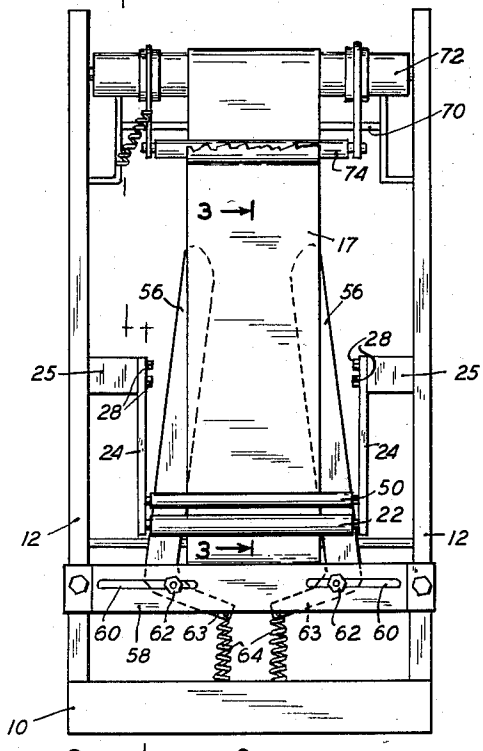
Nov. 29, 1960 K. WAMSLEY ET AL 2,961,930

