April 20, 1965 D. M. HOFF 3,179,023

METHOD OF MANUFACTURING A REINFORCED LINER

Original Filed July 18, 1960 2 Sheets-Sheet 1

Fig. 1.

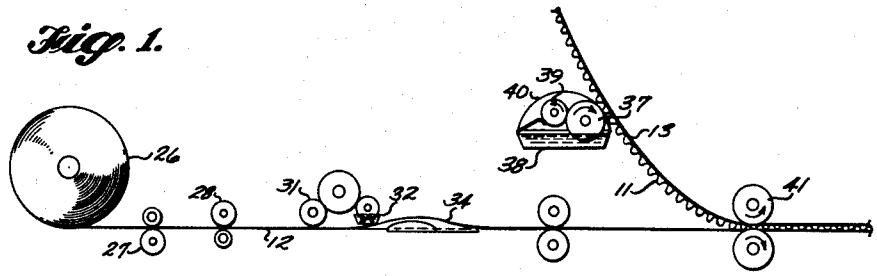


Fig. 2

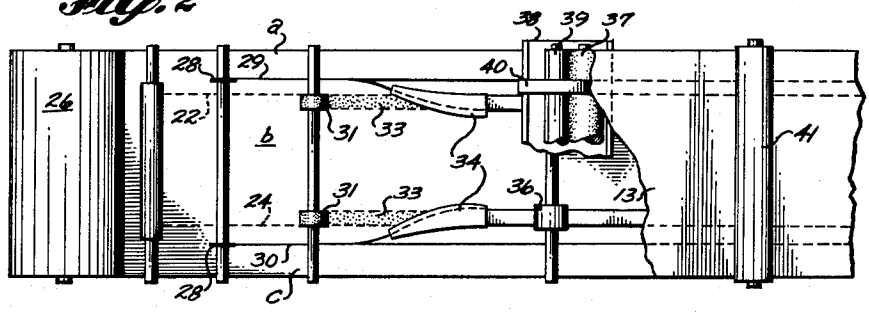


Fig. 3.

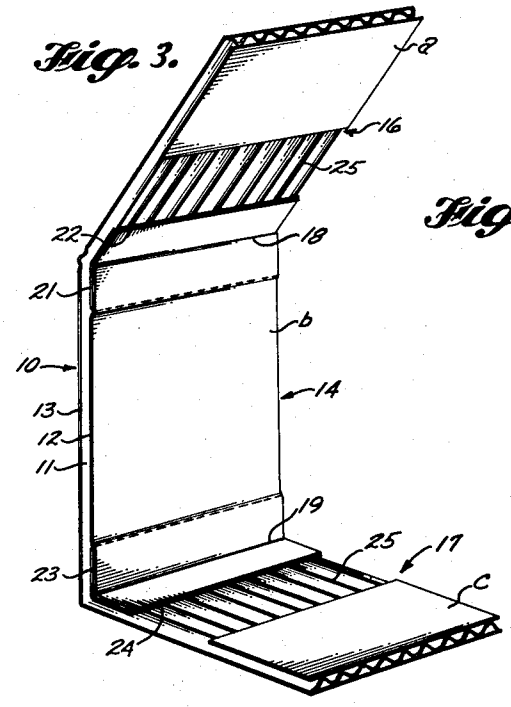
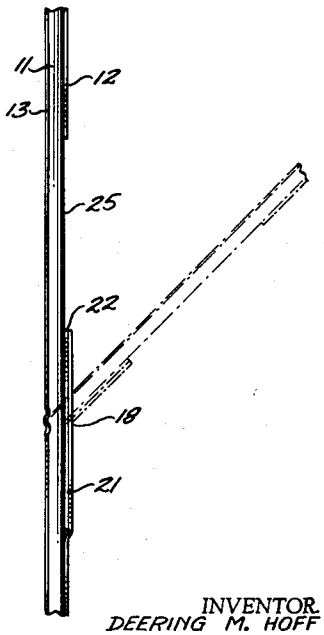


Fig. 4.



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Fig. 5.

