April 25, 1939. J. E. WOLLENWEBER 2,156,037

CONTAINER CLOSING MECHANISM

Filed Nov. 17, 1936 3 Sheets-Sheet 1

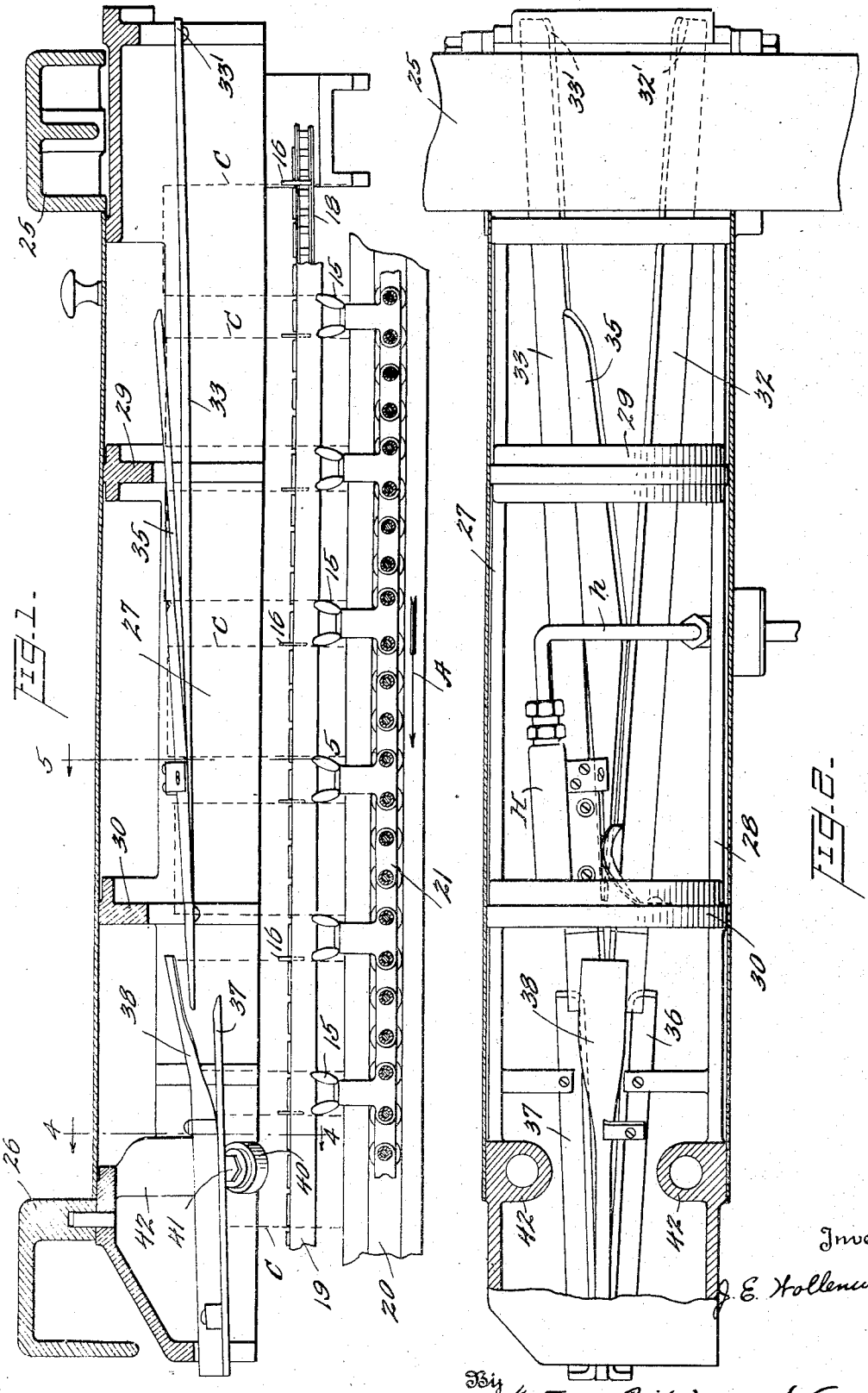


FIG. 1.



FIG. 2.