GUSSET FORMER

Filed Oct. 21, 1957 2 Sheets-Sheet 1

FIG.1



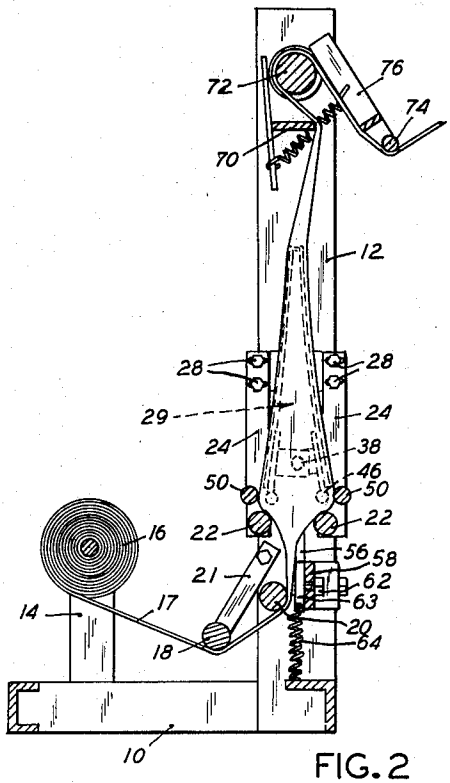


FIG.2

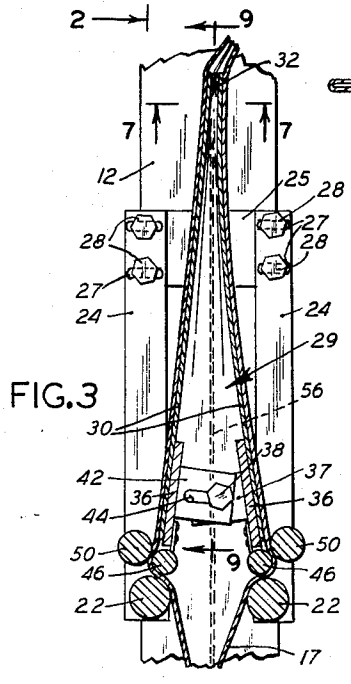


FIG.3

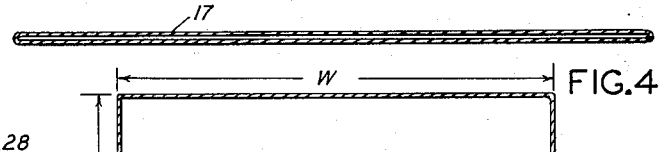


FIG.4

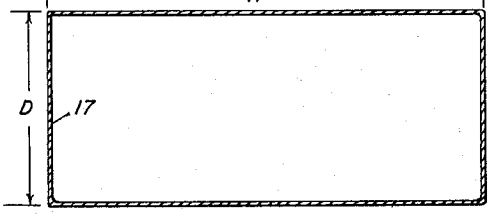


FIG.5

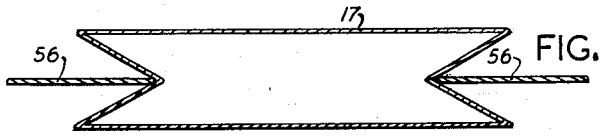


FIG.6

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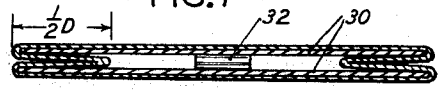
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Nov. 29, 1960 K. WAMSLEY ET AL 2,961,930

GUSSET FORMER

Filed Oct. 21, 1957 2 Sheets-Sheet 2

FIG.7



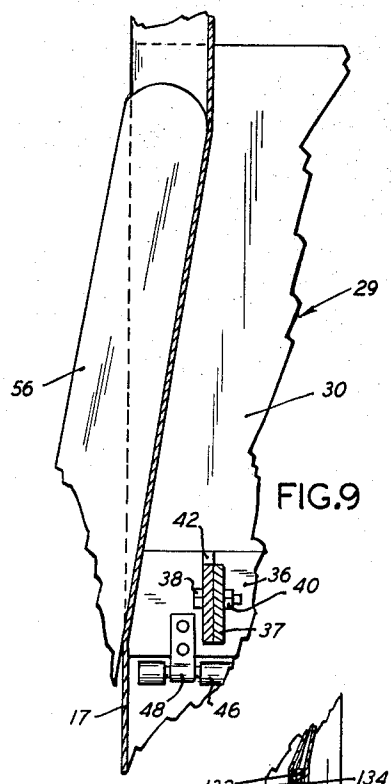


FIG.9

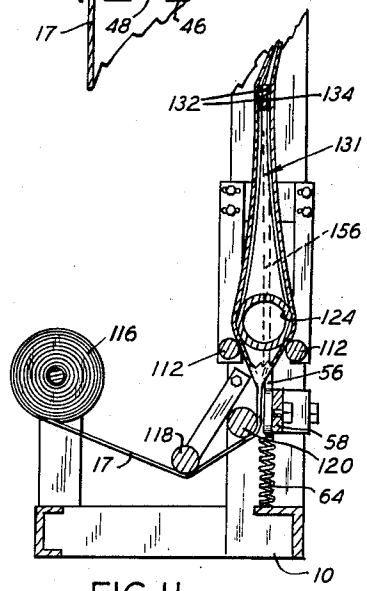
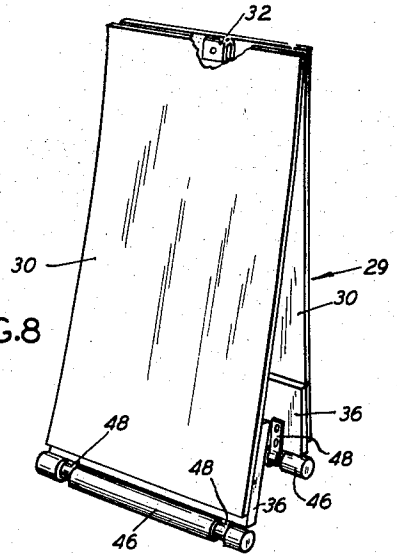


FIG.11

FIG.8



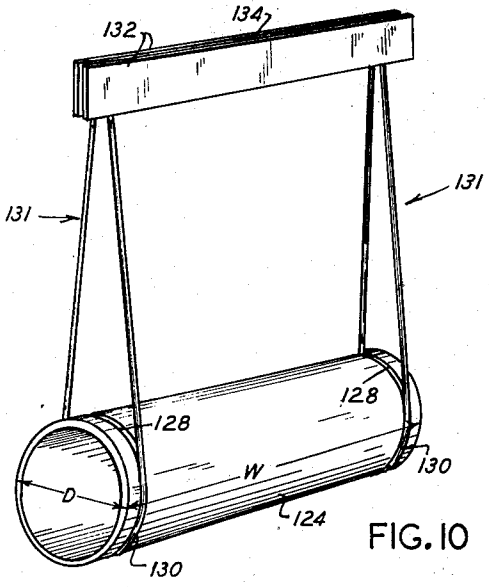


FIG. 10

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2,961,930

GUSSET FORMER

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Filed Oct. 21, 1957, Ser. No. 691,386

8 Claims. (Cl. 93—1)

The present invention relates to apparatus for forming gussets in tubing such as is used for forming bags.

