

[54] **BAG FORMING APPARATUS**

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156/510; 156/583

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[58] Field of Search **93/DIG. 1, 33 H, 33 R,**
93/8 R, 18, 19, 20, 26, 27, 35 SB; 53/183;
156/510, 583

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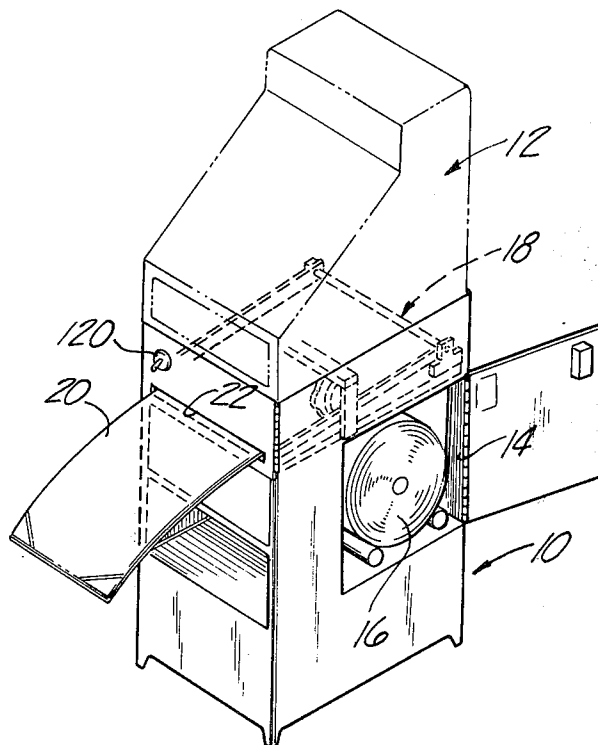
Attorney, Agent, or Firm—Barnes, Kisselle, Raisch & Choate

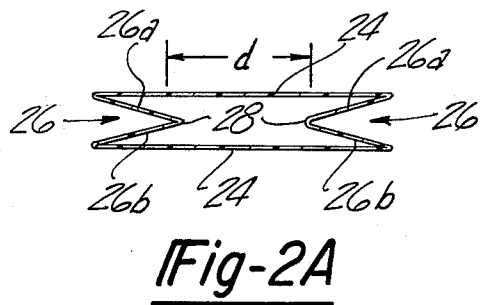
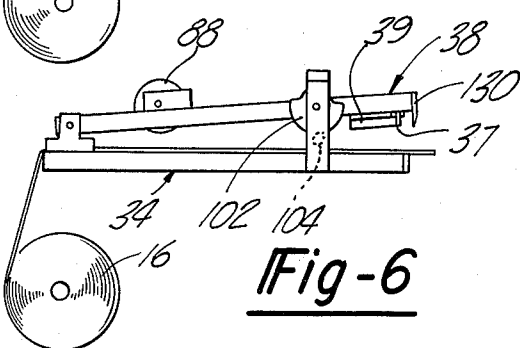
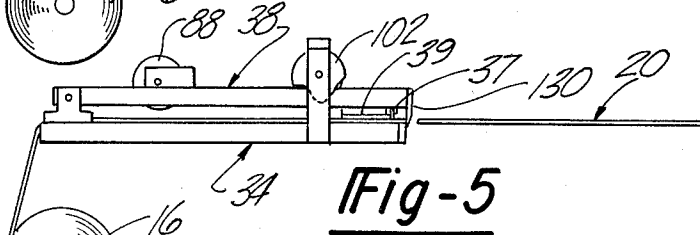
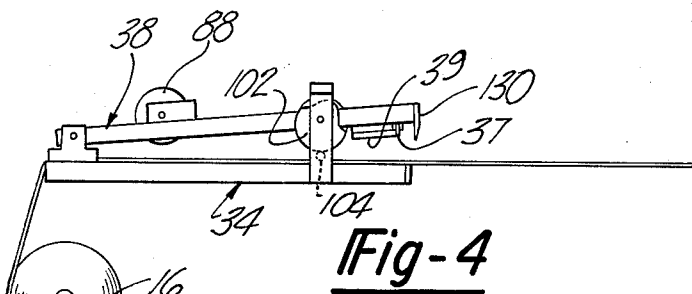
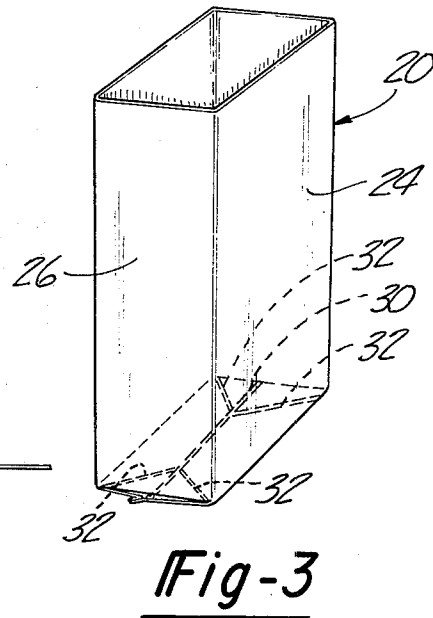
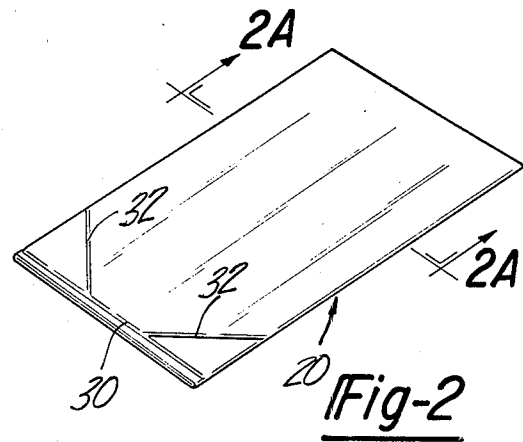
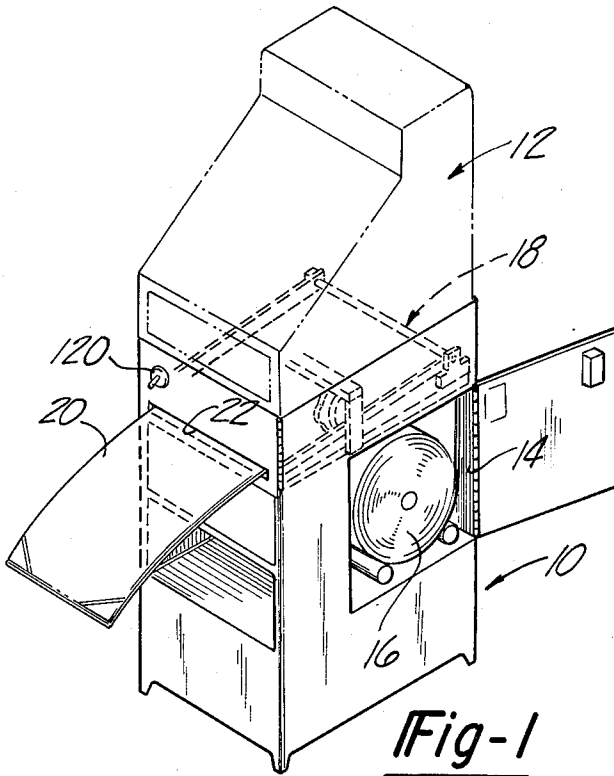
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ABSTRACT

