

Jan. 12, 1965

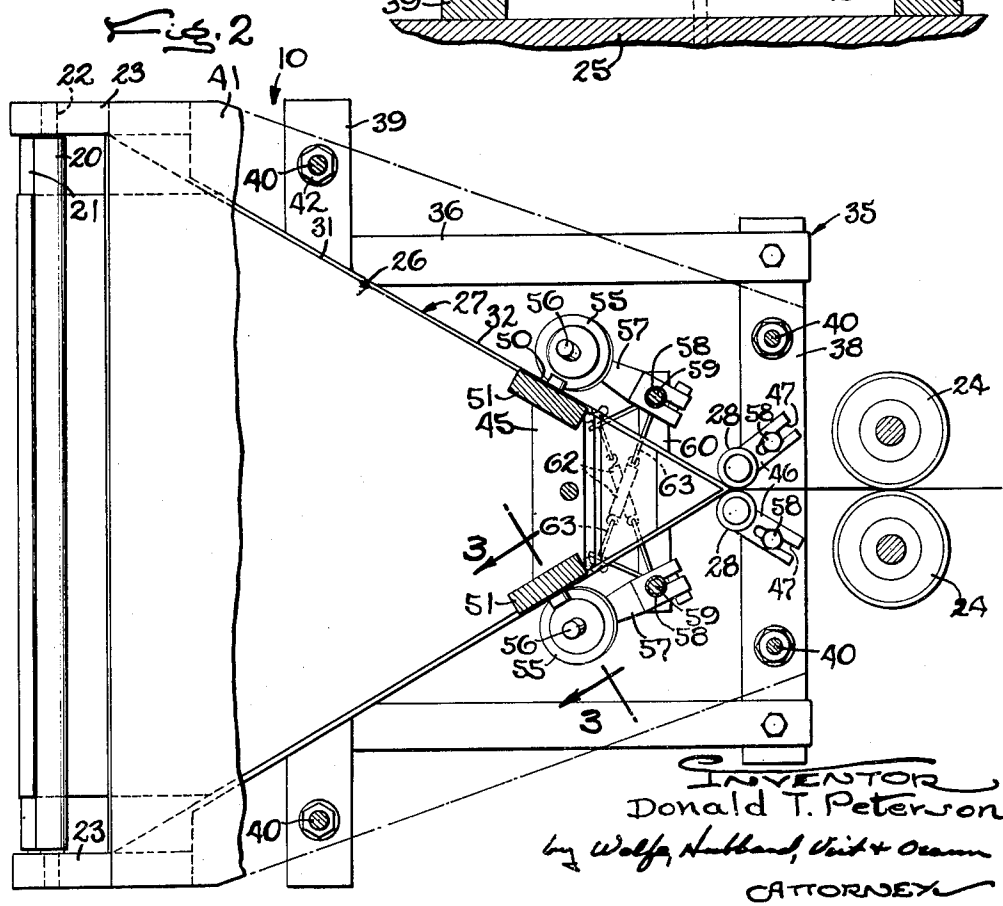
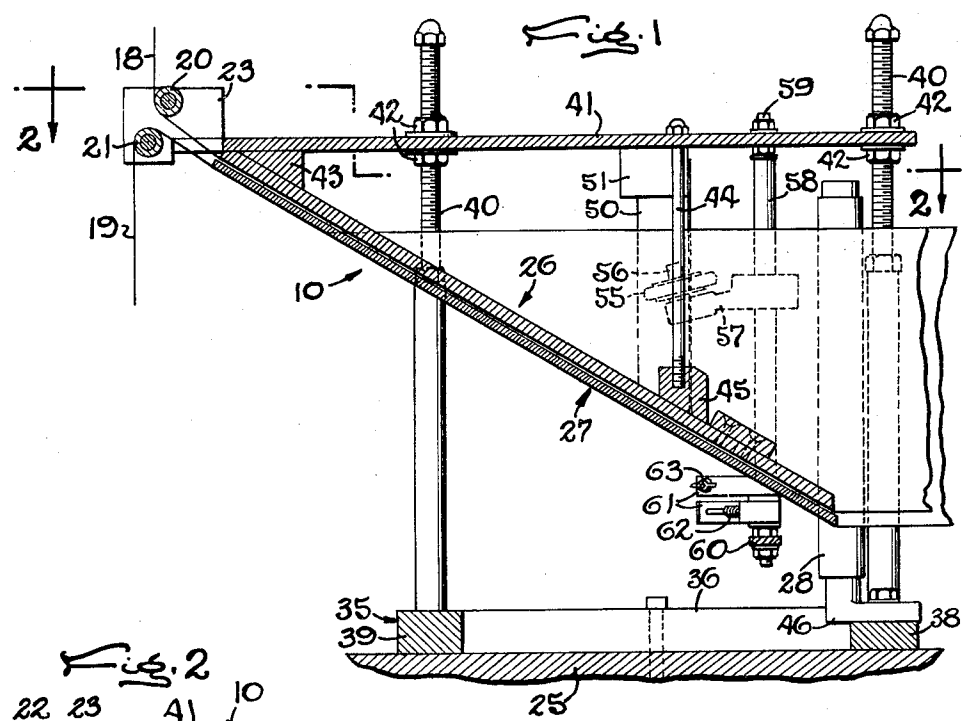
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LONGITUDINAL FOLDING DEVICE FOR TWO STRIPS