A principal object of the present invention is to provide a new and improved apparatus for forming oppositely disposed gussets in a length of seamless tubing.

It is a further object of the invention to provide gusset forming apparatus that may be readily adjusted for use with tubings of various sizes and to form gusseted tubing of desired dimensions.

Other objects and advantages of the invention will become more apparent hereinafter.

In accordance with the illustrated embodiment of the invention, apparatus is provided including a prism-like spreading device for insertion within the tubing to be gusseted and over which the tubing is continuously drawn. The tubing is first fully expanded by the divice and means is provided to coact with the spreading device to form tucks in opposite side portions of the expanded tubing as it is drawn over the device. The gusseted tubing can then be rolled for storage or passed to a bag forming machine or the like.

For a more detailed description of the invention, reference is made to the following specification taken in conjunction with the accompanying drawings wherein:

Fig. 1 is a front elevation of apparatus constructed in accordance with the invention;

Fig. 2 is a sectional view taken substantially along line 2—2 of Fig. 1;

Fig. 3 is an enlarged sectional view taken substantially along line 3—3 of Fig. 1;

Fig. 4 is a sectional view of flatly collapsed tubing upon which apparatus of the invention is designed to work;

Fig. 5 is a view illustrating the fully expanded condition of the tubing as it passes through the apparatus of the invention;

Fig. 6 is a view showing an intermediate condition of the tubing during the intucking of the opposite side portions thereof;

Fig. 7 is a sectional view taken substantially along line 7—7 of Fig. 3 showing the condition of the tubing with the opposite sides fully intucked between the opposite flat faces of the tubing;

Fig. 8 is a perspective view of the spreading device partly broken away;

Fig. 9 is an enlarged fragmentary sectional view taken substantially along 9—9 of Fig. 3 and showing the progressive intucking of the tubing;

Fig. 10 is a perspective view of another form of spreading device in accordance with the invention; and

Fig. 11 is a fragmentary sectional view of apparatus incorporating the spreading device of Fig. 10.

Referring first to Figs. 4 to 7, inclusive, the apparatus of the invention is particularly designed for handling lengths of tubing 17 of plastic, paper or other similar flexible material and for converting the tubing from a flatly collapsed condition such as shown in Fig. 4 to a gusseted condition as shown in Fig. 7. In the apparatus of the invention the collapsed tubing is first expanded

into a rectangle as shown in Fig. 5 having along one pair of sides a dimension w equal to the width desired across the flat faces of the finished gusseted tubing, and having along the other pair of sides a dimension d equal to twice the depth of the desired gussets. The desired opposite sides of the tubing are then progressively intucked as indicated in Figs. 6 and 7 to form flat gusseted tubing which may be used for making collapsed bags or other purposes.

The apparatus of the invention is illustrated as mounted on a frame including a base 10 upon which are secured a pair of oppositely disposed uprights 12. It is to be understood that the apparatus of the invention can be used directly with tubing forming machinery, but in the present instance it is shown with a support 14 for holding a roll 16 of previously formed collapsed tubing 17. From the supply roll 16, the tubing 17 is led under an idler roll 18 supported on arms 21 swingably mounted on the uprights 12. The roller 18 is preferably formed of metal, such as steel, so that it will be relatively heavy and will tend to depress the tubing into a path such as shown in Fig. 2. From the idler roll 18, the tubing is led beneath a guide roll 20 journaled between the uprights 12 and is then passed upwardly between a pair of opposite supporting rolls 22 which are rotatably mounted between hangers 24 secured to the uprights 12 for lateral adjustment for a purpose to be mentioned hereinafter. Refering to Fig. 3, the hangers are each provided with a pair of lateral or horizontal slots 27 adjacent the top thereof for receiving bolts 28 which are threaded into tapped openings formed in brackets 25 rigidly secured to the uprights 12. By loosening the bolts 28, the distance between the rolls 22 may be adjusted as desired.

