

**March 11, 1969**

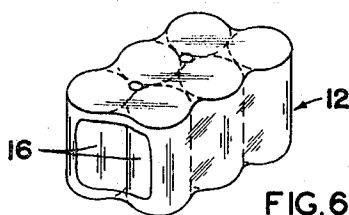
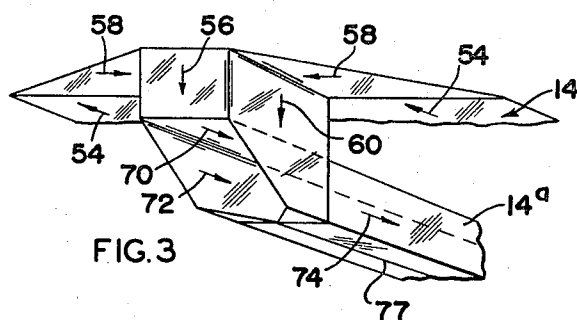
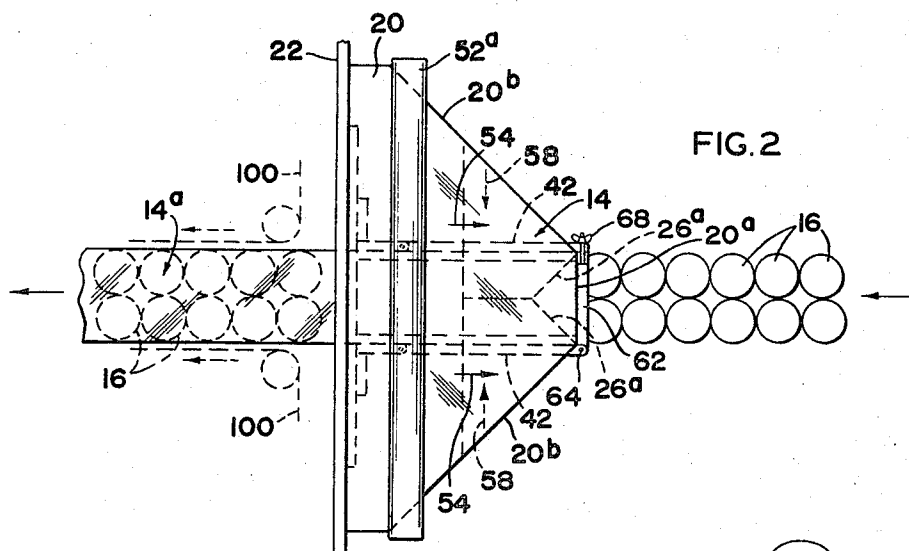
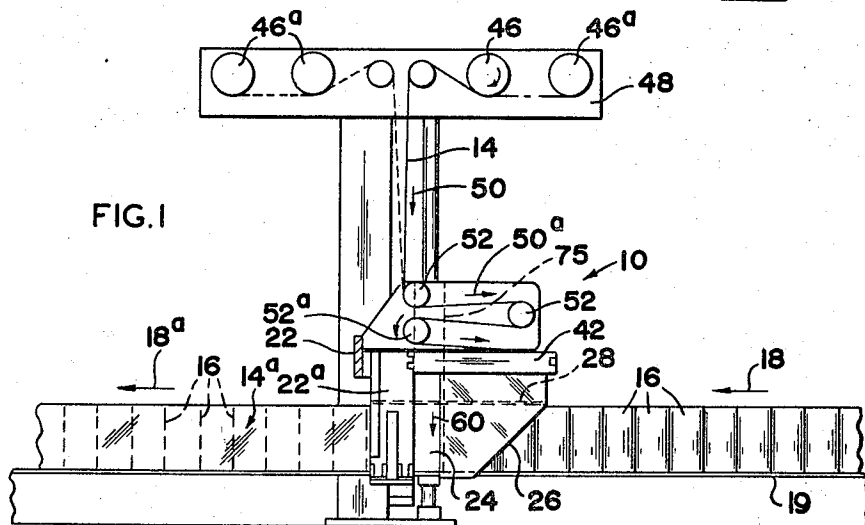
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**3,431,831**