Filed July 10, 1963

2 Sheets-Sheet 1



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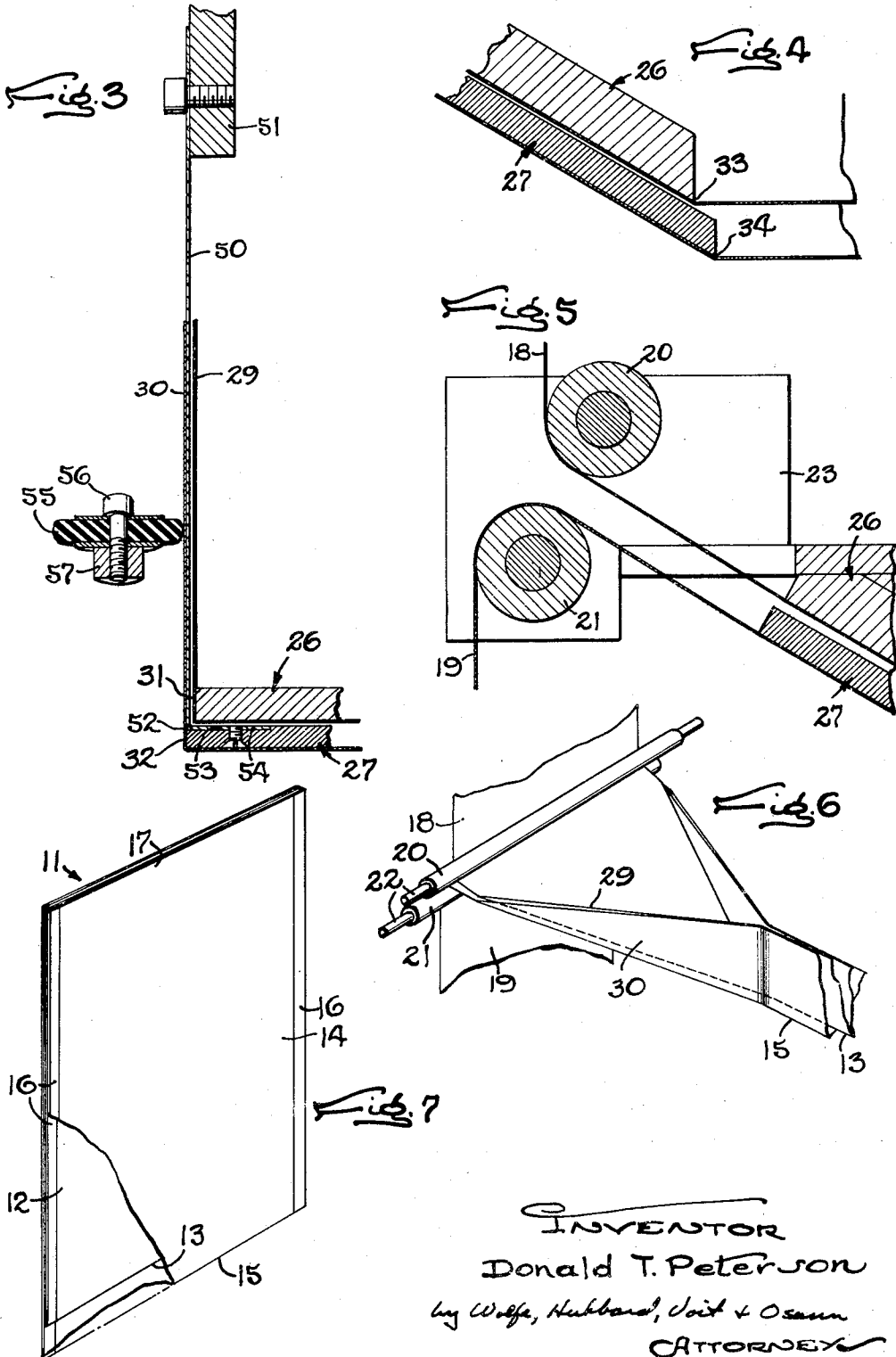
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**LONGITUDINAL FOLDING DEVICE
 FOR TWO STRIPS**