Supported on the rollers 22 and positioned within the tubing 17 is an integral spreading device 29 (Fig. 8) for spreading the tubing from its collapsed condition, such as shown in Fig. 4 to an open condition such as shown in Fig. 5. Referring more particularly to Figs. 3 and 8, the spreading device 29 compises a pair of substantially flat, rectangular elements or plates 30 which extend upwardly from the rollers 22 in substantial parallelism with the axes thereof. The top portions of the plates 30 are hingedly secured together in closely spaced but non-touching relation, such as by a flexible inverted U-shaped member 32, the opposite legs of which are fastened by suitable means to the opposite facing surfaces of the plates 30. Means are provided between the lower end of the plates 30 for retaining the same in predetermined spaced relation. In the illustrated embodiment, adjustable means are provided including a pair of platelike elements 36 mounted one upon the inner face of each of the plates 30. Extending outwardly from one of the elements 36 towards the other, from each of the opposite side edges thereof, are a pair of ears 37 each provided with an opening for receiving therethrough a bolt 38 having a nut 40 mounted thereon. The opposite element 36 is formed with a pair of ears 42 which extend toward the opposite element in juxtaposition one beside each of the ears 37. The ears 42 are each formed with a slot 44 for receiving the corresponding bolt 38. Thus by appropriate loosening or tightening of the nuts 40, the relative position of the lower ends of the plates 30 may be adjusted as desired.

Mounted along the lower edge of each of the plates 30 is a roller 46 supported in bushings 43 secured to the lower edge of the mounting elements 36. As shown best in Fig. 3, the rollers 46 engage through the wall of the tubing upon the rollers 22 and roll thereon as the tubing 17 is drawn between the rollers 46 and 22.

Preferably, means are provided for preventing movement of the spreading device with the tubing as the same is drawn through the apparatus of the invention. The

weight of the spreading device will tend to retain it in position against the force of the frictional engagement of the tubing **17** therewith but to make sure that it is retained in position, positive means are preferably provided. In the present embodiment of the invention, such means comprise a pair of retaining or hold-down rollers **50** journaled in the hangers **24** and mounted one upon each of the opposite sides of the spreading device in position to engage through the wall of the tubing upon the rollers **46** so as to retain the rollers **46** in engagement with the rollers **22** as best shown in Fig. 3.

Means are provided to tuck the opposite side edges of the tubing inwardly between the plates **30** as the tubing moves upwardly past the spreading device. Such tucking means comprise a pair of fingers **56** mounted one upon each of the opposite side edges of the spreading device and extending inwardly between the plates **30** as indicated in Figs. 1 and 9. The fingers **56** engage upon the outer surface of the tubing and are tilted inwardly from the bottom towards the top of the spreading device so that the tuck is progressively deepened as shown also in Figs. 6 and 7 which show the progressive formation of the tucks. The fingers **56** are pivotally mounted on a cross member **58** extending between the uprights **12**. The cross member **58** is provided with slots **60** through which extend bolts **62** which also extend through an appropriate finger **56** and upon which bolts the fingers pivot. The slots **60** permit lateral adjustment of the fingers **56** so that the fingers may be used with spreading devices of various widths. The fingers **56** are each provided with an offset projection **63** at the bottom thereof to the ends of which are attached springs **64** which are secured to the base **10** and tend to bias the upper ends of the fingers inwardly between the plates **30**.

