Oct. 6, 1970 B. K. SMITH ET AL 3,531,907

METHOD OF WRAPPING PRODUCTS

Original Filed Dec. 28, 1966 5 Sheets-Sheet 1

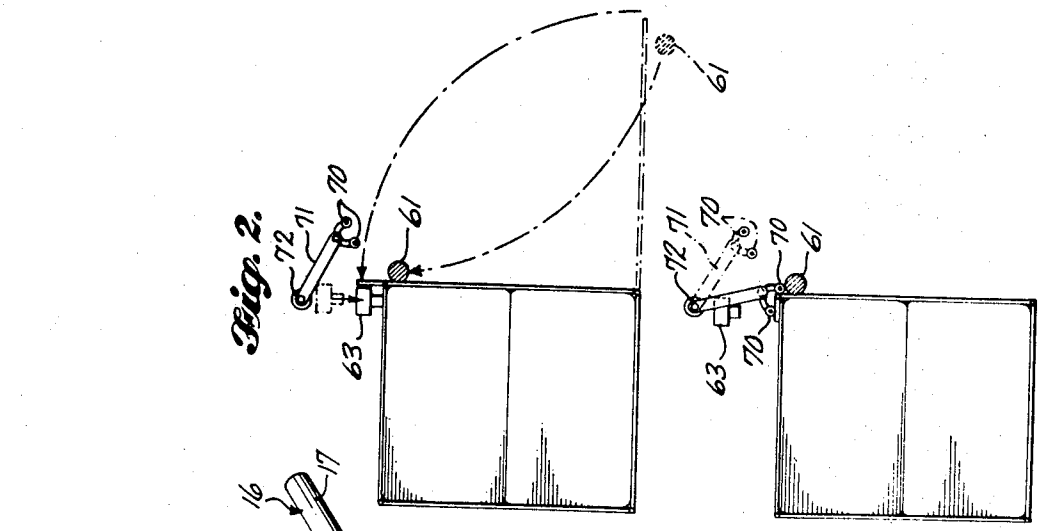


Fig. 2.

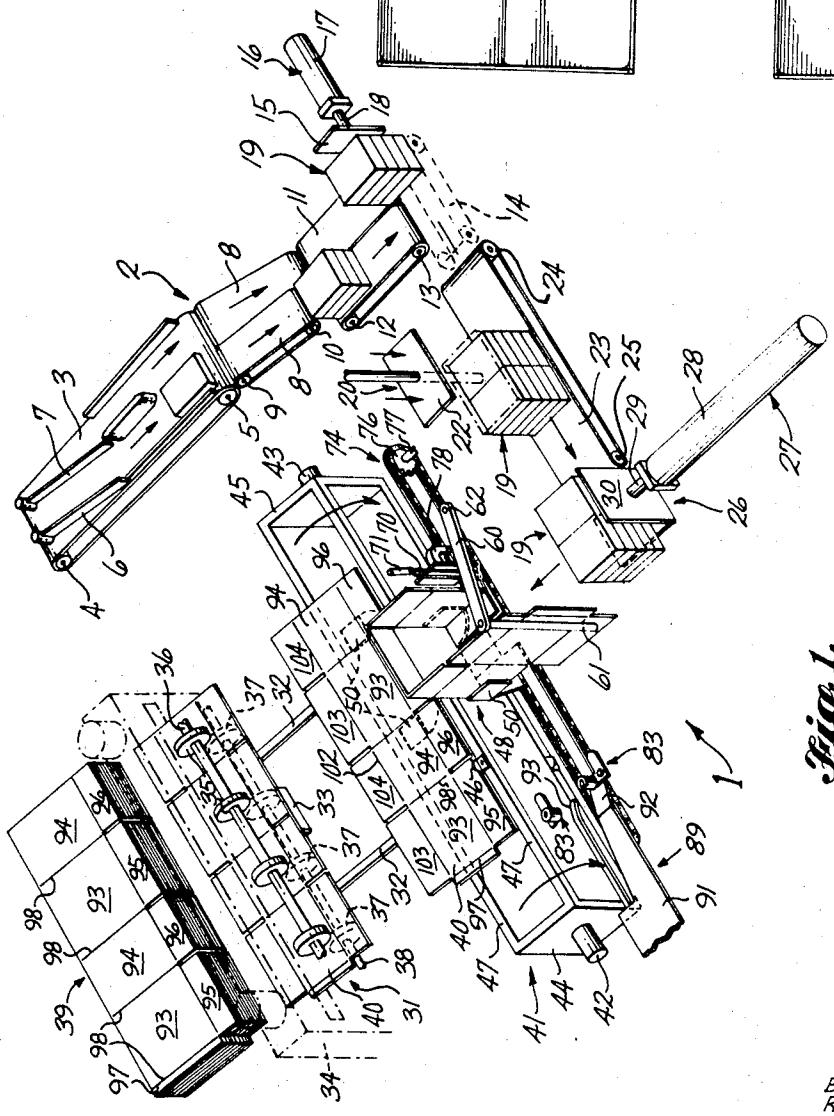


Fig. 3.

Fig. 1.

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METHOD OF WRAPPING PRODUCTS

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Fig. 4.