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 corporation of Delaware
 Filed July 10, 1963, Ser. No. 294,111
 4 Claims. (Cl. 270-41)

This invention relates to a device for use in folding two elongated strips of flexible material longitudinally and one within the other as a step in forming so-called double-walled pouches of the type including two strips of heat sealable material disposed face to face within a cover formed by two panels disposed against the outer sides of the inner sheets. The side margins and one end margin of the package are heat sealed together and the remaining end of the package is closed by folds integrally joining the two sheets and the two panels.

In such packages, it is advantageous to space the cover fold from the inner fold in order to provide a portion of the cover that can be torn away preparatory to opening the package. To produce such folds, the two strips of material are folded around two closely spaced V-shaped plows with generally aligned tips vertically spaced apart. Difficulties in supporting the folding plows and controlling the spacing of the folds have been experienced with prior folding devices of this type.

Accordingly, the primary object of the present invention is to provide a novel folding device capable of producing spaced folds of the above character in which the tips of the plows are rigidly supported relative to each other despite the fact that one of the plows is substantially surrounded by the other plow and the side portions of the strip being folded around the plow.

A more detailed object is to construct and arrange the plows in a novel manner such that the folded edge portions of the strips passing the plows are spaced apart to pass around thin supporting elements which extend downwardly between the edge portions and are secured to the lower plow in a manner which does not interfere with the passage of the strips along the plows.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which

FIGURE 1 is a fragmentary cross-sectional view taken in a longitudinal vertical plane through a folding device embodying the novel features of the present invention.

FIG. 2 is a fragmentary plan view of the folding device shown in FIG. 1 with parts broken away.

FIG. 3 is an enlarged fragmentary sectional view taken along the line 3-3 of FIG. 2.

FIG. 4 is an enlarged view of a portion of FIG. 1.

FIG. 5 is an enlarged view of another portion of FIG. 1.

FIG. 6 is a fragmentary perspective view illustrating the folding of the strips.

FIG. 7 is an enlarged perspective view of a pouch with part of the cover broken away.

As shown in the drawings for purposes of illustration, the invention is embodied in a folding device 10 for use in machines for forming double-walled pouches 11 of the type shown in FIG. 7. Such pouches include two sheets 12 of flexible heat-sealable material such as polyethylene film disposed in opposed face to face relation and integrally joined together along their lower edges by a fold 13. Two cover panels 14 composed of relatively stiff material such as paperboard are disposed against the outer sides of the inner sheets and integrally joined together along their lower margins by a fold 15, and the remaining edges of the sheets and the panels are joined together by heat seals 16 and 17 formed by pressing the edge portions

of the package between sealing bars (not shown) in a manner well known in the art. To facilitate opening of the package, the cover fold 15 is spaced well below the fold 13 to provide a portion of the cover that can be torn away preparatory to stripping the panels away from the inner pouch.