PACKAGE ASSEMBLY FILM FOLDING COLLAR

Filed Jan. 3, 1967

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Sheet 2 of 2

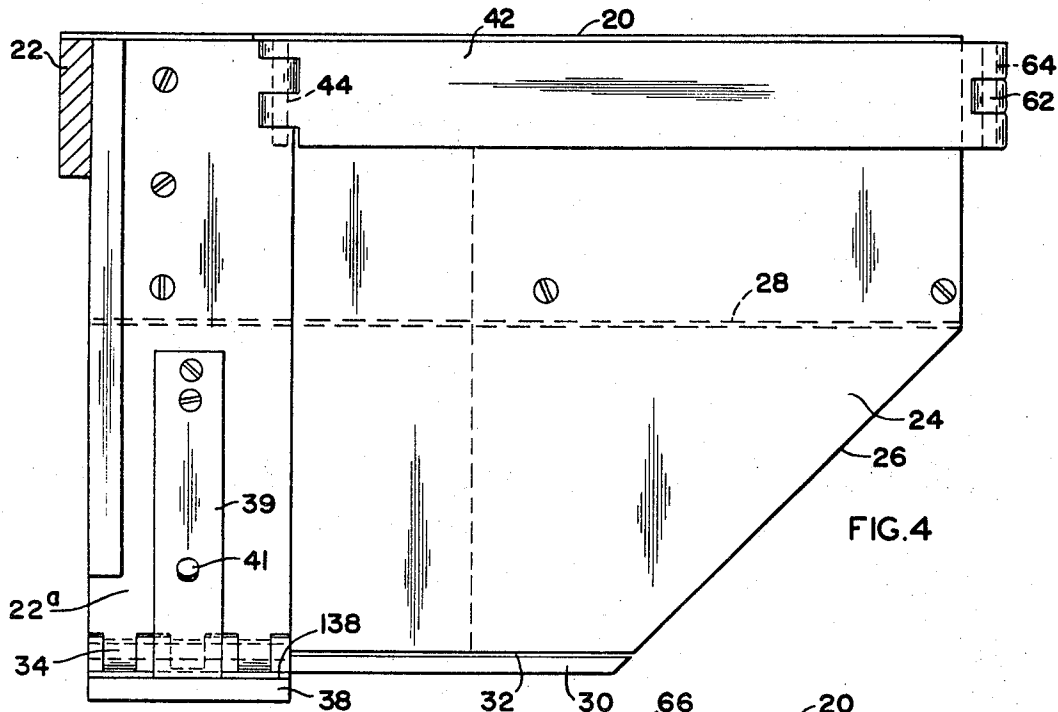


FIG. 4

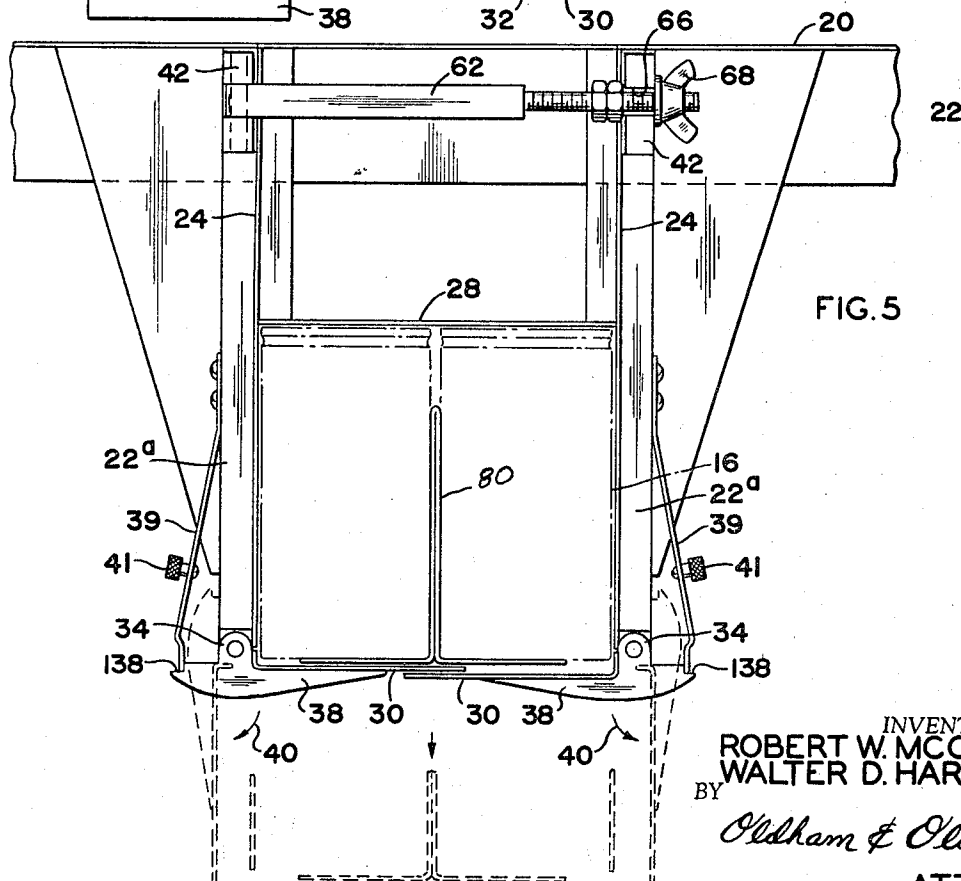


FIG. 5

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**PACKAGE ASSEMBLY FILM FOLDING COLLAR**  
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10 Claims

## ABSTRACT OF THE DISCLOSURE

An apparatus for folding and for facilitating the folding of a sheet of film into a continuous envelope around one or more abutted rows of objects, such as cans, is disclosed. It has movable bottom plates and movable guide or fold bars to facilitate threading the film into initial engagement therewith after which folding action is automatically obtained as the film is pulled through the apparatus.

This invention relates to a film folding apparatus, basically comprised of a film collar which is substantially rectangular in shape and which is formed from a film guide plate, a top plate, a pair of side plates, and a pair of bottom plates, at least a portion of the leading edges of the guide plate, the side plates, and the bottom plates extending at a 45° angle to other edges of the plates to fold the film therearound and into a continuous envelope. The film collar is open ended and its upstream open end is adapted to receive a row of objects, such as cans, which are conveyed up to and into the forward open end of the film collar. A sheet of heat shrinkable, transparent plastic film is adapted to be continuously moved over and folded around the leading edges of the film collar in order to form a continuous envelope around the objects which are passing into and through the film collar.

The apparatus is more completely described in conjunction with the accompanying drawings, wherein:

FIG. 1 is a partly broken-away, side elevation of a preferred embodiment of the entire film folding apparatus of the invention;

FIG. 2 is a broken away plan view of the embodiment illustrated in FIG. 1, particularly illustrating the trapezoidal shaped film guide plate;

FIG. 3 is a fragmentary, perspective view of the way in which the heat shrinkable, transparent film is folded by the film folding apparatus of the invention to form a continuous envelope around the abutted rows of cans which are being fed into the film collar of the film folding apparatus of the invention;

FIG. 4 is an enlarged side elevation particularly illustrating the film collar of the film folding apparatus of the invention;

FIG. 5 is an end elevation of the film collar illustrated in FIG. 4, particularly illustrating the bottom plates and the film folding bar utilized with the film collar; and

FIG. 6 is a perspective view of the resulting package assembly formed when the film folded into a continuous envelope around the cans is heat shrunk and cut.

Referring to the accompanying drawings in greater detail, and with particular reference to FIG. 1, the numeral 10 generally indicates the film folding apparatus of the invention. The film folding apparatus 10 is part of an over-all apparatus adapted to form the package assembly 12 illustrated in FIG. 6, and any suitable apparatus may be used to complete the assembly.

The package assembly 12, as illustrated by FIG. 6, consists of a carrier assembly for two abutted rows of three cans each wherein an open-ended heat shrunk band of plastic film is operatively and tightly wrapped around and engaged with the cans from top to bottom thereof in

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order to present and retain the cans grouped together in a compact, unitary assembly.