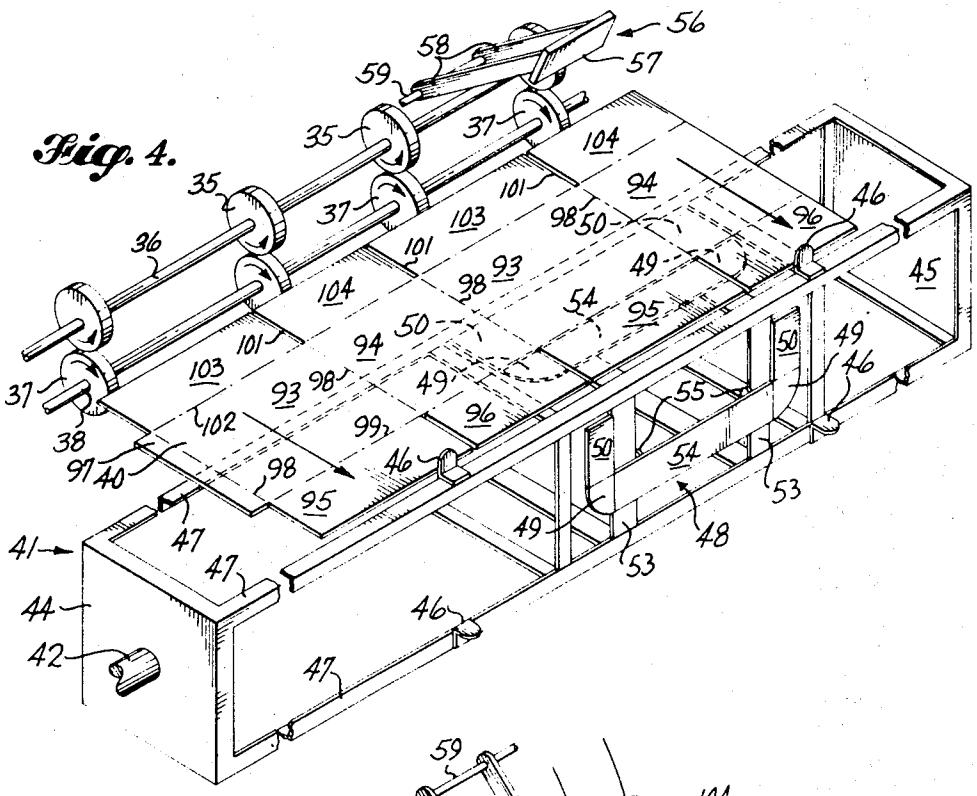
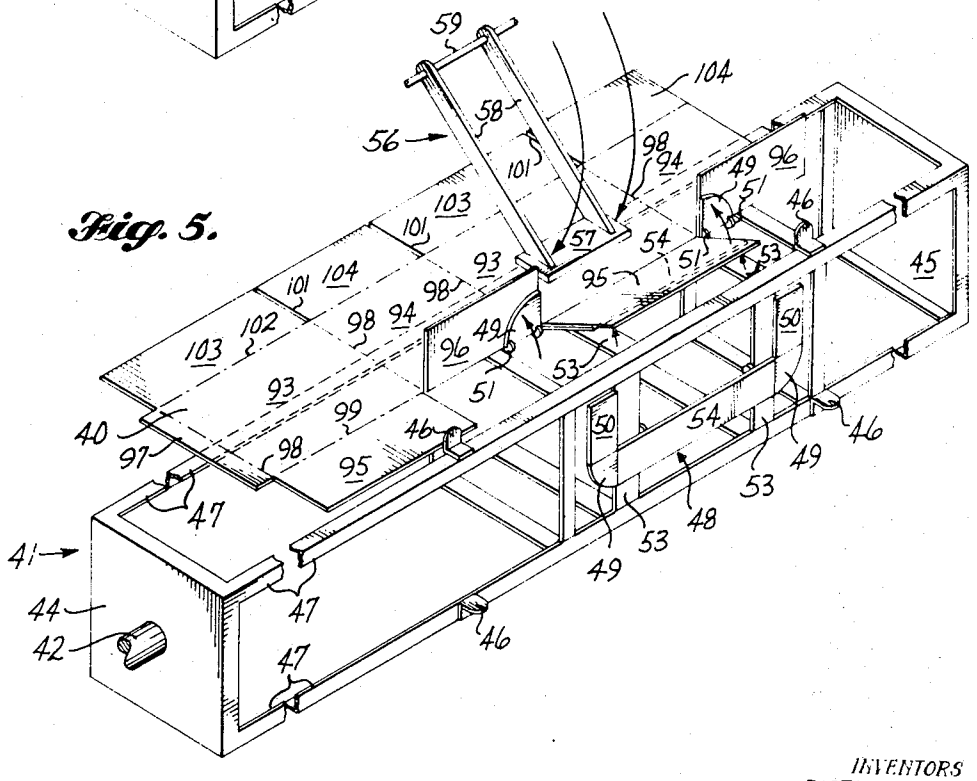


Fig. 5.



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METHOD OF WRAPPING PRODUCTS

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Fig. 6.