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CONTAINER CLOSING MECHANISM

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FIG. 3.

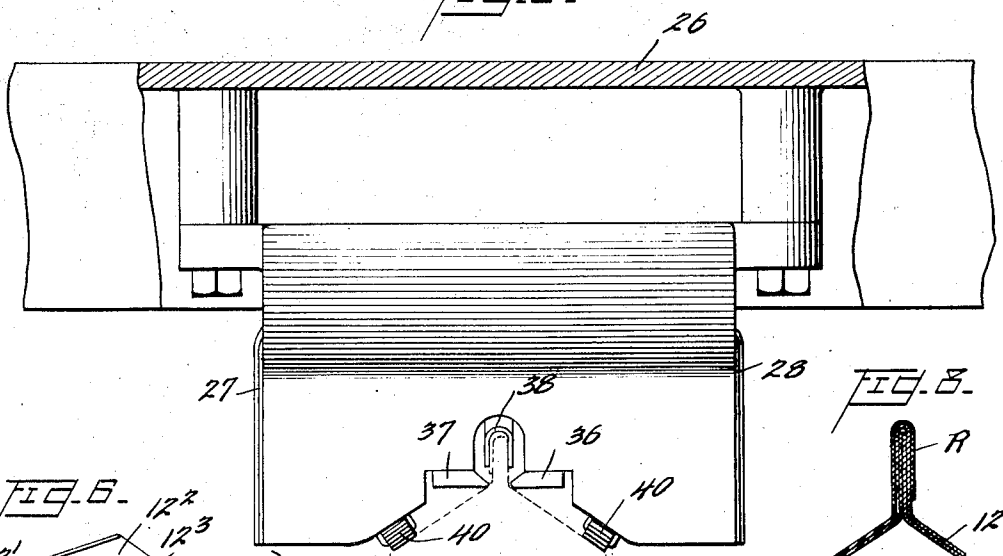



FIG. 8.




FIG. 6.

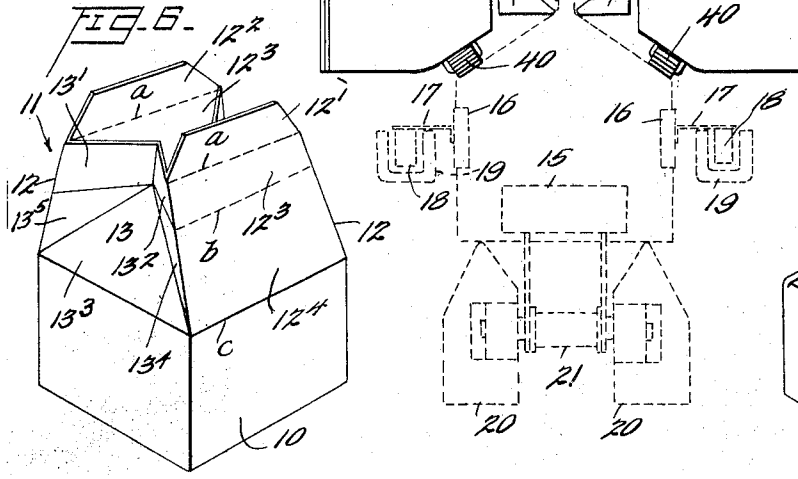



FIG. 7.

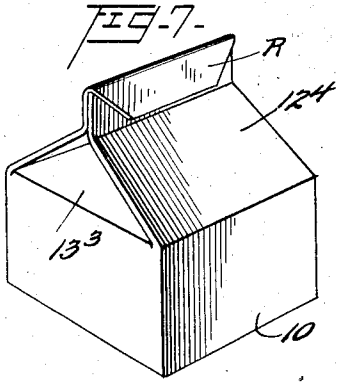



FIG. 4.