Mounted above the spreading device **30** are means for flattening the tubing with the side edges tucked between the opposite flat faces thereof. After passing the spreading device, the tubing is first led over a creasing bar **70** and then passed over a creasing roller **72**. As best illustrated in Fig. 2, the creasing bar **70** is offset from the path between the top of the spreading device and the creasing roller **72** so that the tubing is pressed firmly against the creasing bar to assure the formation of the crease in the folded edges of the tubing. From the creasing roller **72**, the tubing is led beneath a hold-down roller **74** swingably mounted on a pair of arms **76** from the uprights **12**. The tubing can then be fed to a rewind roll (not shown) or may be fed directly into apparatus for severing the tubing and forming individual bags from the same, the latter apparatus not being illustrated since it forms no part of the present invention.

Summary of operation

As has been indicated by the description of the apparatus given hereinbefore, in forming the gussets or tucks in the side edges of tubing **17** with the apparatus of the invention, the tubing is withdrawn from the supply roll **16** and led beneath the rolls **18** and **20**, successively, and thence upwardly between the rolls **22** and over the free-floating spreading device **29**. As the tubing passes over the spreading device, it is first spread to its fully opened condition so that the tubing has on its opposite faces a width *w* equal to the desired width of the flat faces of the gusseted tubing. The opposite sides of the opened tubing each has a dimension *d* which is equal to twice the depth of the gussets to be formed in the tubing. As the tubing is drawn upwardly over the spreading device, the pressure of the fingers **56** causes the opposite sides of the tubing to be tucked inwardly between the plates **30**, the fingers being so arranged that as the tubing emerges between the plates **30** at the top of the spreading device, the gussets will be fully intucked as shown in Fig. **7** and at which point the gussets will have a depth equal to one-half *d* as indicated. The tubing is then led upwardly over the creasing bar **70** and the creasing roller **72** so as to crease the folds and prevent their loss from the folded tubing.

The apparatus is easily adjusted for use with tubing of different circumference or to change the dimensions of the gusseted tubing. For example a given spreading device can be used with tubing of different circumferences merely by varying the distances between the rollers **46** as necessary to fit the device within the tubing. Deep gussets will be formed in large tubing, of course, and shallow gussets in smaller tubing. Similarly with a given tubing the depth of the gussets formed may be varied by selecting a spreading device with an appropriate dimension *w*. Obviously, the spacing of the rollers **22** may be adjusted suitably to support the selected spreading device.

In Figs. 10 and 11, there is illustrated a modified form of the invention and in which the principal change consists in the construction of the separating device. In this modified apparatus, ungusseted tubing **17** is led from a supply roll **116** beneath a tensioning roll **118** and a guide roll **120** and thence upwardly between a pair of supporting rolls **112**. The latter rolls support the separating device (see Fig. 10) which includes a cylindrical separating member **124** which has a length equal to the desired width *w* of the ungusseted tubing and a diameter *d* equal to twice the depth of the gussets to be formed in the tubing. The member **124** is formed with a peripheral groove **128** at each of its opposite ends in which are received rods or wires **130** which extend upwardly from the cylinder and define a pair of opposite rectangular elements indicated generally at **131** which converge symmetrically towards one another. The tops of the elements **131** are defined by a pair of metal strips **132** to which the opposite ends of the wires **130** are secured as by brazing or other suitable means. The metal strips **132** are secured together at their centers in parallel spaced-apart relation by a bracket indicated at **134**. It will be noted that the spreading device of this embodiment and that of the previously described embodiment as well in effect define a prism having a base which is equal in circumference to the circumference of the tubing.

Fingers **156** are provided for progressively tucking the tubing inwardly of the triangulated sides between the elements **131** as the tucking is drawn over the spreading device toward the apex thereof. As in the previously described embodiment, suitable means (not shown) may be provided to crease the gusseted tubing.

Having illustrated and described certain preferred embodiments of the invention, it should be apparent to those skilled in the art that the invention permits of modification in arrangement and detail. We claim as our invention all such modification as come within the true spirit and scope of the appended claims.