A plastic bag forming apparatus through which plastic tubular stock in a flattened condition is directed. The device includes guide members for engaging transversely opposed gusset-forming folds on the stock and heat sealing bars for forming heat sealed seams between plies of the stock at desired locations to provide a blank which can be opened into a bag having a reinforced square bottom.

20 Claims, 18 Drawing Figures





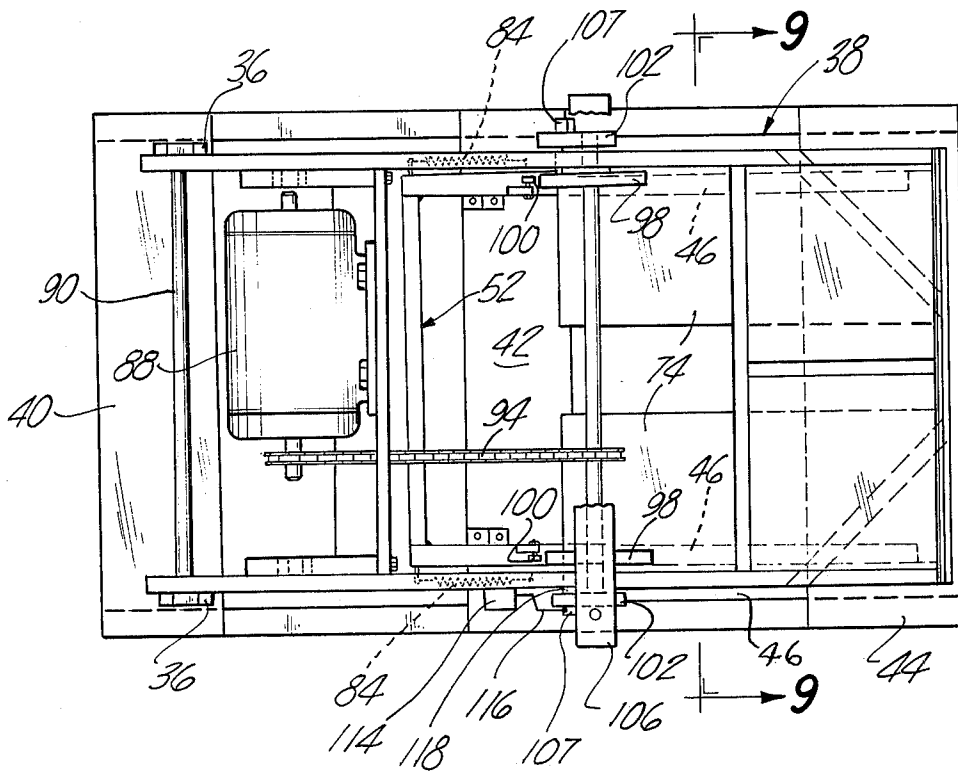


Fig-7

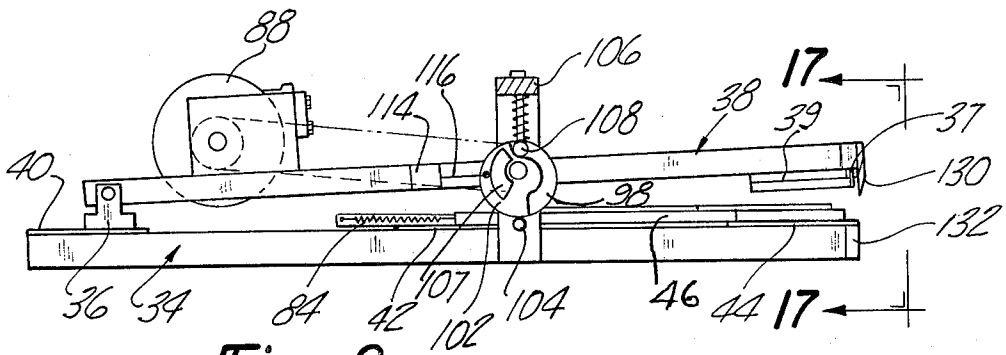


Fig-8

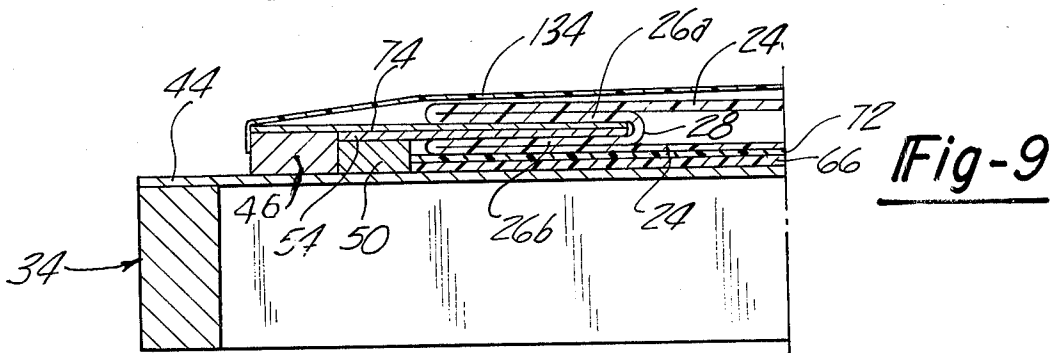


Fig-9

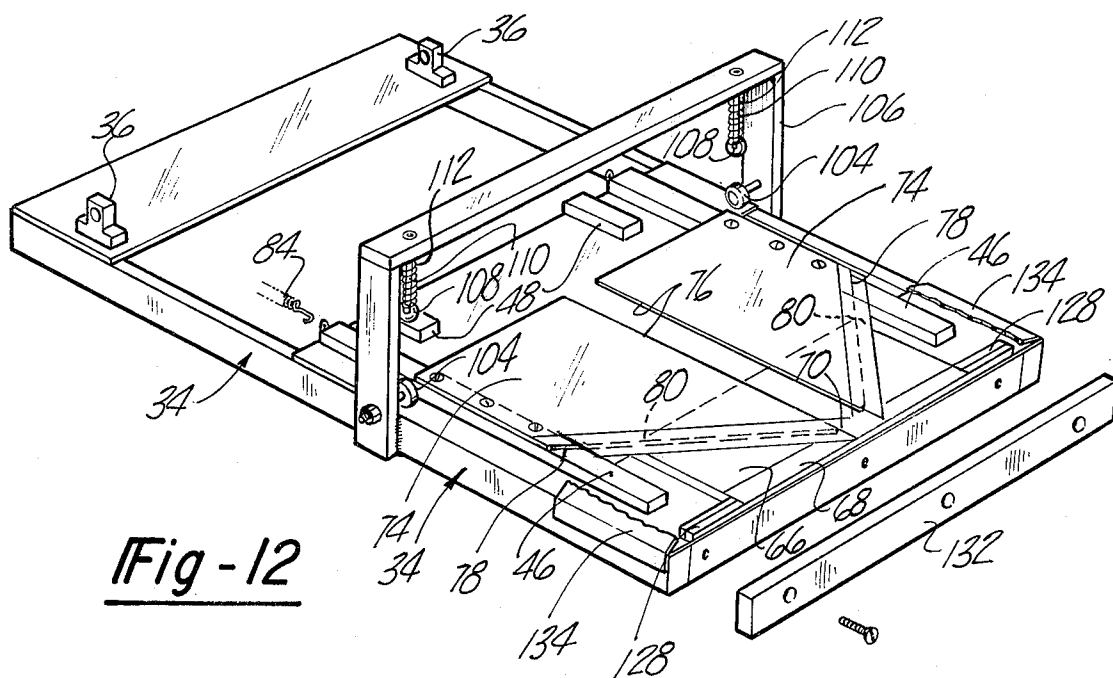
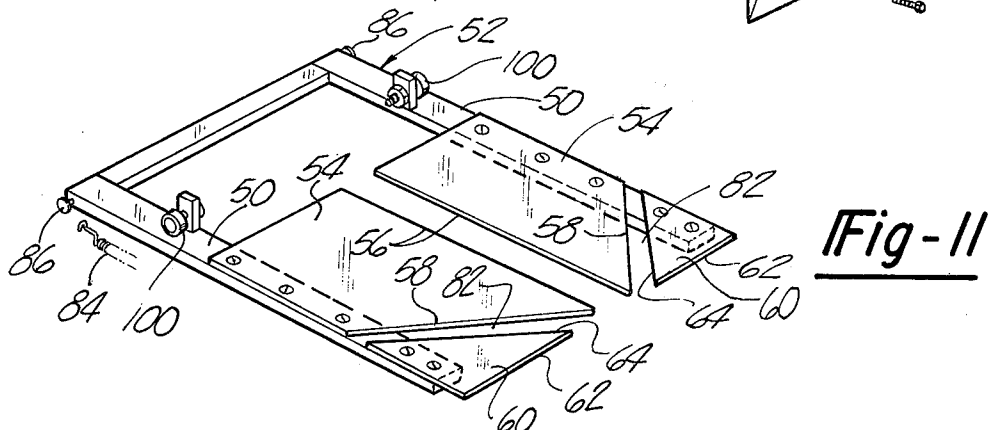
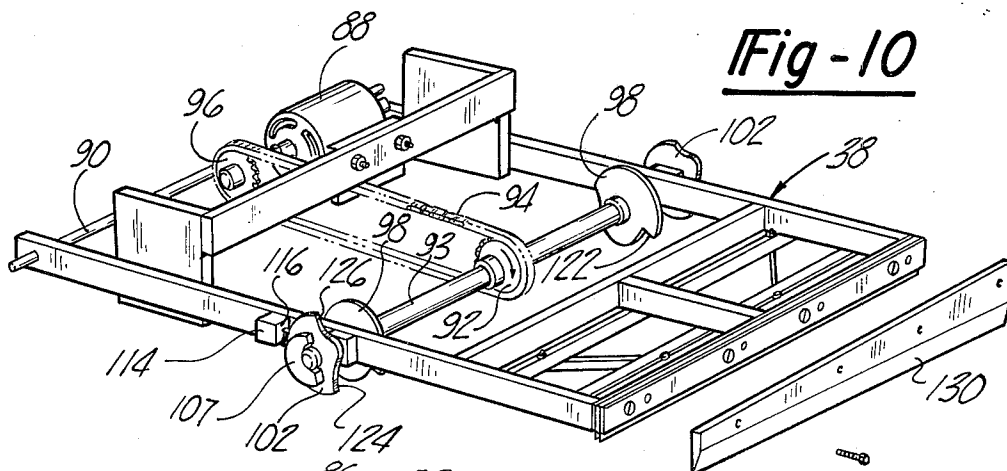