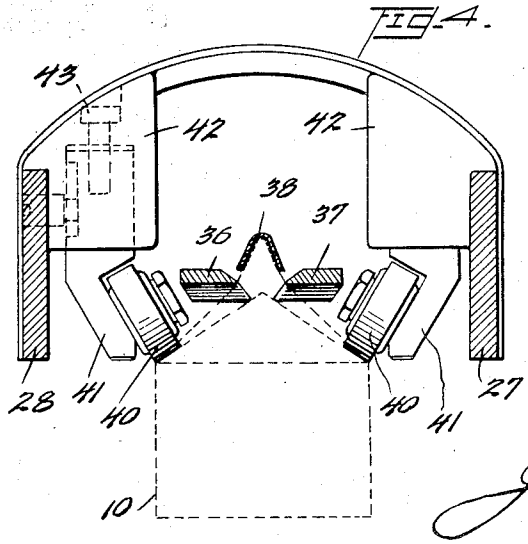
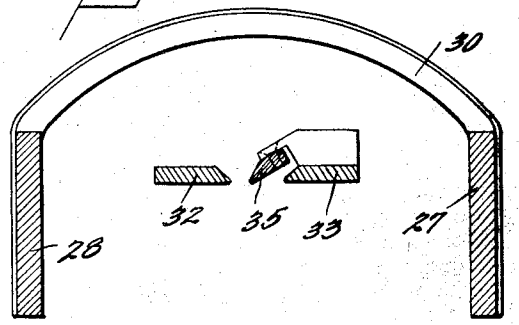



FIG. 5.




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CONTAINER CLOSING MECHANISM

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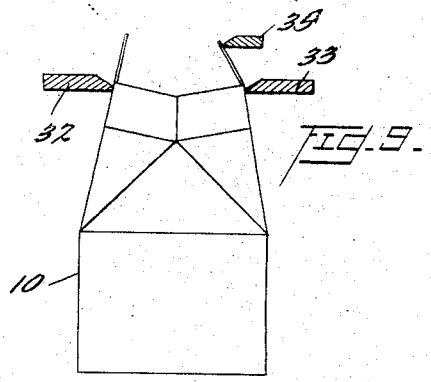



FIG. 9.

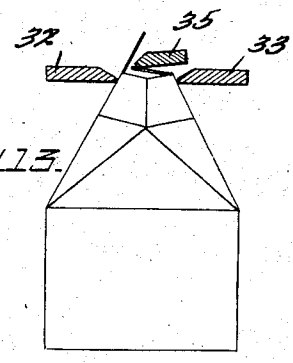



FIG. 13.

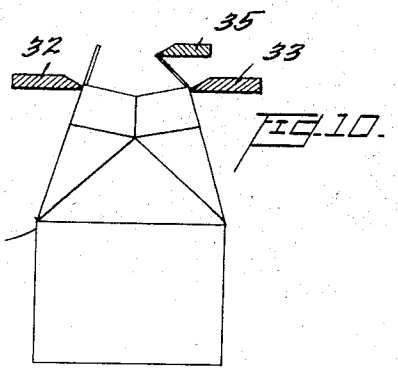



FIG. 10.

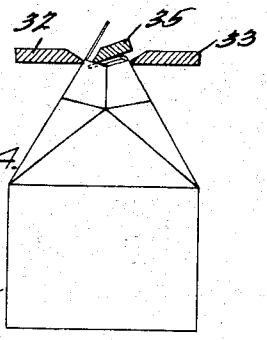



FIG. 14.

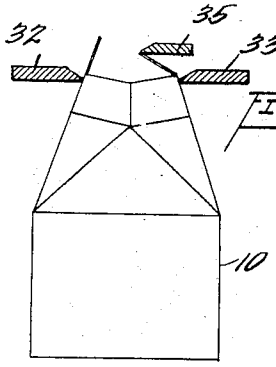



FIG. 11.

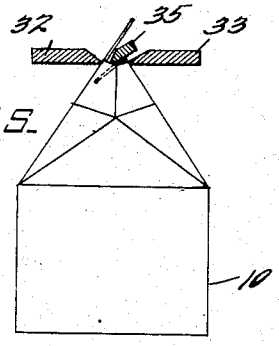



FIG. 15.

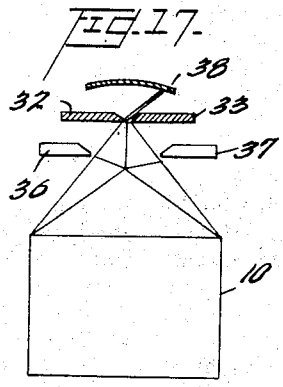



FIG. 17.