We claim:

1. Apparatus for forming a pair of opposite gussets in a continuously advancing length of preformed tubing comprising an integral, free-floating spreading device for positioning wholly within the tubing, said spreading device comprising means defining a pair of elements rectangular in outline arranged substantially to define a prism having a base equal in circumference to the circumference of the tubing, said elements having a predetermined width substantially equal to the desired width of the flat faces of the gusseted tubing, said elements at the apex end of the prism being slightly spaced apart, said tubing being advanced over said device in the direction from the base to the apex thereof, and tucking means mounted one on each of the opposite sides of said device for tucking the opposite side edges of the tubing inwardly of the triangulated sides thereof and between said elements, said tucking means comprising a pair of fingers mounted one on each of the opposite side edges of said spreading device and extending inwardly between said elements at the apex of the device for engaging upon the outer surface of the tubing.

2. Apparatus for forming a pair of opposite gussets in a continuously advancing length of preformed tubing comprising an integral, free-floating spreading device for positioning wholly within the tubing, said spreading device comprising means defining a pair of elements rectangular in outline arranged substantially to define a prism having a base equal in circumference to the circumference of the tubing, said elements having a predetermined width substantially equal to the desired width of the flat faces of the gusseted tubing, said elements at the apex end of the prism being slightly spaced apart, said tubing being advanced over said device in the direction from the base to the apex thereof, a pair of rollers mounted one adjacent the outer surface of each of said elements and positioned to engage the same and prevent movement of the spreading device with the tubing, tucking means mounted one on each of the opposite sides of said device for tucking the opposite side edges of the tubing inwardly of the triangulated sides thereof and between said elements, said tucking means comprising a pair of fingers mounted one on each of the opposite side edges of said spreading device and extending inwardly between said elements at the apex of the device for engaging upon the outer surface of the tubing, and means resiliently urging said fingers inwardly between said elements.

3. Apparatus for forming gussets in a continuously advancing length of preformed tubing comprising a pair of rollers disposed with their axes in the same horizontal plane and between which the ungusseted tubing is led upwardly, an integral, free-floating spreading device for positioning within the tubing above said rollers and comprising means defining a pair of substantially flat, rectangular members having a width substantially equal to the desired width of the flat faces of the gusseted tubing, said members being disposed in parallel relation to the axes of said rollers, the lower ends of said members being spaced apart a distance substantially twice the depth of the gusset to be formed in the tubing, the top ends of said members being positioned in closely spaced but non-touching relation, and means for tucking the opposite side edges of the tubing inwardly between said members at the top ends thereof comprising a pair of fingers extending inwardly between said members adjacent the top ends of said members for engaging upon the outer surface of the tubing, the distance between said rollers being less than the spacing of said member of lower ends whereby said spreading device may be supported on said rollers.

4. Apparatus for forming gussets in a continuously advancing length of preformed tubing comprising a first pair of rollers between which the ungusseted tubing is led, an integral, free-floating spreading device for positioning within the tubing beyond said first rollers and comprising a pair of flat, elongate substantially rigid plates positioned in parallel relation to the axes of said first rollers, adjustable means between the ends of said plates adjacent said first rollers for retaining the plates in predetermined spaced relation, means hingedly connecting the opposite ends of said plates in closely spaced relation, each of said plates having a roller rotatably journaled along the first mentioned end thereof for engaging through the tubing wall one upon each of said first rollers in axially parallel relation therewith, a second pair of rollers mounted in axially parallel relation to said spreader rollers and beyond the same and being positioned to engage upon said spreader rollers and prevent movement of the spreading device with the tubing, tucking means beyond said rollers to tuck the opposite side edges of the tubing inwardly between said plates at the last mentioned end of the latter, said tucking means comprising a pair of fingers mounted one on each of the opposite side edges of said spreading device and extending inwardly between the plates for engaging upon outer surface of the tubing, and means beyond said spreading device and intucking means for flattening the tubing with the side edges intucked between the opposite flat faces of the tubing.