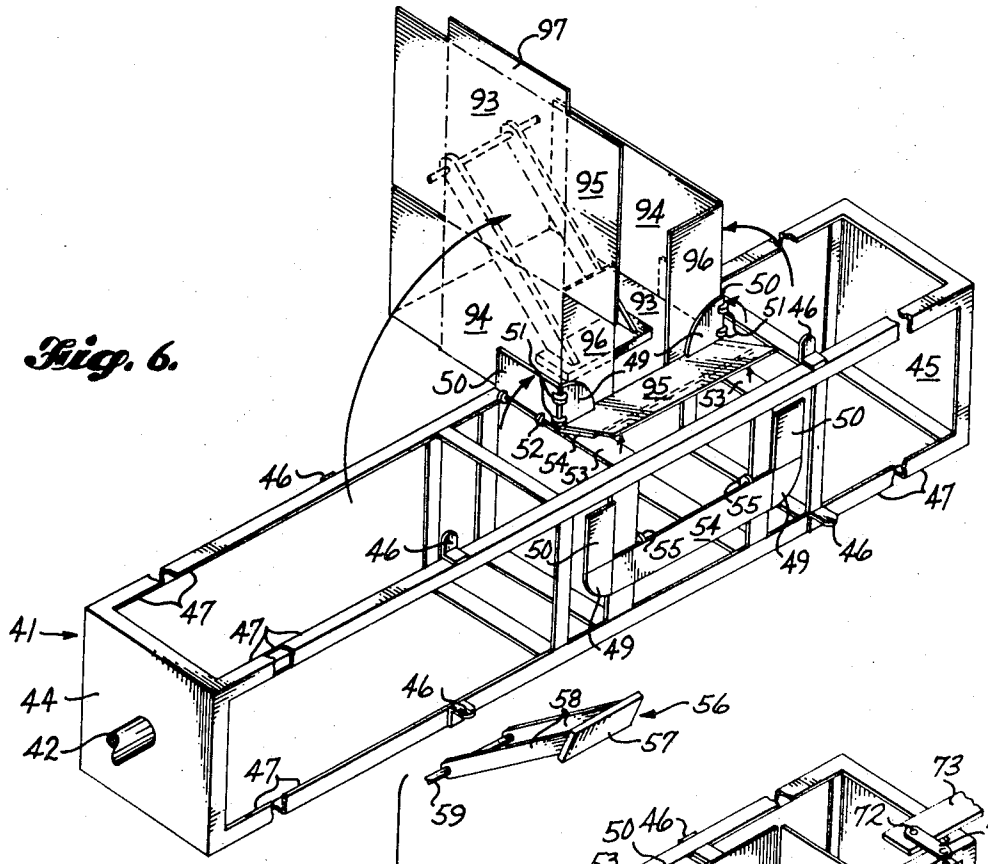
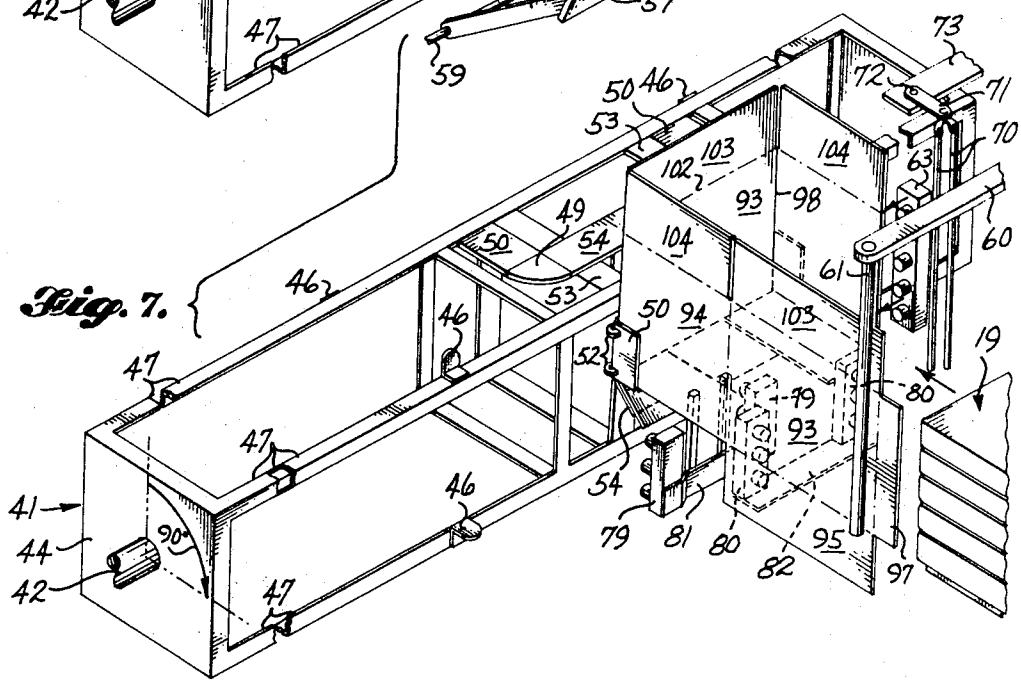


Fig. 7.



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Fig. 8.

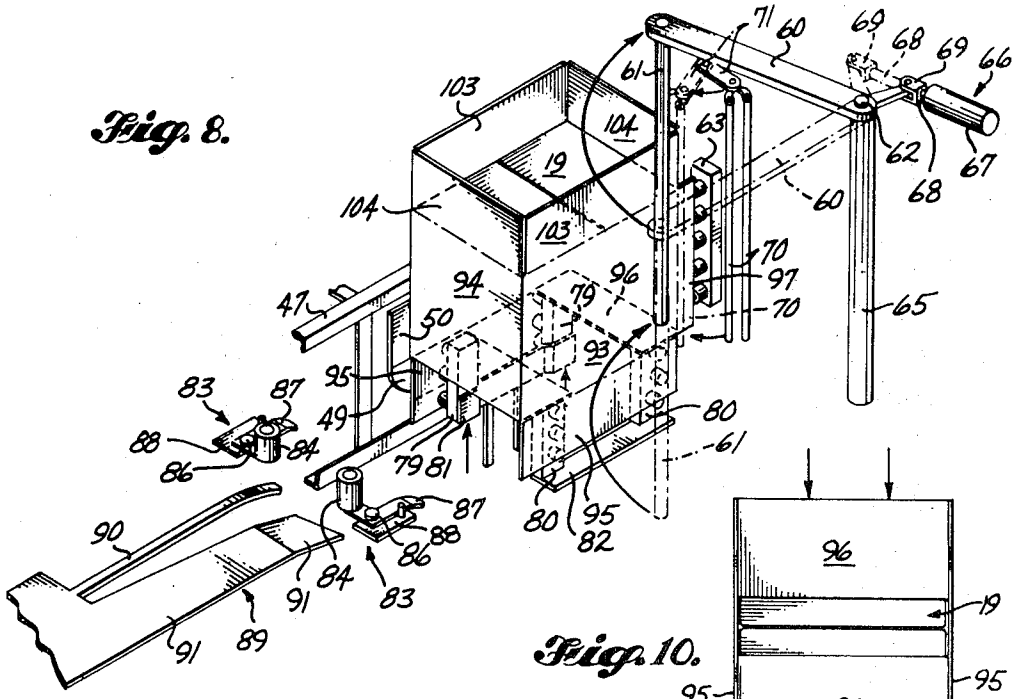


Fig. 10.