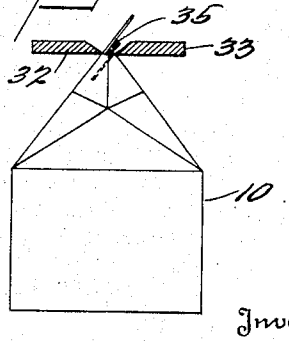



FIG. 16.

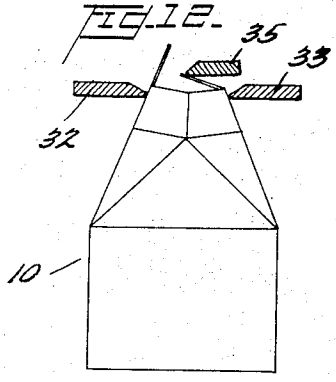



FIG. 12.

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Patented Apr. 25, 1939

2,156,037

# UNITED STATES PATENT OFFICE

2,156,037

## CONTAINER CLOSING MECHANISM

Julius E. Wollenweber, Detroit, Mich., assignor to The American Paper Bottle Company, a corporation of Ohio

Application November 17, 1936, Serial No. 111,297

6 Claims. (Cl. 93—6)

This invention relates to mechanism for closing the ends of containers and particularly to mechanism for folding the collapsible ends of tubular paper containers of the type disclosed in Patent No. 2,047,891 issued in the name of Henry T. Scott.

In the patent just referred to is disclosed a container, rectangular in cross-section, which is fabricated of relatively stiff paper, being self-supporting and having the necessary strength to render it suitable for use in the storage, transportation and distribution of liquids, such for instance as milk. The container is fabricated from a flat blank by folding operations, the blank being divided into panel sections by score lines about which lines the several panels are folded in the formation of the container. The container bottom may be of any suitable construction and is of course closed prior to introduction into the container of any liquid or other material with which the container is charged. The top or opposite end of the container is, however, left open until after charging and includes a foldable end portion comprising a plurality of relatively foldable panels which are adapted to be manipulated after the container is charged into the form of a peaked structure with a central transverse rib which structure not only forms a liquid and air-tight seal for the container top but is of such nature as to readily withstand the shocks and strains incident to transportation and handling of the container after it has been charged. Just prior to charging of the container it is coated exteriorly and interiorly with a coating substance which prevents the penetration of liquid into the paper fibers of the container walls and furthermore the foldable end closure is preferably subjected to a partial folding operation, the score lines intermediate the panels being thus redefined subsequently to the application of the coating substance.

Final closure of the foldable extension is effected by collapsing two opposed collapsible walls of this extension, folding toward each other and the axis of the container the other two walls, folding two end flaps which project from these last mentioned foldable walls, and thereafter breaking down the foldable walls to form the central transverse rib. After compression of the rib and the insertion of a suitable staple or other securing device, the closure operation is complete.

The several operations above described may be performed by hand or upon an automatically operating machine having a number of instrumentalities for successively acting upon the foldable end of the container to bring about the desired closure. In accordance with the present invention mechanism is provided for automatically performing the successive operations which must necessarily be performed upon the foldable end extension of the container and with less likelihood of error than mechanism heretofore designed or suggested for this purpose.

In accordance with the present invention the containers, after being charged, are moved along a predetermined path by a suitable type of conveyor mechanism, the movement being preferably continuous and folding instrumentalities positioned adjacent the path of movement of the containers contacting with the several portions of the foldable container end while the container is in transit and gradually effecting the folding of the container end as it moves. The container end, when it finally disengages the instrumentalities just referred to, is completely folded and closed and in condition to be finally sealed and stapled. The folding instrumentalities to which I have just referred comprise essentially elongated cam members, disposed generally parallel to the path of movement of the container, there being a plurality of such elongated cams and all of which cooperate in the folding of the several panels of the container and in the desired sequence.

In the accompanying drawings one form of mechanism for effecting the folding and closure of the foldable end of a container of the type described is illustrated and will be hereinafter described in detail. It will be appreciated by one skilled in the art that there may be changes in the design and arrangement of the folding instrumentalities without departure from the invention, as may be necessitated by minor changes in the design of the foldable container and that the drawings illustrate only one form of the invention, selected for disclosure by way of example.