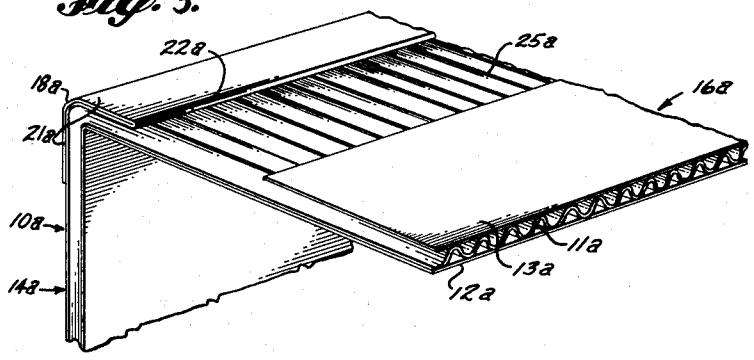
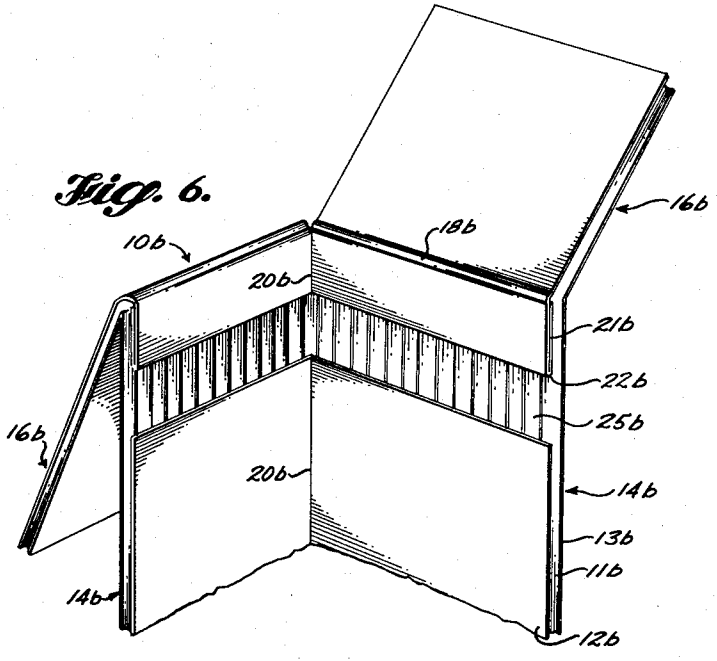


Fig. 6.



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3,179,023
METHOD OF MANUFACTURING A REINFORCED LINER

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Original application July 18, 1960, Ser. No. 43,538, now Patent No. 3,094,266. Divided and this application Nov. 13, 1962, Ser. No. 237,085

5 Claims. (Cl. 93—1)

This invention relates to the method of manufacturing a reinforced liner, and more particularly relates to the method of manufacturing a liner having reinforced sections in which the fold lines for corrugated cartons or containers will be formed.

This application is a division of my co-pending patent application Serial No. 43,538 filed July 18, 1960, now Patent No. 3,094,266.

Much difficulty has been experienced in the packing and handling of canned goods in shipping containers because of the tendency of the relatively sharp can rims to cut into the carton at the fold lines between the side walls and the top and bottom flaps of the cartons. As soon as the carton is so cut, it loses its strength, the side walls bulge out, the cans within start to shift causing greater damage to the carton until the contents become seriously damaged.

An obvious solution to this problem would be to use stronger, heavier cartons, but this would increase the expense unduly. Similarly, applying a strip of tape or the like along the fold lines would be a workable but expensive and probably time-consuming answer. The invention disclosed in my co-pending application reinforces the fold lines without using any extra material and without weakening the overall strength of the carton. The present invention contemplates a method of and means for manufacturing said carton. The present invention may be carried out in a conventional box-making plant without the addition of expensive machinery and without appreciably slowing the speed of manufacture.

An object is to provide a method and means of strengthening the fold lines of a corrugated container by doubling over a portion of one of the liners so that a doubled thickness of such liner is provided along and on each side of the fold line where needed to strengthen the fold line against failure.

Other objects and advantages will become apparent in the course of the following detailed description.

In the drawings, forming a part of this application, and in which like parts are designated by like reference numerals throughout the same,

FIGURE 1 is a generally schematic, elevational view illustrating the method by which cartons of the present invention may be made.

FIGURE 2 is a plan view of the apparatus shown in FIGURE 1.

FIGURE 3 is a perspective view of a fragment of a carton illustrating the manner in which the horizontal fold lines between the side wall and top and bottom flaps are reinforced.

FIGURE 4 is a sectional view of a carton further showing the manner in which the fold lines are reinforced and with the thicknesses of the lines exaggerated for purposes of illustration.

FIGURE 5 is a perspective view of a portion of a carton illustrating another type of reinforced construction.

FIGURE 6 is a perspective view of yet another type of reinforced construction.