The film forming apparatus 10 is particularly designed and adapted to continuously wrap an endless, open-ended envelope of heat shrinkable plastic film 14 around a plurality of abutted rows of cylindrical objects, such as cans 16, whereby the film can be heat shrunk to tightly engage the cans to form the assembly illustrated by FIG. 6. Referring to FIG. 1, the cans 16 are fed in the direction of arrow 18 as by a suitable conveyor 20, and/or other means into the film folding apparatus 10 of the invention. It should be understood that this particular disclosure and invention relates to the precise apparatus which is utilized to smoothly, continuously, and easily wrap and fold plastic film 14 into an envelope 14a around the cans 16. After the envelope 14a has been enclosed around the cans 16, they are conveyed in the direction of arrow 18a whereupon the additional apparatus, not shown, forms the carrier or package assembly 12 of FIG. 6.

Referring to the actual film folding apparatus 10, it includes a horizontally positioned, substantially trapezoidal shaped film guide plate 20 which is secured to a suitable mounting bar or support frame 22 and is pointed upstream of the article supply flow. The leading edge of the film guide plate 20, as best illustrated by FIG. 2, has a top or forward portion 20a which is parallel to the base of the guide plate 20, and also has angularly directed portions 20b which are directed in an angular relationship of 45° with the forward portion 20a of the leading edge of the film guide plate 20. The purpose of such film guide plate 20, and particularly the angularly directed portions 20b, is to begin to fold the film 14 into an envelope 14a around cans 16, as will be explained in greater detail hereinafter.

Secured to the lower face of the film guide plate 20, and extending vertically downwardly therefrom in perpendicular relationship thereto are a pair of parallel side plates 24. The side plates 24, as best illustrated by FIGS. 4 and 5, are substantially rectangular in shape, but the forward lower corner of each side plate is beveled, as at 26, at about a 45° angle to the horizontal. As will be explained in greater detail hereinafter, the film will fold around the edges or bevels 26 of each side plate 24, the purpose of the bevels 26 being to allow portions of the advancing film 14 to fold therearound, in order to form the side portions of the envelope 14a.

Also included in the film folding apparatus 10 is a top plate 28 positioned substantially parallel to the guide plate 20 but spaced therefrom, and positioned therebelow, the top plate 28 extending between and being secured to the side plates 24 in substantially perpendicular relationship thereto. As is best illustrated by FIG. 1, the cans 16 are adapted to be fed by the conveyor 20 into the substantially rectangular shaped opening or film collar formed by the top plate 28 and the side plates 24. Completing the plates utilized in the film folding apparatus around which the film 14 folds to form the envelope 14a, are a pair of bottom or base plates 30 positioned adjacent bottom edges 32 of the side plates 24. The bottom plates 30 are mounted in pivotal relation to the side plates, as by a pair of respective hinge members 34 which pivotally secure downstream ends of the base plates 30 to a dependent portion 22a of a support frame 22. A suitable finger support 38 is associated with and secured to each bottom plate 30, and also is hingedly secured to support frame 22 in order to provide support for the cans 16 as they are fed by conveyor 20 into the film folding apparatus 10. As is best illustrated by FIG. 5, the finger supports 38 and the bottom plates 30, due to their pivotal mounting on the support frame 22a are adapted to be locked in the full line position

indicated in FIG. 5 by leaf spring locking fingers 39, the ends of which can engage shoulders 138 on the supports 38 to position the bottom plates substantially perpendicular to the side plates 24. The bottom plates can be pivoted in the direction of arrows 40 into the dotted line position indicated in FIG. 5 by simply grasping knobs 41 secured to the respective locking fingers 39 and pulling the locking fingers outwardly to allow the supports 38 to fall in the direction of arrow 40 wherein the bottom plates are substantially in vertical alignment with the side plates 24.

It should be noted, as illustrated by FIG. 2, that the leading or forward edges 26a of the bottom plates 30 are also shaped or cut off on an angle to form an extension of the edge or bevel 26 of each of the side plates 24. The purpose of such angled corner 26a on the bottom plates 30 is to allow the film 14 to be folded around the edge 26a in order to form the base portions of the envelope 14a, as will be explained in greater detail hereinafter.