In the drawings:

Figure 1 is a vertical axial section through the container top closing mechanism;

Figure 2 is a top plan view of the mechanism illustrated in Figure 1, the casing or cover for the mechanism, however, having been removed in order that the folding members might be clearly perceived;

Figure 3 is an end view of the apparatus, as seen from the left (Figure 1);

Figures 4 and 5 are sections on line 4—4 and 5—5 respectively of Figure 1;

Figure 6 is a perspective view of a container which has been charged and is ready for final closing;

Figure 7 is a perspective view of a charged and fully closed container;

Figure 8 is a transverse section through the central transverse rib of the closed container shown in Figure 7; and

Figures 9 to 17 inclusive illustrate diagrammatically successive positions of the container end panels as the folding operations are carried out.

The container illustrated in Figures 6 and 7 comprises a rectangular body portion 10, a bottom (not illustrated) and a foldable end portion indicated generally at 11. The foldable end portion in turn comprises opposed foldable sides 12 and opposed collapsible sides, one of which is indicated at 13. End flaps projecting upwardly from the foldable sides 12 are indicated at 12' and $12^2$ respectively. The rib R of the completed container includes the end flaps 12' and $12^2$, after folding, and also the panels $12^3$ of the sides 12, intermediate score lines *a*, *b* and the panels 13' and $13^2$ of the collapsible sides 13 of the end extension. The peaked structure shown in Figure 7, which is surmounted by the rib R, comprises panels $12^4$ of foldable sides 12 (only one of which panels is illustrated) lying between score lines *b* and *c* and three triangular panels $13^3$, $13^4$, and $13^5$ of each of the collapsible sides 13.

To effect the various folding operations the container is moved along a predetermined path and past stationary cam members which effect the desired folding operations, the container being preferably positioned upon a conveyor which moves in past the folding members at a steady uniform rate. The conveyor is illustrated diagrammatically in Figures 1 and 3 but need not be described in detail since various types of conveyors may be employed. It is to be preferred, however, that a conveyor having spaced container engaging and gripping members 15 be provided, for engaging opposed side walls of the container near the bottom thereof, and also that the conveying mechanism include members, such as indicated at 16, for engaging the rear or following wall faces of the several containers and to support the container against rearward tilting movement as it moves past the closing instrumentalities. Members 16 are suitably mounted upon horizontally disposed links 17 which are in turn mounted upon chains 18 diagrammatically shown in Figure 3 and are guided in chainways 19. Container supporting rails are indicated at 20 and the conveyor chain upon which container gripping members 15 are supported and carried is indicated generally at 21, this chain being carried in suitable recesses formed in rails 20.

It will be appreciated that the mechanism for closing the container ends, which comprises the subject matter of the present invention, forms portion of a larger and completely automatic machine for forming, coating, charging, closing, and sealing the containers, although it may be independently operated if desired. Hence the frame upon which the several parts of the closing mechanism are supported may have any one of a number of different forms. In the present instance the various container closing instrumentalities are permanently secured to a frame which comprises the cross members 25 and 26 which may in turn be attached to any suitable base or support, the longitudinally extending members 27 and 28, their ends of which are integral with or rigidly secured to the cross members 25 and 26, and the transversely extending arched members 29 and 30, the ends of which are rigid with the longitudinal members 27 and 28.

A plurality of containers are indicated diagrammatically at C in Figure 1 of the drawings and by means of the conveyor mechanism above briefly described, or any other suitable conveyor mechanism, the containers are steadily advanced through the frame comprising members 27, 28, 29 and 30 in the direction of the arrow A shown in Figure 1. Suitably secured within this frame are the stationary folding members for effecting the folding and closure of each successive container, these members being either directly fastened to the frame or indirectly by means of brackets, the specific mounting means being immaterial. Two of these folding members, which are in the nature of stationary cams, are indicated at 32 and 33 respectively and it is by means of these opposed members that the sides 12 of each container are successively rocked or folded toward each other about score lines C as the containers progress in the direction indicated by the arrow A.