Referring now to the drawings, FIGURE 3 shows a portion of a corrugated shipping container 10 formed

from a blank having a corrugated core 11 and inner and outer liners 12 and 13 glued to the core. The illustrated portion of the container has a side wall panel 14 and adjoining top and bottom flap panels 16 and 17 joined to the side wall panel by fold lines 18 and 19, respectively.

The inner liner 12 of the top flap 16 has a portion 21 thereof doubled back onto itself along a score line 22 and extends back down past fold line 18 so that a double thickness of this line is formed at fold line 18 and on each side of this fold line. Preferably the width of the doubled back portion 21 is approximately twice the distance from fold line 18 to score line 22 so that there will be equal widths of the doubled thickness of liner 12 above and below fold line 18.

The inner liner 12 of the bottom flap has a portion 23 similarly doubled back onto itself along a score line 24 to reinforce the container fold line 19. The folded back portions of liner 12 of course expose the ribs 25 of the corrugated core 11.

FIGURES 1 and 2 illustrate the method by which the reinforced fold lines 18 and 19 of container 10 are produced. Since all of the apparatus used in the present invention is conventional in paper bag and carton manufacture such apparatus is here shown only schematically. The inner liner 12 is fed forwardly as a continuously advancing web from supply roll 26 through scoring and slitting knives 27 and 28, respectively. The scoring knives 27 cut score lines 22 and 24 into the web on the lower side thereof, and the slitting knives cut completely through the web, forming slit lines 29 and 30 dividing the web into three strips *a*, *b* and *c*.

The web then passes under glue rollers 31 which apply glue from the glue pot 32 to the web. These rollers form glue strips 33 having a width generally equal to the distance between the score lines 22 and 24 and the slit lines 29 and 30 and extend generally from the score lines towards the center of the web.

The center strip *b* of the web then has its outer edge portions 21 and 23 passed through folding shoes 34 which bends the edges upwardly around the score lines 22 and 24 and folds them back onto the upper surface of the center web strip, thus forming double thicknesses at the edges of this strip. Pressure rollers 36 press the doubled portion of the web together so that the glue therebetween will hold them together.

In the meantime, webs of the corrugated core 11 and the outer liner 13 will have been glued together and will have been fed to the glue roller 37 to have glue applied to the exposed surface of the core web. Glue roller 37 rotates through glue pot 38 and then against a counter-rotating doctor roll 39 to wipe off excess glue thereon. In order to leave unglued strips on the core surface, thin metal strips 40 of a width corresponding to the width of the gaps between the strips *a*, *b* and *c* of liner web 12 are brought around the upper surface of glue roller 37 and are secured by screws or other suitable means to the walls of the glue pot 38. The interposing of the metal strips 40 between the glue roller and the corrugated core surface of course prevents any glue from being applied to the core thereat. The width of the metal strips 40 and the distance thereof from the ends of the glue roller 37 are easily adjusted.

The inner liner web 12 is now brought into registering engagement with the glued surface of the corrugated core web 11 and the webs are pressed together by pressure rollers 41. The unglued strips of the core web coincide with the gaps in liner web 12 between the center strip *b* and the side strips *a* and *c*.

The glued-together webs then pass through conventional carton-blank forming apparatus (not illustrated)

which forms carton blanks having the desired size side wall panels and top and bottom flap panels and in which all panels are connected together by fold lines so that the cut and creased carton blanks can be easily erected into cartons for use.

The fold lines 18 and 19 between the side walls and the top and bottom flaps will be made by the blank forming apparatus parallel to the side edges of web 12 and will be formed in the middle of the doubled over portions of web strip *b*, as shown in FIGURE 3. It has been found satisfactory for a carton having side walls of approximately 12 inches in height to have the doubled over portion of the web 12 extend approximately one inch on each side of the fold lines 18 and 19.

If it is desired to form a different shape carton from webs 11, 12 and 13 such that the fold lines 18 and 19 are nearer or farther apart, it is a simple matter to move the scoring knives 27 and the slitting knives 28 nearer together or farther apart and to adjust the distance between the glue rollers 31, shoes 34 and pressure rollers 36 correspondingly to double back a desired amount of the inner web strip *b*. As is apparent, it is a simple matter to increase or decrease the width of the folded back portions 21 and 23 or to vary the distance of the folded back portions from the edge of the web to meet the purposes of any desired carton blank. The metal strips 40 covering portions of glue roller 37 will be changed at the same time so that they will register with the spaces between web strips *a* and *b*, and *b* and *c*.