Fig-13

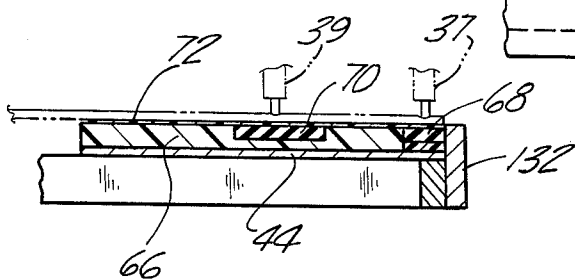
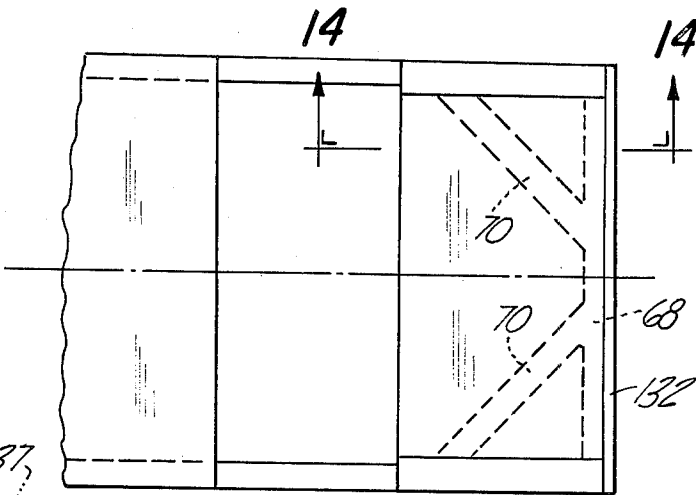


Fig-14

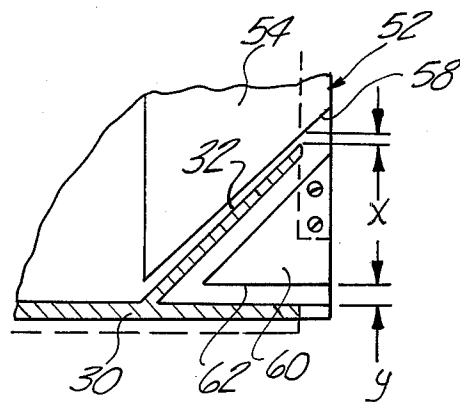


Fig-15

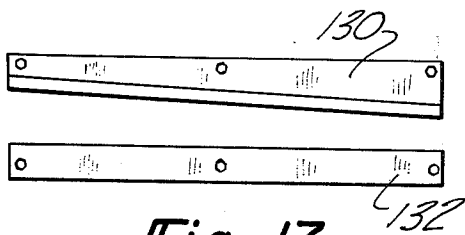


Fig-17

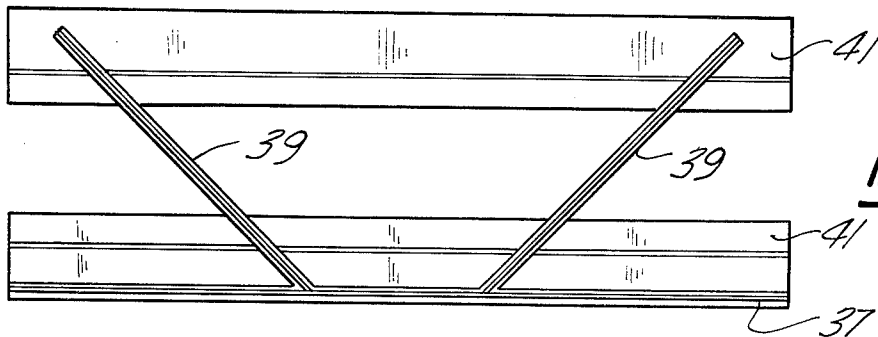


Fig-16

BAG FORMING APPARATUS

This invention relates to an apparatus for forming individual plastic bags from a continuous roll of flattened tubular stock material.

While the use of plastic bags for packaging has been growing in popularity, the storage of such bags, particularly the storage of various sizes of such bags, has posed a problem from the standpoint of both the space required to store the bags and the ease of dispensing such bags.

The present invention has for its object the provision of an apparatus by means of which plastic bags can be readily formed and dispensed as needed from a roll of flattened tubular stock material. Moreover, the apparatus of this invention enables bags of any selected length to be formed by merely withdrawing the desired length of stock from the supply roll.

More specifically, the apparatus of the present invention comprises a mechanism through which tubular stock material from a supply roll is directed and which, in response to actuation of a suitable switch after the desired length of stock is withdrawn, severs a previously formed bag from the supply roll and simultaneously forms the desired heat sealed seams at the leading end of the stock which will form the closed or bottom end of the next successive bag.