Fig. 9.

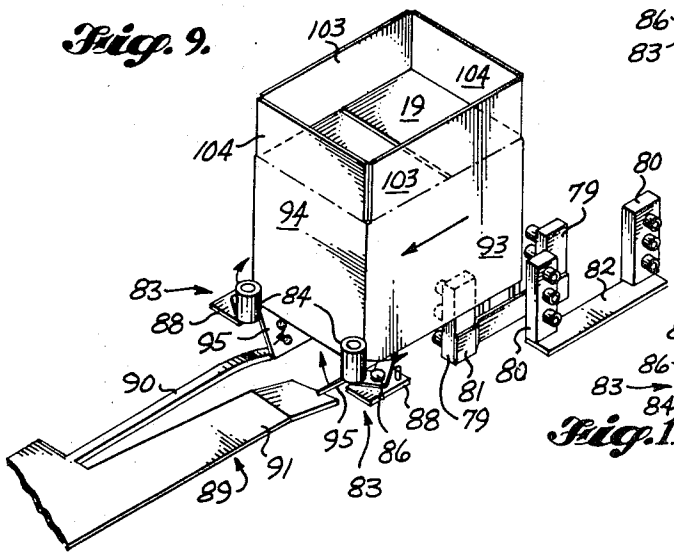
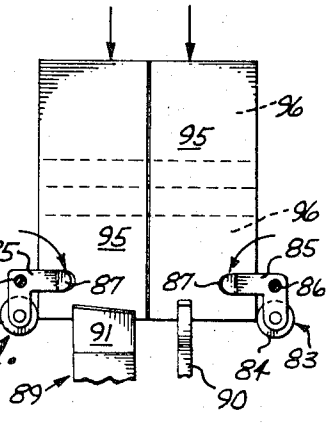


Fig. 11.



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Fig. 12.

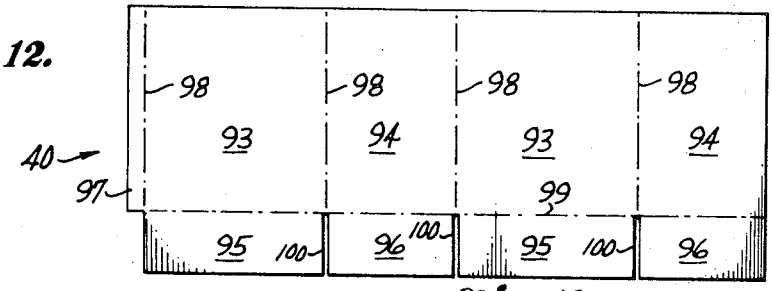


Fig. 13.

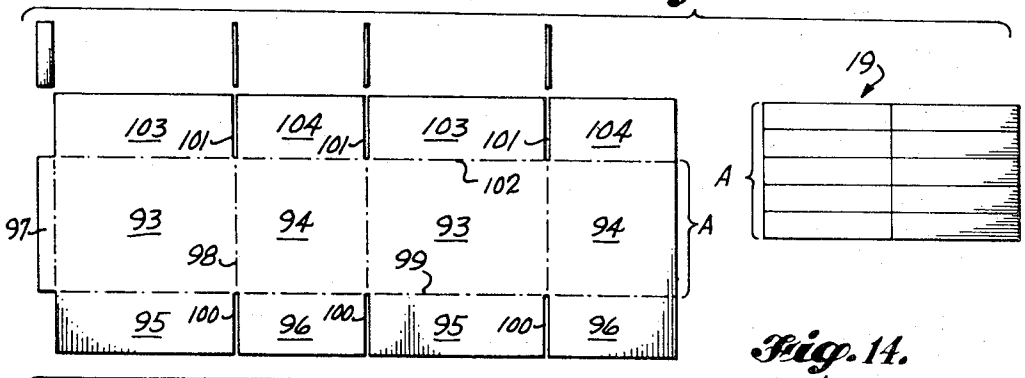


Fig. 14.

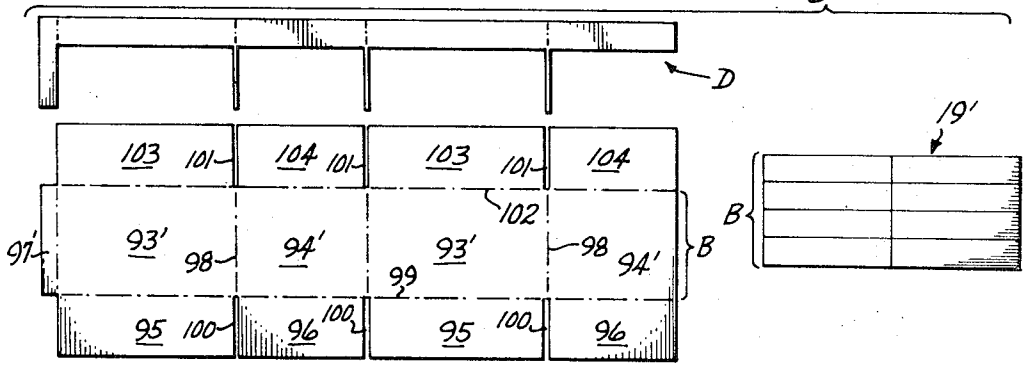
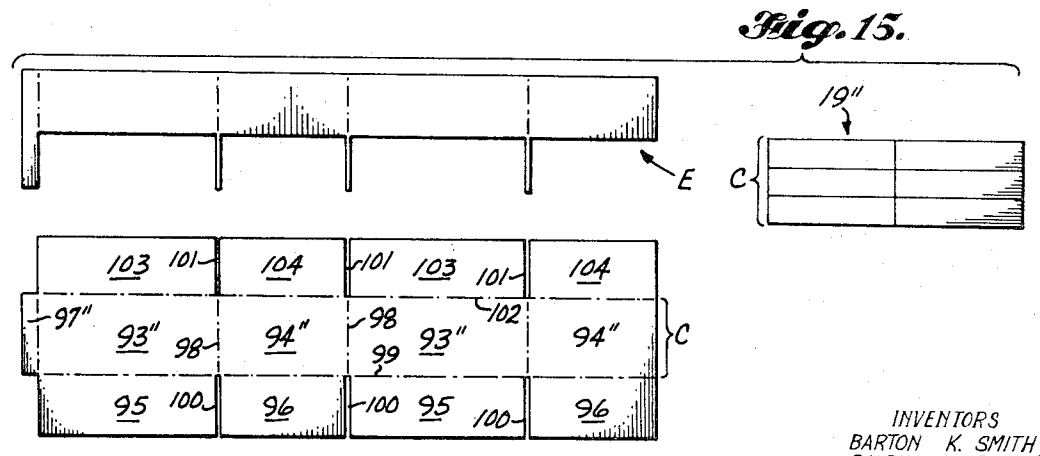