Also pivotally mounted to the portion 22a of the support frame 22 are a pair of film folding bars 42 which are adapted to be swung about their respective pivot pins 44 and into abutment with the respective outside faces of the side plates 24. As is best illustrated by FIGS. 4 and 5, the folding bars 42 are positioned adjacent to the lower face of film guide plate 20 so that as such film folding bars 42 are swung inwardly into abutment with the side plates 24, the film folding bars 42 remain in close proximity with and adjacent to the lower face of the film guide plate 20. The purpose of the folding bars 42 is to allow that portion of film 14 which is folded over the angularly directed portions 20b of the leading edge of film guide plate 20 to be folded again over a respective film folding bar 42 so that the lateral marginal portions of the film advance in a vertically downward direction along the outside faces of the side plates 24.

In describing the actual manner in which the film 14 is folded by the film folding apparatus 10, a better understanding of the inter-relation of the film guide plate 20, the top plate 28, the side plates 24, and the bottom plates 30 is gained, particularly as to the purpose of the edge portions 20b of the film guide plate 20 and the bevels or edges 26 and 26a of the side plates 24 and the bottom plates 30, respectively.

Referring to FIG. 1, it is seen that a length of the transparent, heat shrinkable plastic film 14 is feed off a suitable supply roll 46 which is journaled to a carriage or frame 48. Auxiliary supply rolls 46a are also mounted on carriage 48 so that a continuous length of film 14 can be provided from the supply rolls to the film folding apparatus 10 when one roll ends, by attaching the leading end of a new roll of film to the trailing end of the prior roll. As the film 14 is fed from supply roll 46, it moves downwardly in the direction of arrow 50 and continues in the direction of arrows 50a around a series of suitable guide rolls 52 usually ending in roll 52a parallel to and immediately above the guide plate 20. As the film feeds off guide roll 52a, it will be traveling in the direction of arrows 54 (see FIG. 2) substantially along the top face of the film guide plate 20. The film 14 is then advancing to and is folded around or over the leading edge of the film guide plate 20. That center portion of the film folding over portion 20a of the leading edge, as best illustrated by FIG. 3, will fold in a vertically downward direction as indicated by arrow 56. Those marginal portions of the film 14 which fold around the angularly directed portions 20b of the leading edges of the film guide plate 20 are folded over against the lower face of the guide plate 20, and advance in the direction of arrows 58 towards the side plates 24. These portions of the film moving in the direction of arrows 58 are folded over the respective film folding bars 42 whereby the film is moving in the direction of arrows

60 as it travels in a vertically downward direction along the outside faces of the side plates 24.

Of course, it should be understood that before the film 14 is continuously folded by the film folding apparatus 10, film folding bars 42 are opened or swung outwardly to allow the film 14 folded over the angularly directed leading edges 20b of the film guide plate 20 to be threaded or fed between the lower face of the guide plate 20 and the folding bars 42. This is usually done manually as a new sheet of film 14 is fed into the film folding apparatus of the invention. After such "threading" has taken place, the folding bars 42 are swung about pivot pins 44 and are firmly locked into the position indicated by FIG. 5. A suitable transversely directed cross bar or piece 62 which is pivotally mounted by pivot pin 64 to the end of one of the film folding bars 42 is utilized to accomplish such with the transverse locking piece 62 being adapted to be secured to the free end of the other film folding bar as by being received in a slot 66 provided in the free end of the other film folding bar 42, as illustrated by FIG. 5. An adjustable wing nut 68 is adapted to be tightened so that the film folding bars 42 can be firmly locked together whereby the film 14 passing between such folding bars 42 and the lower face of the film guide plate 20 folds over the folding bars 42 in a wrinkle free condition.

That center portion of the film 14 which has been folded around the leading edge 20a of the guide plate 20, as explained hereinbefore, moves vertically downwardly in the direction of arrow 56. This portion of the film is then folded around the leading edge of the top plate 28 so that it moves along the lower face of the top plate 28 in the direction of arrow 70. This segment or portion of the film 14 forms the top portion of the envelope 14a, as best illustrated by FIG. 3.

Those lateral portions of the film 14 which have been folded around the angularly directed portions 20b of the leading edge of the film guide plate 20, as explained hereinbefore, are traveling in a downward direction along the respective outside faces of the side plates 24, as indicated by arrow 60.

Some of each part of the film moving in the direction of arrow 60 folds around the beveled edge 26 of the side plates 24 to cause it to fold around to the inside faces of the side plates 24 whereby it moves in the direction of arrow 72. These portions of the film moving in the direction of arrow 72 form the side portions of the envelope 14a, as is best illustrated by FIG. 3.