The present invention is designed to form a bag with a reinforced square bottom of the type shown in U.S. Pat. No. 3,143,277 wherein the stock material is in the form of a flattened tubular sleeve having inwardly extending gusseted panels along the opposite longitudinal edges thereof.

IN THE DRAWINGS

FIG. 1 is a perspective view illustrating one form of cabinet in which the apparatus of the present invention is adapted to be housed;

FIG. 2 is a perspective view of the bag in the flattened condition as it is dispensed from the apparatus;

FIG. 2A is a sectional view through the bag along line 2A—2A which, for purposes of illustration, has been slightly expanded;

FIG. 3 is a perspective view of the bag in the open condition ready to receive articles to be packaged;

FIGS. 4, 5 and 6 are somewhat diagrammatic views showing the successive operating sequences of the apparatus;

FIG. 7 is a plan view of the apparatus of the present invention;

FIG. 8 is a side elevational view of the apparatus of the present invention with parts broken away;

FIG. 9 is a fragmentary sectional view generally along line 9—9 in FIG. 7 illustrating the means by which the flattened tubular stock is guided through the apparatus;

FIG. 10 is a perspective view of the pivoted frame of the apparatus on which the sequencing cams, the sealing mechanism, and the shear mechanism are mounted;

FIG. 11 is a perspective view of the reciprocating slide of the apparatus;

FIG. 12 is a perspective view of the base frame;

FIG. 13 is a plan view of the forward end of the base frame with the stationary guide removed;

FIG. 14 is a fragmentary sectional view along the line 14—14 in FIG. 13;

FIG. 15 is a fragmentary view illustrating the manner in which the slide strips and separates the heat sealed

seams between the gusseted panels and advances the stock to facilitate manual withdrawal of the desired bag length;

FIG. 16 is a bottom view of a heat sealing mechanism; and

FIG. 17 is an end view of the shear mechanism.

In FIG. 1 there is generally illustrated an upright cabinet 10 on which a cash register 12 at a checkout counter of a retail establishment may be mounted. Cabinet 10 has a compartment 14 in which a supply roll 16 of flattened tubular plastic stock is rotatably supported. Above compartment 14 the bag-forming mechanism 18 of the present invention is arranged. The finished bag 20 is arranged to be discharged from the cabinet through a slot 22. The present invention is directed primarily to the construction and function of the apparatus 18. As the description proceeds it will become apparent that cabinet 10 merely houses apparatus 18 and may differ appreciably from that illustrated.

As pointed out above, the bag adapted to be formed by the present invention is of the type shown in U.S. Pat. No. 3,143,277; namely, a bag having a square reinforced bottom panel. The stock material 16 is in the form of a flattened tubular sleeve having top and bottom panels 24 adapted to form the side panels of the bag and inwardly extending gusset panels 26 which, when the bag is assembled, form the end walls of the bag. The gusset panels 26 comprise inwardly folded sections 26a, 26b which terminate in central fold lines 28 which are spaced apart laterally (FIG. 2A). The square bottom panel is defined by a heat sealed seam 30 extending straight across one end of the bag blank and diagonal sealed seams 32 which extend from the side edges of the gusseted blank inwardly to the straight seam 30. While seam 30 extends through all of the plies of the blank, the diagonal seals 32 are actually four in number, two extending between the top panel 24 and the adjacent gusset panel 26a and the other two extending between the bottom panel 24 and its adjacent gusset panel 26b. Thus, after these heat sealed seams are formed and the blank severed from the supply roll, the blank can be assembled into the bag illustrated in FIG. 3.

Referring now to FIGS. 7 through 12, the apparatus of this invention includes a rectangular base frame 34 having a pair of upstanding brackets 36 on which there is pivotably supported an upper frame 38. Electrically heated seal-forming bars 37, 39 are mounted on transversely extending support plates 41 at the forward end portion of frame 38. Bars 37, 39 have their heat sealing edges projecting downwardly. As shown in FIG. 16, bar 37 and bars 39 are positioned to form on the bag the heat sealed seams 30, 32, respectively. Thus, bar 37 extends transversely straight across the forward end portion of frame 38 and the two bars 39 extend diagonally outwardly and rearwardly from bar 37.

Base frame 34 is of generally rectangular shape and has three transversely extending support plates 40, 42 and 44 mounted on the top side thereof. Plate 40 extends across the rear end of base frame 34; plate 44 extends across the front end of base frame 34; and plate 42 is located approximately midway between plates 40 and 44. Brackets 36 are supported on plate 40. A pair of longitudinally extending and transversely spaced outer guide bars 46 have their forward ends mounted on plate 44 and their rear ends mounted on plate 42. There is also mounted on plate 42 adjacent the rear ends of guide bars 46 and spaced laterally inwardly

thereof a pair of short inner guide bars 48. Outer guide bars 46 in combination with the inner guide bars 48 form guideways for receiving and guiding the side rails 50 of a rectangular slide frame 52 (FIG. 11). A stripper plate 54 is mounted on each side rail 50. The inner longitudinal edges 56 of stripper plates 54 are spaced laterally apart to correspond with the distance d between the center folds 28 of the gusset panels on the tubular stock material as indicated in FIG. 2A. The forward edges 58 of the stripper plates 54 extend diagonally rearwardly in a laterally outward direction. Forwardly of stripper plates 54 there is also mounted on each side rail 50 of slide 52 a pusher foot 60. The forward edges 62 of these pusher feet extend transversely of the longitudinal axis of slide 52 and the rear edges 64 of these pusher feet extend diagonally in a laterally outward direction. The edges 58 and 64 of the stripper plates and pusher feet are spaced apart as shown in FIG. 11 to correspond generally with the orientation of heat sealing bars 37 on frame 38.