These packages 11 are produced at high speed by drawing two continuous strips 18 and 19 of the respective materials off supply rolls (not shown), guiding the strips into side by side relation, and pulling the strips through the folding device 10 which folds the strips longitudinally and one within the other in the manner shown in FIG. 6. Then the strips are cross-sealed to form separate pockets in the folded strips and are severed along the cross-seals, and the separate packages thus formed are filled and closed by the seals 16 and 17, all the steps subsequent to the folding being accomplished in a manner well-known to those skilled in the art and forming no part of the present invention.

Herein, the two strips 18 and 19 are guided around two vertically spaced horizontal rollers 20 and 21 journaled on rods 22 extending between two upright plates 23 disposed on opposite sides of the paths of the strips. The polyethylene strip 18 passes downwardly and under the upper roller 20 while the paperboard strip 19 passes upwardly and over the lower roller 21 both strips coming off the rollers in the same direction, to the right in the drawings, with the polyethylene strip spaced somewhat above the paperboard strip. In this instance, the strips are pulled off the supply rolls and through the folding device by a pair of power-rotated upright feed rolls 24 journaled on the machine frame 25 (FIG. 1) beyond the folding device and rotating in frictional engagement with the opposite sides of the folded strips and in appropriate directions to advance the strips endwise to the right.

To form the folds 13 and 15, a pair of folding plows 26 and 27 are mounted in side by side relation, each above one of the strips 18, 19, and are shaped and positioned to cooperate with a pair of folding rollers 28 to press the centers of the strips progressively downwardly and fold the opposite side portions 29, 30 (see FIG. 3) of the strips progressively upwardly as the strips pass over the plows and approach the folding rollers. For this purpose, each plow comprises a flat V-shaped plate having an underside engaging the top side of the respective strip and inclined downwardly to the right in the drawings with side edges 31, 32 converging at angles of thirty degrees to form tips 33 and 34 on the lower downstream ends, the tip 34 of the lower plow being spaced below the tip 33 of the other plow thereby to space the fold 15 below the fold 13.

As shown in FIGS. 1 and 2, the folding plows are supported above a framework indicated generally at 35 and comprising four bars 36 through 39 bolted together in a rectangular arrangement and secured to the machine frame 25 (FIG. 1). Upstanding from this framework on opposite sides of the plows are four studs 40 with threaded upper end portions projecting through and above a horizontal plate 41 above the plows. The plate 41 is adjustably positioned above the framework by means of lock nuts 42 threaded onto the studs and tightened against opposite sides of the plate to hold the latter at a selected level.

The wider upper end of the upper plow 26 is secured to the underside of the plate 41 by means of wedge-shaped blocks 43 suitably fastened to the top of the plow and the underside of the supporting plate to hold the two pieces in the position shown in FIG. 1 with the plow inclined downwardly to the right at an angle on the order of thirty degrees. The lower end portion of the plow is braced against yielding upwardly by a rod 44 threaded at its lower end into a bar 45 fast on the top of the plow

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at a point adjacent the tip 33, and is fast at its upper end in the supporting plate. The upright plates 23 in which the guide rollers 20 and 21 are journaled are mounted on the left end of the adjustable supporting plate.

In order to fold the strips 18, 19 upwardly over the side edges 31, 32 of the plows as the strips pass under the plows, the folding rollers 28 are journaled on the frame 25 on opposite sides of the folded strips for rotation about vertical axes with the peripheral surface of each roller substantially tangent to the plow edge on the corresponding side and just beyond the tips, the rollers being long enough to extend both above and below the folded strips. Herein, each roller is journaled on and projects upwardly from a horizontal arm 46 slotted at 47 at one end to fit around the shank of a bolt 48 threaded into the top of the bar 38 on one side of the folded strip. With the bolts 48 loosened, the rollers may be swung toward the strips and adjusted forwardly or rearwardly relative to the tips to apply the desired folding pressure on the strips.