Fig. 15.



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3,531,907

METHOD OF WRAPPING PRODUCTS

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Original application Dec. 28, 1966, Ser. No. 605,321, now Patent No. 3,478,487, dated Nov. 18, 1969. Divided and this application Jan. 14, 1969, Ser. No. 810,887

Int. Cl. B65b *43/00*

U.S. Cl. 53—29 2 Claims

ABSTRACT OF THE DISCLOSURE

An apparatus and method for packaging articles of variable height. The articles are stacked and the height measured. A half-slotted container is then cut to size and scored and slotted. The blank is partially erected and the articles placed into the container through an open side. The container is then closed.

CROSS-REFERENCE TO RELATED APPLICATION

This is a division of application Ser. No. 605,321, filed Dec. 28, 1966, now Pat. No. 3,478,487, issued Nov. 18, 1969.

This invention relates to a method of forming, filling and enclosing products within containers. More specifically, this invention relates to a method of wrapping products of fixed lengths, fixed widths and varying heights within containers.

In the art of packaging products of fixed length and width and varying heights, it is the practice to form blanks for each size product to be packaged. The blanks are folded along the usual score lines and formed into a tubular configuration by a manufacturer's joint with a top and bottom thereof open. They are then knocked down for storage. When they are to be used, they must be set up and telescoped over the product or the product must be placed into the open-ended container. This practice has proved to be unsatisfactory because a machine is required for each step in the assembly of the blanks that packages the product which substantially increases the cost. Moreover, the manufacturer is required to maintain a large inventory of knocked down containers of varying sizes together with an inventory of filler pads for insertion into the filled containers to insure a tight package. Also, normal height variation in so-called standard size products will result in the container selected being slightly too small or too large. Thus, a tight package of the product is not obtained.

The object of this invention is to provide a method of tightly packaging products having fixed width and length and varying heights.

Another object of this invention is to provide a method of sensing the height of a product to be packaged and then wrapping the product with packaging material that is the exact height of the product.

Another object of this invention is to provide a method of wrapping products wherein a half-slotted blank is cut to the exact dimension of height of the product in response to a sensing means that measures the exact height of the product to be packaged.

Another object of this invention is to provide a method of wrapping packaging material around the product to be packaged wherein the packaging material is cut to the exact dimensions of the product.

It has been discovered that products of a fixed length, fixed width and varying height can be tightly fitted into packaging material. This is accomplished by a machine which measures the height of the product which is to be packaged, finishes a partially slotted and scored container blank, partially forms the container blank to fit and receive the product, finishes wrapping the container around the product, forms a manufacturer's joint, closes and seals the closure flaps and discharges the package. As the product enters the machine, a sensing plate is brought to bear on the top of the product to measure the height thereof. A half-slotted container blank is then fed from a hopper into a die cutter which slots the container blank, trims it and scores it according to the sensing plate's measurement. The resulting regular slotted container blank moves into a folding station where it is folded into a generally U-shape with lower end wall closure flaps folded to 90° and one lower sidewall closure flap folded to 45°. There, the partially formed container is positioned to accept and be wrapped around the product for which it is specifically sized. With wrapping completed, adhesive is applied to form the manufacturer's joint. Adhesive is applied to the flaps which are folded as the completed package moves from the assembly station to the take-away conveyer.

These and other objects and advantages will become manifestly clear to those skilled in the art when taken in conjunction with the detailed drawings and description, wherein:

FIG. 1 is a perspective schematic illustration of the apparatus of the present invention.

FIG. 2 is a top view with parts shown in cross section of the container illustrating the manner in which the container is folded around the product.

FIG. 3 is a view similar to FIG. 2 illustrating the manner in which the glue flap is formed into the manufacturer's joint.

FIG. 4 is a perspective view of the partial erecting and rotating means with the blank in position to be folded.

FIG. 5 is a perspective view similar to FIG. 4 but illustrating the lower flaps of the blank being folded into position.

FIG. 6 is a perspective view similar to FIG. 4 but illustrating the blank being formed into another position.

FIG. 7 is a perspective view similar to FIG. 6 but illustrating the partial erecting and rotating means rotated 90° with the blank ready to receive the material to be packaged.

FIG. 8 is a perspective view of the container with the product therein illustrating the manner in which the container is wrapped around the product.

FIG. 9 is a perspective view similar to FIG. 8 but illustrating the manner in which the bottom flaps are closed.

FIG. 10 is a bottom view of the package as it approaches the flap closing means.

FIG. 11 is a bottom view of the package illustrating the manner in which the bottom flaps are closed.

