flattened end portion between the bends defining said folds, whereby one or more folds are formed on both sides of the unfolded flattened end portion, said last-named three means including common clamping and folding elements.

9. A tube closing machine comprising tube conveying means, means for flattening the open ends of tubes carried by said conveying means, means for folding over the flattened end portion of each of said tubes, means for refolding in the same direction a portion of said flattened end portion substantially twice the length of the first fold, and means for folding in the reverse direction said refolded portion at the center thereof, said last-named four means including common clamping and folding elements.

10. A tube closing machine comprising tube conveying means, means for flattening the open ends of tubes carried by said conveying means, means for bending the flattened end portion of each of said tubes, means for raising said tube and retaining it in raised position, means for again bending said flattened end portion, means for raising said tube a second time and retaining it in raised position, and means for bending said flattened end portion as retained in said second raised position to form a fold overlying each side of the unfolded flattened end portion, said flattening, bending and retaining means including common clamping and folding elements.

11. A tube closing machine comprising tube conveying means, means for flattening the open ends of tubes carried by said conveying means, means for bending the flattened end portion of each of said tubes to form a fold, means for raising said tube for a distance substantially equal to twice the width of said fold and retaining it in raised position, means for again bending said flattened end portion, means for raising said tube a second time by a distance substantially equal to the width of the finished fold and retaining it in raised position, and means for bending said flattened end portion as retained in said second raised position to form equal folds overlying the sides of the unfolded flattened end portions, said flattening, bending and retaining means including common clamping and folding elements.

12. A tube closing machine comprising tube conveying means, means for flattening the open ends of tubes carried by said conveying means, means for bending the flattened end portion of each of said tubes to form a fold, means for raising said tube for a distance substantially equal to twice the width of said fold and retaining it in raised position, means for again bending said flattened end portion in the same direction, means for raising said tube a second time by a distance substantially equal to the width of the finished fold and retaining it in raised position, and means for bending in the reverse direction said flattened end portion as retained in said second raised position to form equal folds overlying the sides of the unfolded flattened end portion, said flattening, bending and retaining means including common clamping and folding elements.

13. A tube closing machine comprising tube conveying means, a pair of closer jaws, means for operating said closer jaws to clamp said tube therebetween and to release the same, a folder shoe, means for actuating said shoe to fold a portion of said tube projecting from said jaws while clamped, and means operating in timed relation to said jaws for moving said shoe between one of said jaws and the tube and in contact with a fold to continue the bending thereof and for thereafter moving said shoe between the other of said jaws and the tube and in contact with another fold to continue bending thereof.

CHARLES J. WESTIN.