Between the forward ends of outer guide bars 46 there is mounted on plate 44 a plastic pad 66 which forms a platen for the sealing mechanism. Pad 66 has rubber strips 68 and 70 embedded therein. Strip 68 extends transversely across the front end of plate 44 and strips 70 extend diagonally rearwardly thereof in a laterally outward direction. Strips 68, 70 are located to register in position with heat sealing bars 37, 39, respectively, on upper frame 38. The top surface of the entire pad 66 is overlaid with a film 72 of a material such as Teflon to which the plastic bag stock will not firmly adhere when it is subjected to heat and pressure to form the heat sealed seams 30, 32.

Referring to FIG. 12, it will be noted that there is mounted on the two guide bars 46 a pair of laterally spaced guide plates 74, the inner edges 76 of which are spaced apart a distance d corresponding to the distance between the center folds 28 of the plastic tube stock. The forward edges 78 of guide plates 74 extend diagonally in a laterally outward and rearward direction. Separator strips 80 are secured to the forward edge portions of guide plates 74 on the upper side thereof so as to extend forwardly beyond the forward edges 78 thereof. Separator strips 80 are formed of a material such as Teflon to which the plastic bag stock material will not firmly adhere when a heat sealed seam is formed thereon against the separator strips.

The slide frame 52 illustrated in FIG. 11 is arranged on base frame 34 with the side rails 50 thereof arranged between the outer and inner guide bars 46, 48 on base frame 34. When the slide frame is so arranged on base frame 34 the stripper plates 54 underlie the guide plates 74 on base frame 34. In the normal retracted position of slide frame 52 on base frame 34 the diagonal slots 82 between each stripper plate 54 and its associated pusher foot 60 underlie the separator strips 80 on guide plates 74 and overlie the rubber insert strips 70 of the plastic pad 66 on plate 44 at the front end of base frame 34. Likewise, in the normal retracted position of slide frame 52, the forward edges 62 of pusher feet 60 are disposed slightly rearwardly of the rubber insert strip 68 at the forward end of plastic pad 66. A pair of tension springs 84 extend rearwardly from the rear ends of outer guide bars 46 to anchoring lugs 86 at the rear end of each side rail 50. Springs 84 urge slide frame 52 forwardly on base frame 34.

In the arrangement illustrated the power for operating the apparatus comprises an electric motor 88

mounted on upper frame 38. A transverse rod 90 at the rear end of frame 38 is journaled in brackets 36 so that frame 38 is pivotably supported for movement toward and away from base frame 34. A sprocket 92 fixed to a rotary shaft 93 extending transversely of frame 38 is connected by a chain 94 with a drive sprocket 96 on the output shaft of motor 88. Shaft 93 supports a plurality of cams which are arranged in pairs. The first pair of cams, designated 98, is fixed on shaft 93 inwardly of the side rails of frame 38. Cams 98 lie in the same vertical plane as and slightly forwardly of a pair of cam followers 100 supported on the side rails 50 of slide frame 52. The second pair of cams, designated 102, on shaft 93 are located slightly outboard of the side rails of frame 38 and are located directly above a pair of cam followers 104 which are mounted on an upwardly extending inverted U-shaped bracket 106 (FIG. 12) on base frame 34. Semi-circular cams 107 are mounted on the outer faces of cams 102. Cams 107 are adapted to be engaged by pressure rollers 108 which are also mounted on bracket 106. Rollers 108 are supported by vertically slidable studs 110 and are urged downwardly by springs 112. Cam followers 104 and rollers 108 are adapted to engage diametrically opposite edge portions of cams 98. On the side rail of frame 38 adjacent one of the cams 102 there is mounted a micro-switch 114 having a forwardly projecting finger 116 which is adapted to be momentarily tripped by a pin 118 (FIG. 7) projecting laterally inwardly from the inner face of the adjacent cam 102.

The configuration of the various cams described are such that, when a manual switch 120 (FIG. 1) on cabinet 10 is actuated, motor 88 is energized to rotate shaft 93 in the clockwise direction as viewed in FIGS. 8 and 10. With the motor de-energized frame 38 is in the elevated position; that is, the high sides of cams 102 are bearing downwardly upon cam followers 104 as shown in FIG. 8. At the same time, the radial steps 122 on cams 98 are engaged with cam followers 100 on slide frame 52 to retain the slide in a retracted position against the bias of springs 84. When the motor is energized the radial steps 124 on cams 102 ride over cam followers 104 and cause frame 38 to pivot downwardly while slide 52 is retained in the retracted position by the radial steps 122 on cams 98. As slide 52 pivots downwardly the pressure rollers 108 engage cams 107 to maintain the frame in the downwardly pivoted position for a predetermined period of time (for example, 5 seconds). Thereafter, as the cams continue to rotate, cam followers 104 engage the heel portions 126 of cams 102 and pressure rollers 108 ride off cams 107 so as to pivot frame 38 upwardly. As frame 38 pivots upwardly the radial steps 122 on cams 98 disengage cam followers 100 and slide 52 shifts forwardly under the bias of springs 84. The extent to which slide 52 can shift forwardly is limited by rubber bumpers 128 at the forward end of base frame 34 which are engaged by the forward ends of the side rails 50 of frame 52. Eventually the cam followers 104 again engage the high sides of cams 102 to pivot frame 38 upwardly and the radial steps 122 on cams 98 again engage cam followers 100 to retract the slide until such time as pin 118 momentarily trips finger 116 to de-energize motor 88 and thereby retain all of the components in the at rest position shown in FIG. 8. As indicated previously, when motor 88 is de-energized between cycles upper frame 38 is in the raised position and slide 52 is in the retracted position.