FIG. 12 is a plan view of the half-slotted blank used with the present invention.

FIG. 13 is a plan view of a regular slotted container blank and the products to be packaged therein after the blank has been cut to the exact size of the height of the product to be packaged.

FIG. 14 is a view of a blank similar to FIG. 13 but illustrating a blank of a different height.

FIG. 15 is a view similar to FIG. 14 but illustrating a blank for packaging a product of yet a still different height.

Referring to FIG. 12 of the drawings, a half-slotted blank **40** is illustrated that is usable with the present invention. The blank **40** is provided with a plurality of vertical score lines **98** to provide the blank **40** with side walls **93** and end walls **94** and a glue flap **97**. A lower

horizontal score line **99** is provided in the conventional manner to form lower side wall closure walls **95** and lower end wall closure flaps **96**. Slots **100**, coaxial with the vertical score lines **98** are provided in the usual manner to separate the flaps **95** and **96** in the usual manner.

In FIG. 13, a completed regular slotted blank is illustrated for receiving the product **19**. As illustrated, the height of the product **19** is indicated at A. As hereinafter set forth, this height A is measured by a sensing means and then the half-slotted container **40** is formed with an upper score line **102** which will provide a distance A between lower horizontal score line **99** and upper horizontal score line **102**. Simultaneously with forming the upper score line **102**, the upper side wall closure flaps **103** and upper end wall closure flaps **104** are formed with slots **101** therebetween. Also, a portion of the glue flap **97** is removed to form a conventional container blank. In FIG. 14, the half-slotted container blank **40** is illustrated as being cut to a size to receive a product **19'** of a different height. As illustrated, the height of the product **19'** is indicated at B and the distance between lower horizontal score line **99** and upper horizontal score line **102** is the distance B. Since the height of the product **19'** is smaller than the height of the product **19** in FIG. 13, additional material D is removed from the upper portion thereof. In FIG. 15, the half-slotted blank **40** is illustrated as being cut to a size C to receive a product **19''** having a height C. Since the height of the material **19''** is smaller than the product **19'**, additinal material E is removed as waste. The regular slotted container blanks illustrated in FIG. 13, 14, and 15 are identical with each other except for the height between the lower horizontal score line **99** and upper horizontal score line **102**. The size of the half-slotted blank **40** illustrated in FIG. 12 will be selected for the maximum size of product to be packaged. Thus, if there is any variation in size between packages of products **19**, the machine for forming the half-slotted blank **40** into a regular slotted blank will automatically compensate therefor as hereinafter set forth.

Referring now to FIG. 1, the wrapping machine **1** includes a feeding and collating conveyor **2** for stacking the product **19** in an orderly manner. The product **19** is then passed to a height sensing mechanism **20** which accurately determines the height of the product **19**. The sensed stack of product is advanced by means of conveyor **23** to inserter mechanism **26**, said inserter mechanism moves the product **19** into the container for wrapping the product **19**. The wrapping machine **1** is also provided with a blank slotting and scoring means **31** which forms the half-slotted blank **40** into a regular slotted container blank. Located adjacent the blank slotting and scoring means **31** is a partial erecting and rotating means **41** which includes the container blank folding means **48**. As the blank **40** is held in the position as indicated in FIG. 1, the product **19** is loaded into the partially folded blank and then the side wall **93** thereof is folded around the product and a manufacturer's joint is formed. An ejector mechanism **74** pushes the container which has been wrapped around the product **19** past bottom flap folding means **83** and onto a ramp **89** where the container is then removed to a top closing mechanism which may be positioned in tandem relationship with the ramp **89**.

In the illustration of the present invention, the product **19** being packaged is reams of paper that are being stacked five high with two stacks being packaged within one container. However, it is to be understood that other products can be packaged using the present invention. As illustrated in FIG. 1, the feeding conveyor **2** is provided with a belt **3** extending around pulleys **4** and **5**, one of which is driven. The feeding conveyor **2** is provided with guides **6** and **7** that are movable across the belt **3** to guide the reams of paper **19** into the proper position. At the exit end of the feeding conveyor **2** are dual tipple

conveyors **8** extending around pulleys **9** and **10**. The tipple conveyors **8** are movable up and down so as to stack the reams of paper one on top of the other to form a stack as illustrated in FIG. 1. Dual stacking conveyors **11** receive the stacked reams of paper from the tipple conveyors **8** and move the same to another conveyor **14**. The stacking conveyors **11** extend around pulleys **12** and **13** in the usual manner.

When sufficient reams of paper have been stacked onto the conveyor **14**, they are moved from the stacking position to a position under the height sensing means **20** by a motor means **16**. Cylinder **17** having a piston rod **18**, a piston, not shown, and a plate **15** constitute a squaring device to ensure the proper advance of the piled stacks of product **19**. The sensing means **20** consists of a rod **21** which is mechanically or otherwise actuated to move in a vertical plane. Mounted on the lower end of the rod **21** is a plate **22** which engages the top of the product **19** to be packaged. When the sensing means **20** is actuated, the exact height of the product **19** is accurately measured. This distance is then relayed to the blank slotting and scoring means **31**. Accordingly, the height of the container for the particular package underneath the sensing means **20** is exactly determined.

The product **19** is then moved by means of conveyer **23**, which is mounted around the pulleys **24** and **25**, from the sensing means **20** to the inserter tray which is part of air motor **27** assembly. The inserting means **26** includes a tray over fork arrangement, the tray receiving the product **19** from the sensing means, said tray being withdrawn from the product **19** by means of air motor **27** having a cylinder **28**, a piston rod **29** and a piston, not shown. When the tray is withdrawn, the product **19** is dropped vertically upon a support (not shown) which is part of plate **30**. This plate and fork arrangement **30** is mounted on a chain which is actuated by a motor unit. Plate and fork arrangement **30** moves the product **19** to the left as indicated by arrow in FIG. 1. Product **19** is inserted into the partially folded container by means of plate and fork arrangement **30**. To ensure product remaining in the partially folded container a vertically operated stripping plate, not shown, is raised beneath and between the fork of arrangement **30** thus retaining product **19** in container while plate and fork arrangement **30** is retracted.