With this arrangement, the two strips 18, 19 pass under the respective folding plows along downwardly inclined, side-by-side paths and the opposite side portions 29, 30 of the strips are drawn upwardly into generally horizontal planes by the rollers 28. As the plows become narrower, the upwardly extending side portions become wider until they reach the tips 33, 34 and pass between the rollers where the opposite sides of the polyethylene strip are pressed together in opposed face to face relation and the paperboard strip is folded longitudinally and pressed against the outer sides of the polyethylene strip. Since the paperboard fold 15 comes horizontally off the lower tip at a level below the upper fold 13, the two folds are spaced apart a distance determined by the vertical spacing of lower extremities of the two tips. To hold this spacing to the desired relatively small amount, the plows are spaced apart at the tips a distance only slightly greater than the thickness of the polyethylene film (see FIG. 4).

It will be seen that the lower end portion or nose of the plow 27 is substantially enclosed between the folded paperboard and the upper plow 26. Moreover, a substantial upward force is exerted by the relatively stiff paperboard during folding thereby tending to bend the lower plow upwardly against the upper strip.

The present invention contemplates supporting the lower plow 27 in a novel manner on the adjustable plate 41 such that the nose of the lower plow is rigidly fixed in a predetermined relation relative to the nose of the upper plow 26 thereby to avoid any possibility of pinching of the polyethylene web between the plows and avoid variation in the width of the tear portion of the package formed. To achieve these ends, the side edges 32 are spaced outwardly from the corresponding edges 31 of the upper plow thereby to space each side portion 30 of the paperboard outwardly from the adjacent side portion 29 of the polyethylene along the sides of the plows. Supporting elements 50 fastened at their upper ends to the plate 41 and the thinner than the spacing of the edge portions 29, 30 extend downwardly between the latter and are spaced from the edges 31 and secured to the lower plow in a manner which avoids interference by the supporting elements with the passage of the two strips.

In this instance, each of the edges 32 is substantially parallel to the corresponding edge 31 and is spaced outwardly therefrom a distance greater than the combined thickness of the element 50 and the polyethylene strip 18 as shown most clearly in FIG. 3. Accordingly, the lower tip 34 projects slightly beyond the upper tip 33 and herein is shown as projecting approximately one-quarter inch past the lower tip. The supporting elements take the form of thin flat fingers of metal fastened at (FIG. 3) their upper ends to blocks 51 fast on the underside of the supporting plate 41 and extending downwardly in

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planes between the planes of the side portions 29 and 30. The lower end portion of each finger is spaced outwardly far enough from the associated edge 31 of the upper plow to avoid contact with the polyethylene strip, and is bent inwardly at 52 and recessed in the upper side of the lower plow in a notch 53. Preferably, the outer side of the finger is flush with the edge 32 and the upper side of the recessed portion 54 is flush with the upper side of the lower plow thereby permitting the closest possible spacing of the plow plates.

As shown in the drawings, the two fingers 50 provide the only support for the lower plow 27. It will be evident, however, that additional supporting fingers may be provided, if desired, either above or below the beginning of the folds in the strips.

In accordance with another aspect of the invention, the fingers 50 are utilized in preventing the slipping of the paperboard strip 19 from one side to the other as it passes under the plow 27. For this purpose, a pair of rollers 55 are mounted on the frame to ride on the side portions of the strip passing the fingers 50 and press the strip against the fingers. In this manner, the rollers apply a frictional resistance to slipping of the paperboard toward one side or the other. Moreover, the rollers are supported for rotation in planes that are inclined upwardly in a downstream direction and therefore apply a positive upward pull on each side portion of the paperboard to maintain the latter taut.

Each roller 55 is journaled on the shank of a bolt 56 projecting upwardly and inclined slightly rearwardly from the upper side of a generally horizontal arm 57 fast on a sleeve 58 telescoped over and rotatable on a vertical rod 59 fast at its upper end on the plate 41 and at its lower end on a horizontal crossbar 60. The latter spans and stabilizes the lower end portions of the two rods.