When frame 38 is pivoted downwardly a knife blade 130 at the forward end thereof cooperates with a knife bar 132 at the forward end of base frame 34 to shear the plastic therebetween across the full width thereof. Likewise, when slide 52 is in the retracted position and, more specifically, when frame 38 pivots downwardly, the heat sealing bars 39 are aligned vertically with slots 82 between stripper plates 54 and pusher feet 60. The forward straight edges 62 of pusher feet 60 are disposed slightly rearwardly of the straight transverse heat sealing bar 37.

In operating the machine the plastic stock is threaded through the apparatus so that the center folds 28 engage and extend around the inner edges 76 of guide plates 74 and the inner edges 56 of the underlying stripper plates 54 as shown in FIG. 9. Thus, the lower panel 24 and gusset panels 26b of stock material are located between stripper plates 54 and the Teflon film 72 which overlies the plastic pad 66. The upper panel 24 and gusset panels 26a of stock material are disposed between guide plates 74 and a sheet of Teflon 134 which extends across and over the front end portion of base frame 34. Thus, when upper frame 38 is pivoted downwardly, the heat sealing bars 37, 39, which are maintained at an elevated temperature, are pressed down on the vertically stacked layers of the tubular stock material to form seams 30, 32. Since the heat sealing bar 37 presses down against the upper and lower plastic layers between the Teflon sheet 134 and the Teflon film 72, a continuous seam is formed along the leading edge of the stock. At the central portion seam 30 is of dual thickness whereas at the laterally outer portions thereof seam 30 includes four layers of plastic material by reason of the gusseted panels 26. However, at slots 82 of slide 52 the two upper layers of the stock are separated from the two lower layers of stock by the Teflon separator strips 80 at the forward ends of guide plates 74. Thus, each heat sealing bar 39 actually forms two vertically registering seams, one between the two upper layers of the stock at the gusseted panels and one between the two lower layers of stock at the gusseted panels.

Referring to FIG. 15, several important features of the present invention are illustrated. For example, it will be observed that the forward edges 58 of stripper plates 54 are angularly related to seams 32 formed by the heat sealing bars 39. More specifically, the laterally outer portions of edges 58 are spaced closer to seam 32 than the laterally inner portions of edges 58. Likewise, it will be observed that edges 58, at least at their outer ends, are spaced rearwardly of the adjacent portion of seam 32 a distance x while the forward edges 62 of pusher feet 60 are spaced rearwardly of seam 30 by a greater distance y . Thus, after seams 30, 32 are heat sealed, slide 52 is shifted forwardly so that edges 58 of stripper plates 54 progressively strip or peel the heat sealed seams for the separator strips 80 on guide plates 74. This progressive stripping action also separates the lower seam 32 from the Teflon film 72 and the upper seam 32 from the Teflon sheet 134. It will also be observed from FIG. 15 that after seals 32 have been stripped the forward edges 62 of pusher feet 60 engage the laterally outer portions of the straight seam 30 to advance the stock forwardly a distance corresponding to the amount of forward travel of slide 52. For example, in FIG. 11 it will be noted that pusher feet 60 extend forwardly beyond the forward ends of side rails 50 so that when the forward ends of side rails 50 engage

rubber bumpers 128 the forward edges 52 of pusher feet 60 project forwardly beyond the knife bar 132. This enables the forward end of the stock to be readily grasped so that the operator can pull the stock forwardly and extend it an amount corresponding to the desired length of the bag required before actuating manual switch 120.

The operation of the apparatus can be briefly summarized by reference to FIGS. 4 through 6. In FIG. 4 the apparatus is shown in the condition wherein the operator pulls out the desired length of stock after the heat seals 30, 32 have been formed during the previous cycle of the apparatus. In this position the upper frame 38 is in the raised position and slide 52 is retracted. At this point the operator actuates switch 120 so that the upper frame 38 pivots downwardly to form seams 30, 32 at the forward end portion of the stock within the apparatus and to shear off the desired length to form the bag 20. As pointed out previously, after the upper frame 38 has been in the lowered position for approximately five seconds, it is again elevated by cams 102 and slide 52 is reciprocated by cams 98 to project the leading end of the stock with the seals formed thereon outwardly beyond the knife blade structure.

We claim:

1. Apparatus for forming flattened plastic tubular stock material having inwardly folded gusseted panels along the opposite longitudinal edges thereof into bags having a reinforced flat bottom panel defined by heat sealed seams which comprises, means for supporting a supply roll of said flattened stock material, a base having a generally flat supporting surface over which the leading end of said flattened tube is adapted to be advanced from said supply roll, a heat sealing mechanism movable vertically toward and away from said support surface for forming adjacent the leading end of the flattened tube a straight transverse heat sealed seam and two diagonal heat sealed seams extending inwardly from opposite side edges of the stock material to said straight seal, a guide and feed mechanism on said base which includes a pair of laterally inwardly extending guides on said base, the lateral inner longitudinal edges of said guides being spaced apart transversely and adapted to engage the center fold of each gusseted panel as the stock material is advanced on said support surface to maintain the flattened tube in proper alignment with the heat sealing mechanism, a mechanism for severing said stock material along a line spaced adjacent and forwardly beyond said straight transversely extending seam, said guide and feed mechanism also including a longitudinally reciprocable slide on said base having a portion disposed within each of said gusseted panels and adapted to engage said straight seam to advance the flattened tubular stock and means for operating the apparatus to first lower said heat sealing mechanism to engage the stock on said support surface and thereby form said heat sealed seams, sever the stock along said line adjacent and forwardly of said straight transverse seam, then raise the heat sealing mechanism and thereafter displace the slide forwardly to engage said straight transverse seam and advance the stock so that the leading end thereof is accessible for manual grasping.

2. Apparatus as called for in claim 1 including a separator film of material to which the plastic tube material does not firmly adhere when subjected to heat and pressure and means supporting said separator film between the folded layers of the gusseted panels in verti-

cal alignment with the mechanism for forming said two diagonal heat sealed seams.