From Figures 9 to 17 of the drawings it will be perceived that these side folding operations are steadily progressing as a container is moved through the apparatus, the ends 32' and 33' of these cam members first engaging the sides 12 of a container, at or adjacent the upper margins of these sides, as the container enters the apparatus, and as indicated in Figure 9. Cams 32 and 33 are disposed angularly to the path of movement of the container with the result that the upper edges of sides 12 are eventually brought together, as shown in Figure 17, through the action of these cams 32 and 33, to form a peaked structure. During this time, of course, the opposed collapsible sides 13 of the container are forcibly collapsed, the collapsing of these sides progressing uniformly as the sides 12 are progressively folded.

The container end flap 12' must, however, be inserted within the open mouth of the container prior to the completion of the folding operations performed on the side walls 12 and to effect the inward folding of flap 12' a cam member 35 is provided, this cam being so supported and shaped as to deflect inwardly and then downwardly the end flap 12', as may be readily perceived from an inspection of Figures 9 to 16 of the drawings. Prior to the time that the side walls 12 of the end closure are caused to meet along the upper edges, as shown in Figure 17, the end flap 12' has been completely inserted within the container, the flap and wall folding operations occurring concurrently although, as may be readily perceived from an inspection of Figures 1 and 2, the flap folding cam 35 need not be coextensive in length with the side folding cams 32 and 33.

Overlapping the terminal ends of the side folding cams 32 and 33 also, as shown in Figure 2, are the rib forming cams 36 and 37, also the cam 38 for folding downwardly and over the rib the remaining end flap $12^2$. As a container emerges from between cams 32 and 33 it is engaged by the three folding cams 36, 37 and 38, cams 36 and 37 being at an elevation above the conveyor to contact the inclined walls 12 of the container at approximately the score lines *b* and it being the function of these cams to break down the sides 12 of the foldable extension and to bring

panels $12^3$ of these sides into parallelism, thus forming a rib comprising in addition to parallel panels $12^3$ the end flap 12' and the panels $13^1$ and $13^2$ of the collapsible sides 13 of the end extension. During this rib forming operation the stationary cam member 38 is acting upon the end flap $12^2$ and to fold this end flap downwardly over and into parallelism with the panel $12^3$ of the side 12 to which the flap $12^2$ is not connected, as indicated in Figure 8 in the drawings. In Figures 4 and 17 the rib forming cams are illustrated, also the flap folding cam 38 and from an inspection of Figure 4 it is perceived that these three cams are so angularly disposed with respect to each other that, just prior to the emergence of a container from the device, the rib has been completely formed and the various plies thereof brought into complete parallelism. When the container actually emerges from the folding mechanism just described the end, therefore, has been completely closed and the transverse rib formed. Upon emergence, the rib is engaged by additional instrumentalities (not illustrated) which maintain it in the condition in which it is delivered and further act upon it to seal and staple the same.

As will be perceived from an inspection of Figures 1 and 4, rollers 40 are adapted to engage the lower margins of the inclined panels $12^4$ just prior to emergence of a container from the folding apparatus, it being the function of these rollers to act upon these panels closely adjacent the score lines *c* and to stress the paper at the score lines *c* so as to cause the panels $12^4$ and the sides 10 to intersect at a sharp angle, the paper at the score lines *c* being broken down slightly by the action of the rollers so that the resultant closed container has sharp well defined angles along opposite edges. The rollers 40 are mounted upon members 41 which are received within apertures formed in brackets 42 rigid with the frame members 27 and 28. The rollers may be elevated or depressed by the manipulation of adjusting screws 43, positioned in suitable apertures in the frame and having threaded engagement with members 41.

As previously observed the mechanism above described may form a portion only of a complete automatic container forming, charging and closing machine, although not necessarily so. It is contemplated, however, that in the usual case the containers will be coated with a suitable liquid proofing substance such as paraffin or the like, prior to being subjected to a closing operation, which substance is liquid when heated and solidifies upon cooling. Just prior to charging also the container foldable end may also be, and preferably is, subjected to a score line redefining operation such as may be carried out by means of the mechanism disclosed in Patent No. 2,056,330 granted October 6, 1936. From this mechanism the container is delivered in the partially closed condition in which it is illustrated in Figure 6 of the drawings, no attempt having been made, however, to show the paraffin coating.