To urge the rollers 55 toward the supporting fingers 50, an arm 61 is secured to the lower end portion of each sleeve and projects generally rearwardly from the sleeve. As shown in FIG. 2, a coiled tension spring 62 is stretched between the free end of each arm and a rod 63 fast on the opposite sleeve thereby to urge each sleeve in a direction to press the associated roller against the paperboard strip 19 and press the latter against the associated finger 50. It will be evident that similar rollers could be used to prevent slipping of the polyethylene strip 18 but usually are not necessary.

From the foregoing, it will be seen that the present invention provides firm support for the nose of the lower plow 27 despite the fact that it is substantially enclosed between the paperboard strip 19 and the upper plow 26. Accordingly, all danger of pinching of the polyethylene strip is eliminated and the spacing of the folds 13, 15 is held constant and to a relatively small amount.

I claim as my invention:

1. A device for folding two elongated strips of flexible material one within the other as the strips are advanced endwise and side by side along a predetermined path, said device including, in combination, a frame, a first flat plate mounted on said frame along said path and positioned above one of said strips, means for guiding said one strip against the underside of said plate and drawing the opposite edge portions of the strip upwardly along opposite side edges of said plate into generally vertical planes as the strip slides along said plate, said side edges converging to a first point in the direction of advance of the strip whereby said edge portions are folded into opposed face-to-face contact in passing said point, a similar second flat plate disposed beneath and generally parallel to the underside of said first plate closely adjacent said one strip and positioned above the other strip, means for guiding said other strip against the underside of the lower plate and drawing the opposite edge portions of the same upwardly along the opposite side edges of the lower plate into generally vertically planes, the side edges of the lower plate each generally paralleling

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the corresponding edge of the upper plate and being spaced laterally outwardly therefrom whereby the corresponding edge portions of said strips are spaced apart by said edges, and the point of the lower plate being spaced below the point of the upper plate thereby to space apart the folds in said strips, and two elements fast on said frame and supporting the lower plate in a predetermined relation with the upper plate, said elements being at least as thin as the spacing of said corresponding edge portions and extending downwardly between the latter past the upper plate and secured to the lower plate at a point spaced inwardly from the edges thereof.

2. A device as defined in claim 1 in which said elements comprise thin fingers having flat outer sides generally flush with the edges of the lower plate, and in-turned lower ends recessed into the upper side of the lower plate and fastened thereto.

3. A folding device including, in combination, a frame, a first flat plate mounted on said frame with one side of the plate facing upwardly and having a V-shaped nose formed by two side edges converging to a point, a second flat plate disposed beneath and closely adjacent the underside of said first plate and having a V-shaped nose beneath the nose of said first plate and formed by two side edges each generally paralleling and offset laterally outwardly from the corresponding edges of said first plate whereby the opposite side edge portions of a strip of flexible material drawn along the underside of said second plate toward the point thereof and folded upwardly around the edges thereof are spaced from the corresponding side edge portions of another strip similarly folded about said first plate, and at least one supporting element fast on said frame and supporting said second plate in a predetermined relation with said first plate, said element being thinner than the spacing of adjacent side edge

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portions of the two strips and extending downwardly between the latter past said first plate and secured to the top of said second plate.

4. A device for folding two elongated strips of flexible material one within the other as the strips are advanced endwise and side-by-side along a predetermined path, said device including, in combination, a frame, a first folding member having a V-shaped nose defined by first side edges converging to a first tip, a second folding member having a V-shaped nose defined by second side edges converging to a second tip, said noses being disposed in spaced side-by-side planes with said first tip overlying said second tip and said first edges generally paralleling and overlying the corresponding second edges with the latter spaced outwardly from the first edges whereby one of said strips may be drawn between said members and its opposite edge portions folded over said first edges away from said second member into face-to-face relation, and the other strip may be drawn along the exposed side of said second member in spaced relation with the first strip all the way to said tips and its opposite edge portions drawn over said second edges and into planes spaced from and generally paralleling the planes of corresponding edge portions of said first strip, means supporting said first member on said frame, and at least one element fast on said frame and extending in between the planes of two corresponding edge portions of said strips and secured to said second member adjacent its tip to brace the latter and maintain its spacing from said first tip.

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