A small lateral edge portion of the film moving in the direction of arrow 60 down the outside face of each of the side plates 24 misses folding around the inclined forward edge 26 of the side plate 24, and instead will fold around the beveled or angled leading edge 26a of the bottom plate 30. Since the bottom plates, in actual operating position, will be positioned substantially perpendicular to the side plates 24, the entire remaining marginal portions of the film folds around the beveled leading edges 26a of the bottom plate to the inside upper faces thereof, whereby it moves in the direction of arrows 74. These portions of the film hence form the base flaps of the envelope 14a, as is best illustrated by FIG. 3.

When the film is being manually fed into the film folding apparatus 10, as mentioned hereinbefore, the entire film folding apparatus 10 has previously been raised vertically by one or more suitable power cylinders 75 or equivalent means which are operatively secured to the support frame 22 and are carried by the frame of the apparatus. By raising the film folding apparatus 10 vertically, it becomes much easier to "thread" the film 14 into the film folding apparatus and particularly to fold the film around the beveled leading edges 20a, 26 and 26a of the guide plate, the side plates, and the bottom plates, respectively. Before the film folding apparatus 10 is raised vertically by the power cylinder 75, the bottom plates 30 are pivoted downwardly to the position indi-

cated in the dotted lines of FIG. 5. The film 14 is folded around the beveled forward edges to the bottom plates by hand and the plates are then pivoted upwardly and inwardly into the full line position indicated by FIG. 5. As best illustrated by FIG. 5, the bottom plates 30 slightly overlap each other with the edges of the film 14 folded around the bottom plates also overlapping. Such an overlapping arrangement of the folded edges of the film 14 readily allows the two overlapping edges of the film 14 to be heat sealed together, as at 77, to form the continuous envelope 14a. Normally the film is centered on the film guide plate 20 and it is drawn into and through the apparatus 10 by suitable members such as devices (not shown) on endless chains 100 which engage the can and film assembly to move it along for further processing.

FIG. 3 best illustrates the precise way in which the film 14 is folded by the film folding apparatus 10 in order to form the continuous envelope 14a smoothly. FIG. 3 also illustrates the precise manner in which the direction of the moving film 14 is changed as the film folds over the straight and beveled corners of the film folding apparatus. Of course, as indicated hereinbefore, all the beveled edges or corners of the top plate, the side plates, and the bottom plates are quite smooth and are formed at an angle of substantially 45° to an adjacent edge of such plates. Or, stated in another way, the guide surfaces, or edges of the plates are formed at an angle of about 45° to the direction of movement of the film. The angles may vary a degree or two from 45° as in some instances this seems to give an improved fold and material flow action. Hence the plastic film or other material being processed, such as paper, is evenly folded around such edges with no resulting wrinkles and will smoothly flow therearound. Normally these various plates are all made from thin sheet metal, for example 0.050 inch thick, as the folding edges are quite thin or narrow for smooth folding action of a sheet therearound.

The cans 16 are slid onto and over a suitable support 80 as they move into and through the apparatus 10.

It should be noted that the side plates 24, the top plates 28, and bottom plates 30 form an assembly which is, for example, removably secured to the support frame 22 so that a different size folding assembly can be substituted in order to adapt the film folding apparatus 10 to receive slightly differently dimensioned cans or other objects which are fed thereto.

From the foregoing, it can be seen that the use of the film folding apparatus of the invention uniquely allows a continuous length of a plastic film, which is usually made from a heat shrinkable material such as polyvinyl chloride or the like and usually is only one or two mils thick, to be easily, automatically, continuously, and quickly folded around the leading edges of the film folding apparatus in order to form a continuous envelope around an abutted row or rows of articles, such as cylindrical cans, which are passing into the forward open end of the film folding apparatus.

While in accordance with the patent statutes only one best known embodiment of the invention has been illustrated and described in detail, it is to be particularly understood that the invention is not limited thereto or thereby, but that the inventive scope is defined in the appended claims.