5. Apparatus for forming gussets in a continuously advancing length of preformed tubing comprising a first pair of rollers disposed with their axes in the same horizontal plane and between which the ungusseted tubing is led upwardly, an integral, free-floating spreading device for positioning within the tubing above said first rollers and comprising a pair of flat, elongate substantially rigid plates extending parallel to the axes of said first rollers, said plates being hingedly secured together at their upper ends, adjustable means between the lower ends of said plates for retaining the same in predetermined spaced relation, each of said plates having a roller rotatably journaled along the lower edge thereof for resting through the tubing wall one upon each of said first rollers in axially parallel relation therewith, a second pair of rollers mounted in axially parallel relation to and above said spreader rollers and being positioned to engage upon said spreader rollers and prevent their upward movement with the tubing, tucking means mounted above said rollers to tuck the opposite side edges of the tubing inwardly between said plates at the top of the latter, said tucking means comprising a pair of fingers mounted one on each of the opposite side edges of said spreading device and extending inwardly between the plates for engaging upon the outer surface of the tubing, and means above said spreading device and intucking means for flattening the tubing with the side edges intucked between the opposite flat faces of the tubing.

6. Apparatus for forming gussets in a continuously advancing length of preformed tubing comprising a first pair of rollers between which the ungusseted tubing is led, an integral, free-floating spreading device for positioning within the tubing beyond said first rollers and comprising a pair of flat, elongate substantially rigid plates positioned in parallel relation to the axes of said first rollers, the ends of said plates adjacent said first rollers being spaced apart a distance equal to twice the depth of the intucked gussets to be formed in said tubing, the opposite ends of said plates being closely spaced together but in non-engaging relation, each of said plates having a roller rotatably journaled along the first mentioned end thereof for engaging the inner surface of tubing wall as the tubing passes over the same, a second pair of rollers mounted in axially parallel relation to and above the rollers of said plates and positioned to engage the same so as to prevent upward movement of said spreading device with the tubing, tucking means to tuck the opposite side edges of the tubing inwardly between said plates at the last mentioned end thereof, said tucking means comprising a pair of fingers mounted one on each of the opposite side edges of said spreading device and extending inwardly between the plates for engaging upon the outer surface of the tubing, and means above said spreading device and intucking means for flattening the tubing with the side edges intucked between the opposite flat faces of the tubing.

7. Apparatus for forming gussets in a continuously advancing length of preformed tubing comprising a first pair of rollers between which the ungusseted tubing is led, an integral, free-floating spreading device for positioning within the tubing beyond said first rollers and comprising a pair of flat, elongate substantially rigid plates positioned in parallel relation to the axes of said first rollers, adjustable means between the end of said plates adjacent said first rollers for retaining the same in predetermined spaced relation, means hingedly connecting the opposite ends of said plates in closely spaced relation, each of said plates having a roller rotatably journaled along the first mentioned end of the lower edge thereof for engaging the tubing wall as the tubing passes over the same, means positioned exteriorly of the tubing and acting upon said separating device to resist move-

ment of the latter with the tubing, tucking means mounted above said rollers to tuck the opposite side edges of the tubing inwardly between said plates at the last mentioned end thereof, said tucking means comprising a pair of fingers mounted one on each of the opposite side edges of said spreading device and extending inwardly between the plates for engaging upon outer surface of the tubing, and means above said spreading device and intucking means for flattening the tubing with the side edges intucked between the opposite flat faces of the tubing.

8. Apparatus for forming gussets in a continuously advancing length of preformed tubing comprising a first pair of rollers disposed with their axes in the same horizontal plane and between which the ungusseted tubing is led upwardly, an integral, free-floating spreading device for positioning within the tubing above said first rollers and comprising a pair of flat, elongate substantially rigid plates extending parallel to the axes of said first rollers, said plates being hingedly secured together at their upper ends, adjustable means between the lower ends of said plates for retaining the same in predetermined spaced relation, each of said plates having a roller

rotatably journaled along the lower edge thereof for resting through the tubing wall one upon each of said first rollers in axially parallel relation therewith, tucking means mounted above said rollers to tuck the opposite side edges of the tubing inwardly between said plates at the top of the latter, said tucking means comprising a pair of fingers mounted one on each of the opposite side edges of said spreading device and extending inwardly between the plates for engaging upon outer surface of the tubing, and means above said spreading device and intucking means for flattening the tubing with the side edges intucked between the opposite flat faces of the tubing.

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