The blank slotting and scoring means **31** is provided with a frame **34** which supports a table **32** and movable pivotally mounted stop member **33**. Also, feed rolls **35** and **37** are provided to move the half-slotted blank into position and to move the fully slotted blank from the machine. The rolls **35** and **37** are mounted on shafts **36** and **38** to rotate in opposite directions to move the blank **40** from the blank slotting and cutting means **31**. As is conventional, the blank slotting and scoring means is provided with a scoring means and a cutting means to form the upper flaps **103** and **104** and slots **101** along with upper horizontal score line **102**. The stop member **33** in the scoring and cutting mechanism **31** is moved within the blank slotting and scoring means **31** in response to the height sensing means **20** to accurately position the blank **40** in mechanism **31** so that it is die cut to the exact height of the product **19**. After the blank **40** has been formed, the stop **33** pivots downwardly out of the of the blank **40** and the feeding wheels **35** and **37** are actuated to move the blank on the table **32** into the position as shown in FIG. 1 and FIG. 4 onto the partial erecting and rotating means **41**. As is conventional, a bundle of blanks **39** is positioned to be fed from the lower portion thereof into the blank slotting and scoring means **31**.

The machine **1** is provided with a partial erecting and rotating mechanism **41** which is illustrated as being rectangular in form. The partial erecting and rotating means is mounted on hollow trunnions **42** and **43** with the ends closed by plate members **44** and **45**. The hollow trunnions rotate about a fixed shaft, not shown, which extends laterally across the erecting and rotating means and is an-

chored at each end outside the operating areas of trunnion 42 and 43. The ends 44 and 45 are connected together by rails 47. Each of the rails 47 is provided with stop lips 46 which are engageable with the blank 40 to retard the advance of the blank 40. Each side of the rectangular partial erecting and rotating mechanism 41 is provided with a container folding means 48 which includes side flap folding means 54, end flap folding means 49 and end wall folding means 50. The side flap folding means 54 is mounted on pivots 55 on the frame structure to rotate the side flap folding means to 45° which in its rotation causes end flap folders 49 to fold about pivots 51 mounted on end wall folding means 50 to fold the end flaps 96 to 90° with respect to the end walls thereof. The end wall folding means 50 is mounted on pivots 52 to fold the end walls 94 to about 87° with respect to the side walls 93 (see FIG. 6).

To ensure that the blank 40 is properly maintained on the partial erecting and rotating mechanism 41, a blank holding means 56 is provided which includes a shoe 57 that engages one of the side walls 93 to hold the same in proper position. The shoe 57 is mounted on support arms 58 which in turn are supported by a support rod 59. As can be seen in FIG. 4 and FIG. 5, the rod 59 will rotate the blank holding means toward and away from the blank 40.

After the blank has been folded or partially erected as illustrated in FIG. 6, the blank holding means 56 is retracted to position as indicated in FIG. 4. The partial erecting and rotating means 41 is then rotated through 90° to place the container blank with an open side in position to receive product 19 for packaging. To ensure this position of partial erecting and rotating means 41 a pin and stop arrangement is provided with the stop mounted on the side plate 44 with the pin mechanism mounted from the fixed shaft supporting frame. This position is illustrated in FIG. 7. A side wall folding arm 60 is provided having a rod member 61 vertically mounted thereon. The arm 60 is pivotally mounted on a pivot 62. As is more clearly seen in FIGS. 2, 3, 7 and 8, the rod 61 engages the side wall 93 containing the glue flap 97 to fold the same along one of the vertical score lines 98 to completely enclose the product 19. As is illustrated in FIG. 8, side wall folding arm 60 is pivotally mounted at 62 which is supported by a post 65. A linkage 64 connects the arm 60 with an air motor 66 which includes a cylinder 67 having a piston rod 68 extending out one end thereof with a yoke 69 pivotally connected to the linkage 64. In this manner, the folding arm 60 can be rotated to close the side wall thereof. When it is desired to adhere the glue flap to the end wall, a glue applicator 63 is actuated to move adjacent the end wall that is adjacent the glue flap 97 and applies a glue line thereon. A vertical pivotal dual rod 70 is provided which is adapted to be rotated about a linkage 71 which is pivotally connected at 72 to a support 73 to fold the glue flap 97 adjacent to the end wall and close the same. This is illustrated in FIGS. 3 and 7.

After the glue flap 97 has been adhered to the end wall, the container containing product 19 will be ejected therefrom by an ejector means 74 which includes a chain 75 extending around sprocket 76 which is mounted on shaft 77. The chain is provided with an abutment 78 to move the container from the position shown in FIG. 1 to the left thereof. The ejector mechanism 74 functions in a reversible manner so that the abutment 78 moves the partially packed or closed container toward the left as illustrated in FIG. 1 and then reverses itself in response to the rotation of shaft 77.

Adhesive applicators 79 and 80 are provided on each side of the lower portion of the container so as to apply an adhesive on the interior surface of the lower side wall closure flaps 95. As illustrated in FIG. 7, the adhesive applicators 79 and 80 are mounted on support plates 81 and 82. At the time side panel 93 is folded, the support plate 81 with its adhesive applicators is raised to position for application of adhesive on side flap 95. In the upward motion of the support plate 81 a toggle lever is provided to return side flap 95 to a vertical position from its 45° position so that said side flap can receive adhesive. After adhesive application support plate 81 with its adhesive applicators is returned to a lowered position to permit passage of product filled container by means of ejector means 74. Accordingly, as the container is moved past the glue applicators by the abutment 78 in response to the rotation of shaft 77, adhesive is applied to the flaps which are subsequently closed.