What is claimed is:

1. Apparatus for forming a continuous heat-shrinkable envelope around one or more abutted rows of objects, such as cans, as they are advanced into the apparatus, from a film or sheet of plastic or other material as it is moved through the apparatus comprised of

- a horizontally extending, substantially trapezoidal shaped film guide plate positioned to extend upstream in the apparatus, the sides thereof forming about 45° angles with the top and the base thereof,
- a pair of parallel side plates mounted perpendicular to said guide plate and extending vertically downwardly

therefrom, such side plates having forwardly positioned lower corners forming substantially 45° angles with the bottom edges of said side plates,

- a bottom plate operatively secured to the bottom edge of each side plate and adapted to extend inwardly therefrom in substantially perpendicular relation thereto, the forward edge of each of said bottom plates being shaped at an angle of about 45° to the laterally outer edge of each side plate,

- a top plate positioned substantially parallel to said guide plate but below and spaced therefrom and extending between said side plates whereby a substantially rectangularly shaped opening is defined by said top plate, said side plates and said bottom plates into which said objects can be fed, and

movable guide means for continuously engaging a length of moving film and drawing it against the edges of said guide plate wherein the film folds therearound, said guide means positioning marginal portions of the film for movement down along said side plates and around the corners of said side plates and said bottom plates to form a continuous envelope around the abutted objects passing into the opening.

2. Apparatus according to claim 1 wherein said bottom plates are hingedly secured to said side plates along adjacent edges thereof wherein said bottom plates are pivotal with relation to said side plates from a position perpendicular thereto to a position in vertical alignment therewith.

3. Apparatus according to claim 1 and including a pair of pivotally mounted film folding bars adapted to be swung about their pivot points and into abutment with the respective outside faces of each of said side plates whereby the film which folds over the angularly directed portions of the leading edge of said film guide plate also folds over a respective film folding bar.

4. Apparatus according to claim 3 wherein means are provided to secure each of said film folding bars to each other while said bars are positioned in the respective joiners of the outside faces of said side plate with said film guide plate.

5. Apparatus according to claim 3 wherein the film folding over the forward portion of the leading edge of said film guide plate also folds over the forward edge of said top plate, and the film folding over the angularly directed portions of the leading edge of said film guide plate also folds over the film folding bars and the beveled leading edges of said side plates and said bottom plates.

6. Apparatus for forming a continuous envelope around one or more abutted rows of objects, such as cans, as they are advanced into the apparatus, from a continuous film or sheet as it is moved through the apparatus, comprised of

- a substantially rectangular shaped, open-ended film shaping collar formed from a trapezoidal shaped film guide plate, a pair of side plates, and a pair of bottom plates, said film guide plate, side plates, and bottom plates having leading edge portions extending at about a 45° angle to adjacent edge portions thereof, and said film guide plate having a leading edge portion normal to the line of advance of the objects into the apparatus, and

means for continuously retaining a moving, continuous film to fold around the leading edges of said film guide plate of said film collar and for retaining folded marginal portions of the film against said side plates, to form a continuous envelope around the abutted objects passing into the open ended film collar as the film is moved through said film shaping collar, the lateral, marginal portions of the film being doubled back and folded over the leading edges of said bottom plates.

7. Apparatus according to claim 6 wherein said bottom plates are pivotal with relation to said side plates from a position perpendicular thereto to a position in

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vertical alignment therewith, and wherein locking means for locking said bottom plates in one or the other of said positions is provided.

8. Apparatus according to claim 6 and including means for vertically raising said film shaping collar whereby said film can be manually folded around the leading edges of the film shaping collar prior to the film being continuously moved and folded therearound.

9. Apparatus according to claim 6 wherein said means for continuously retaining the film to fold around the leading edges of the guide plate and for retaining folded marginal portions of the film against the side plates include

a pair of pivotally mounted film folding bars adapted to be swung about their pivot points and into abutment with the respective outside faces of each of said side plates whereby the film which folds over the angularly directed portions of the leading edge of said film guide plate also folds over a respective film folding bar.

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10. Apparatus as in claim 6 where a top plate means is positioned below said film guide plate and extends between said side plates, said top plate means having a leading edge portion parallel to and directly below said leading edge portion of said film guide plate, a center portion of the film being adapted to move around and be folded over the leading edge portion of said top plate means, all of said plates being made from sheet metal.

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U.S. Cl. X.R.

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