As the coated container passes through the closing mechanism illustrated it may be found desirable to soften certain portions of the coating, to facilitate flexing of the panels about the score lines or to soften the coating on certain panels just prior to the time of contact of such panels with other panels in the formation of the central transverse rib. A more closely bonded and more solid rib is thus obtained. In conjunction with the folding cams above described, I employ one such coating softening device, and may employ others if it appears advantageous. This device is indicated at H, being mounted upon the flap folding cam 35. Essentially it is a heater and is so connected to the cam 35 that this cam is also heated. Just prior to the time that container flap 12' is brought into contact with the panel $12^3$ of the opposite side of the foldable end extension therefor, the coating upon the end flap 12' is softened and better bonding of the two panels results. Other heaters may be placed elsewhere on the folding cams to effect similar results. The details of construction of the heater H may be varied widely and steam, electricity or other heating medium employed, the heater communicating with a suitable source of such medium by means of a tubular conduit *h*.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. Mechanism for closing the end of a tubular container having a foldable end portion, comprising stationary opposed cam members for engaging and folding toward the container axis two opposite sides of said end portion as the container is moved longitudinally of said cam members, and a third cam member for folding and bending downwardly into the open mouth of the container a closure flap projecting from one of said sides.

2. Mechanism for closing the end of a tubular container having a foldable end portion, comprising stationary opposed cam members for engaging and folding toward each other and the container axis two opposite sides of said end portion to form a peaked structure as the container is moved longitudinally of said cam members, and a third cam member for engaging a closure flap projecting from one of said sides and folding the same into the container mouth prior to the completion of said peaked structure by the first mentioned cam members.

3. Mechanism for closing the end of a tubular container having a foldable end portion with opposed foldable sides and end flaps projecting therefrom respectively, comprising stationary cams for folding the sides toward the container axis to form a peaked structure, as the container is moved longitudinally of the cams, and additional stationary cams for folding the end flaps, one flap into the container between said sides and the other flap over the outer surface of the side to which it is not attached.

4. In a mechanism for closing the end of a previously scored, partially closed, coated tubular container having a foldable top portion, two groups of fixed cam members, the container engaging surfaces of which are inclined both vertically and horizontally to the direction of container movement, the first of said groups comprising a pair of elongated opposed cam members acting upon the sides of the foldable portion of the container, a relatively shorter cam member acting upon the extended portion of one side of the container whereby said portion is inserted within the foldable portion of the container before the ends thereof are brought into intimate engagement with each other, a heating element secured to said shorter cam member by means of which the coating material of said container is softened before the other extended portion of the container is brought into intimate engagement with the partially closed container, the second of said groups comprising a pair of cam members engaging the side walls of the partially

folded portion of the container whereby the opposite side walls of the container are brought into intimate engagement with each other and a relatively longer cam member of tapering inverted U section which engages the said other extended portion of the container folding it over the top of the first extended portion.

5. A mechanism for closing the open ends of previously scored tubular containers by relatively folding the end panels thereof, said mechanism comprising a conveyor having gripping elements for engaging the body of a container and advancing the same along a predetermined path, fixed folding members positioned to engage the relatively foldable end panels thereof and fold said panels, and opposed rollers rotatably mounted laterally of said fixed path for rotation about axes disposed transversely of said path and in position to directly engage and deflect predetermined areas of the foldable portions of successively presented containers moving along said path to more sharply define the corners formed by angularly disposed adjacent panels of such containers.

6. A mechanism for closing the open ends of previously scored tubular containers by relatively folding the end panels thereof, said mechanism comprising a conveyor having gripping elements for engaging the body of a container and advancing the same along a predetermined path, fixed folding members positioned to engage the relatively foldable end panels thereof and fold said panels, and opposed rollers rotatably mounted on opposite sides of said path, respectively, the axes of said rollers being relatively inclined and disposed in a common plane transverse to said path, said rollers being positioned to simultaneously engage and deflect predetermined areas of the foldable portions of successively presented containers moving along said path and to more sharply define the corners formed by angularly disposed adjacent panels of such containers.

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