As illustrated in FIGS. 1, 9, 10, and 11, the bottom side wall closing flaps 95 are folded adjacent to the bottom end wall closing flaps 96 by spring loaded flap closure means 83. The flap closing means 83 are mounted on each side of the path of travel of the container containing the product so as to close each lower side wall closing flap. Each of the bottom side wall flap closing means 83 are provided with rollers 84 which are mounted on an L-shaped arm 85 which is in turn pivotally mounted on the frame by a pivot pin 86. Accordingly, as the packed container advances toward the rolls 84, the rolls pivot around the pivot pin 86 and the lateral portion 85 moves underneath the container to fold the flaps 95 into position as illustrated in FIG. 11. The outer extreme end portions of the members 85 opposite the end mounting the rolls 84 are provided with curved portions 87 to ensure that no inadvertent scoring or detainment of the flaps 95 occurs. This curved portion 87 merely ensures that the container will not hang up in this position.

As the bottom closed container moves past the bottom side wall closing flaps 83, it is received on a receiving ramp 89 provided with arms 90 and 91. The end portion of the arms 90 and 91 are provided with curved portions 90' and 91' to ensure proper sliding movement of the loaded container onto the ramp 89.

When the container reaches the receiving ramp 89, the bottom of the container is completely closed with the top thereof remaining open. The container may then be passed through a conventional top closing machine which can be mounted in line with the ramp 89 to automatically close the top portion thereof.

In operation, it will be assumed that reams of paper are being packaged within the container blanks 40 and that there will be ten reams per package with the ten reams being divided into two separate stacks with each stack being five reams high. It will further be assumed that the feeding conveyer 2 has positioned a stack of ten reams of paper adjacent the motor means 16 so as to move the same into the machine. It will further be assumed that a stack 39 of half-slotted blanks 40 are positioned to be fed into the blank slotting and scoring means 31.

Accordingly, the motor 16 is actuated to move the product 19 to be packaged on the conveyer 14 to a position directly underneath the height sensing mechanism 20. Simultaneously with moving the product 19 under the sensing means 20, a half-slotted blank 40 is stripped from underneath the stack 39 and moved to a position engageable with stop 33. Power means are now actuated to move the plate 22 on sensing means 20 down on top of the product 19 to exert a slight pressure thereon. Accordingly, the height sensing means 20 measures the distance between the upper and lower end of the product 19. This distance is transmitted by mechanical linkage or other means to the blank slotting and scoring means 31 which moves the stop member 33 that positions the blank 40 properly therein to provide an upper score line, as indicated at 102 in FIG. 13, to provide a distance between the score lines 99 and 102 the exact height of the product 19 to be packaged. The power means that actuated the sensing means 20 is then reversed to move the plate 22 upwardly and away from the product 19. Simultaneously therewith, the stop 33 is pivoted downwardly and the feed wheels 37 and 35 feed

the now regular slotted blank toward the partial erecting and rotating means **41** until the blank engages the stop lips **46**.

With the blank **40** positioned on the partial erecting and rotating means **41** as illustrated in FIG. 4, the blank holding means **56** is pivoted down to engage one side wall thereof with the end walls adjacent the outer edges thereof. This position is shown in FIG. 5. Thereafter, the side flap folding means **54** is actuated and folded to a 45° angle which in turn actuates the end flap folding means **49** to fold the lower end flaps **96** to 90° with respect to the end walls **94**. Thereafter, the end walls **94** are folded along score lines **98** so as to be positioned about 87° with respect to the side walls by the end wall folding means **50**. Thus the side wall **93** provided with the glue flap **97** is in the same plane as the end wall **94**. With the blank held in this position, power means is actuated to rotate the means **41** to about 87° to position the partially erected blank in a position to receive the product **19** from the side thereof.

With the blank **40** partially erected, the product **19** is placed therein by actuating the loading mechanism **26** to slide the product **19** into the container. Then the motor means **66** is actuated to move the side wall folding arm **60** from a position as seen in FIG. 2 to a position adjacent the side wall thereof to fold the side wall **93** along score line **98** to completely enclose the product **19** within the container. Thereafter, the glue applicator **63** is actuated to move toward the container which applies the proper amount of adhesive thereto. Thereafter, the dual glue flap closure rods **70** are actuated to fold the glue flap adjacent the end wall as illustrated in FIG. 3 to close the container around the product **19**. It is to be understood that the loading means **26** moves toward and away from the open container so that it is out of the position to interfere with the function of the closure rods **70** and **61**. Thereafter, the rods **61** and **70** are positioned to return to their original position and the ejector means **74** is actuated so that the abutment means **78** moves the packaged container out of the machine.

As the package is being moved from the position as shown in FIG. 8, the glue applicators **79** and **80** apply a glue line on the lower side wall closure flaps **95**. The package then engages the lower side wall folding means **83** as illustrated in FIGS. 10 and 11 to fold the lower side wall closure flaps adjacent the lower end wall closure flaps and adheres the same to close the lower end. The package is then moved onto the ramp **89** for further processing to close the upper end thereof.

While specific details of a preferred embodiment have been set forth above, it will be apparent that many changes and modifications may be made therein without departing from the spirit of the invention. It will therefore be understood that what has been described herein is intended to be illustrative only and is not intended to limit the scope of the invention.

What is claimed is:

1. A method of packing products within a container, comprising the steps of: sensing the height of the product to be packaged; forming a regular slotted container blank in response to the height of the product to be packaged to conform to the exact height dimension thereof; partially erecting said container blank so as to provide an opening on one side thereof; loading the product within the container blank from the side thereof; fully enclosing the product within the container blank; closing the lower end thereof.

2. The method of claim **1** together with the additional step of rotating the container blank 90° prior to loading the product into the blank from the side thereof.

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