3. Apparatus as called for in claim 2 including means on said slide directly adjacent said separator film for engaging said film and stripping it from the heat sealed diagonal seams.

4. Apparatus as called for in claim 2 including a frame mounted on said base, said heat sealing mechanism being mounted on said frame and comprising a heat sealing bar extending transversely straight across the forward end portion of the frame and a pair of heat sealing bars extending diagonally rearwardly from said transverse heat sealing bar in a laterally outward direction.

5. Apparatus as called for in claim 4 wherein said frame is mounted on said base for vertical movement toward and away from said support surface and including a knife bar on said frame spaced forwardly of said transverse heat sealing bar and cooperating with a shear bar at the forward end of said base for severing the stock material along a line spaced forwardly of said straight transverse seam when said frame is lowered.

6. Apparatus as called for in claim 4 wherein said slide includes a pair of laterally spaced stripper plates and a pair of laterally spaced pusher feet which are spaced from and forwardly of said stripper plates, the forward edges of the stripper plates extending generally diagonally of said support surface and the forward edges of said pusher feet extending transversely straight across said support surface, said forward edges of the stripper plates and the pusher feet being disposed rearwardly of said diagonally extending and said transverse heat sealing bars, respectively, when the slide is retracted and forwardly of said respective bars when the slide is advanced.

7. Apparatus as called for in claim 6 wherein said forward edges of the pusher feet are located rearwardly of said transverse heat sealing bar a greater distance than the forward edges of the stripper plates are located rearwardly of said diagonally extending heat sealing bars in the retracted position of the slide so that the forward edges of the stripper plates engage said separator film at the diagonal heat sealed seams before the forward edges of the pusher feet engage the transverse heat sealed seam when the slide is displaced forwardly from its retracted position.

8. Apparatus as called for in claim 7 wherein the forward edges of the stripper plates are skewed relative to the diagonally extending heat sealing bars.

9. Apparatus as called for in claim 8 wherein said forward edges of the stripper plates are angularly inclined toward the diagonally extending heat sealing bars in a laterally outward direction.

10. Apparatus as called for in claim 1 wherein said guides comprise a pair of laterally spaced plates fixed on said base and said longitudinal slide includes a pair of laterally spaced stripper plates and a pair of laterally spaced pusher feet, said stripper plates being slidably disposed between said support surface and said guide plates.

11. Apparatus as called for in claim 10 wherein said guide plates have forward edges disposed rearwardly of said diagonally extending heat sealing bars and including flexible separator strips mounted on said guide plates and extending forwardly beyond said stripper plates so as to underlie said diagonally extending heat sealing bars.

12. Apparatus as called for in claim 11 wherein said separator strips are secured to the top face of said stripper plates.

13. Apparatus as called for in claim 1 including a support frame on which said sealing mechanism is mounted, said support frame being mounted for vertical movement toward and away from said base, a plurality of rotatable cams on said support frame, means for rotating said cams simultaneously, said base having a cam follower fixed thereon and cooperating with one of said cams to raise and lower said support frame, said slide having a cam follower thereon cooperating with another of said cams to reciprocate said slide longitudinally on said base.

14. Apparatus as called for in claim 13 wherein said two cams are inter-related such that when said support frame is raised said slide is reciprocated forwardly from a retracted to an advanced position and then rearwardly from said advanced to said retracted position.

15. Apparatus as called for in claim 14 wherein said slide is spring-biased in a forward direction and said last-mentioned cam cooperates with the cam follower on the slide to drive the slide rearwardly against the bias of the spring.

16. Apparatus as called for in claim 14 including a third cam on said support frame cooperating with a pressure roller on said base which is spring biased in a downward direction, said first and third cams being inter-related such that the pressure roller engages the third cam to bias the support frame in a downward direction when the first cam and its associated cam follower permits the support frame to move downwardly.

17. Apparatus as called for in claim 14 wherein said means for rotating said cams comprises an electric motor, switch means for de-energizing said motor and means on one of said cams for actuating said switch means when the support frame is in the raised position and said slide has been reciprocated to the retracted position.

18. Apparatus for forming flattened plastic tubular stock material having inwardly folded gusseted panels along the opposite longitudinal edges thereof into bags having a heat sealed seam at the bottom thereof which comprises, means for supporting a supply roll of said flattened stock material, a base having a generally flat support surface over which the leading end of the flattened tube is adapted to be advanced from the supply roll, a heat sealing mechanism positioned adjacent the leading end of said base for forming adjacent the leading end of the flattened tube a heat sealed seam which extends transversely across the tube, a guide and feed mechanism on said base which includes a pair of laterally inwardly extending guides on said base, the lateral inner longitudinal edges of said guides being spaced apart transversely and adapted to engage the center fold of each gusseted panel as the stock material is advanced on said support surface to maintain the flattened tube in proper alignment with the heat sealing mechanism, means positioned forwardly beyond said heat sealing mechanism for severing the stock material along a line spaced adjacent and forwardly beyond said transverse seam, said guide and feed mechanism also including a longitudinally reciprocable slide on said base having a portion disposed within each of said gusseted panels and adapted when advanced to engage said transverse seam and thereby advance the flattened tubular stock, and means for operating said apparatus to first cause the heat sealing mechanism to engage the

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stock and thereby form said transversely extending heat sealed seam, sever the stock along said line adjacent and forwardly of said transverse seam, and thereafter displace said slide forwardly from a position rearwardly of said heat sealing mechanism to engage said transverse seam and advance the stock so that the leading end thereof is disposed forwardly beyond said severing means and is accessible for manual grasping.

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19. The combination set forth in claim 18 wherein said guides are mounted on said slide.
20. The combination set forth in claim 19 wherein the portion of said reciprocable slide adapted to engage said transverse seam comprises the forward edges of said guides.

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