As is apparent from the above, the carton 10 will be formed having reinforced fold lines 18 and 19, which will be much more resistant to cutting by can rims, without increasing the amount of material used in the carton. The resistance of the inner liner to can rim cutting will be increased by 100 percent since the thickness of the liner at this point of localized stress is doubled. The side walls 14 of the carton are in no way weakened, and possess the same strength as if the fold lines had not been reinforced. The top and bottom flaps which have a portion of the inner liner removed therefrom are individually somewhat weakened, but the carton is not weakened since the top and bottom flaps are glued or stapled together in double thicknesses such that they are much stronger than the single thickness side walls. Thus, the carton has its weakest points reinforced without requiring any additional material and without weakening the carton as a whole.

The carton is additionally strengthened against endwise or sidewise forces applied thereto due to the channel effect of the doubled back liner portion. As will be noted in FIGURES 3 and 4, the doubled back portions 21 and 23 of the inner liner 14 form double thickness L-shaped channels along the upper and lower fold lines when the carton is in erected position. Thus, when any one of the side walls is subjected to end-to-end compression, the channeled shape of the reinforced fold lines will greatly rigidify the carton.

The apparatus used for cutting, folding and gluing the doubled over portions can be readily set up on conventional carton forming machinery and without any appreciable decrease in speed of conventional operations.

FIGURE 5 illustrates a modification of the carton in which the carton 10*a* is formed with side walls 14*a* and top flaps 16*a* from a blank having a corrugated core 11*a* and inner and outer liners 12*a* and 13*a* glued to the core. In this modification, the outer liner has a portion 21*a* thereof doubled back onto itself along score line 22*a* so that a double thickness of the outer line 13*a* is formed along the length of the fold line 18*a* and on each side of this fold line.

The lower fold line between the side walls and the bottom flaps (not shown) is similarly formed. In this embodiment, the ribs 25*a* of the corrugated core will be partially exposed on the top and bottom of the container 10*a* when it is filled and closed and will reduce the slippage between layers of containers when stacked on top of each other.

The embodiment of FIGURE 5 is manufactured by essentially the same process as previously described. As shown in FIGURE 5, the portion 21*a* of the outer panel 13*a* is folded back around score lines 22*a* and away from the corrugated core 11*a* rather than being folded into and against the core as in FIGURE 3. This last detail of folding is a matter of design and illustrates how the embodiment shown in FIGURE 3 can be varied if so desired to produce this manner of folding. The folding shoes 34 will of course have to be reversed so as to fold the edges of the central part of the web down rather than up, as shown in FIGURE 1. The scoring knives 27 and glue rollers 31 would also have to be reversed to operate on the other side of the web.

FIGURE 6 shows yet another embodiment of the carton which has been developed for use in packing such items as lettuce, for example. These items will not stack within a carton and will exert outward pressure on the side walls as the carton is packed and when the cartons are later piled on top of one another. In addition, the top flaps are unusually interlaced rather than being glued or stapled, and thus no support is given the side walls by the top flaps. As a consequence, the weakest points of the carton are the vertical fold lines between adjacent side panels. The present embodiment has been designed specifically to strengthen the upper portion of the vertical fold lines to prevent the carton from splitting along these lines. It is not necessary to strengthen the entire height of these fold lines since it is only necessary to prevent the fold lines from starting to tear, and invariably this failure starts from the unsupported upper end.

The carton 10*b*, shown in FIGURE 6, is again formed with side walls 14*b* and top flaps 16*b* from a blank having a corrugated core 11*b* and inner and outer liners 12*b* and 13*b* glued thereto. In this embodiment, a portion 21*b* of the inner liner of the side walls is folded back along score line 22*b* and extends to the horizontal fold lines 18*b* between the side walls and top flaps. This then forms a double thickness of the inner liner at the vertical fold line 20*b* between adjacent side wall panels which double thickness extends down from the top thereof down to the score line 22*b*. Since most of the peripheral strength of the carton is derived from the tensile strength of the liners at the vertical fold lines it is obvious that the doubled thickness of a liner results in double strength thereof.

The changes in the manufacturing setup of FIGURE 1 to produce the FIGURE 6 embodiment will be readily apparent. Only one scoring knife 27 and one slitting knife 28 will be needed, and the folding shoe 34 will have to be reversed so as to fold the inner edge of web strip *a* around the score line formed in web strip *a*. Of course, the glue roller 31 and pressure rollers 36 will have to be shifted to operate on web strip *a*.

If desired, a thin strip of additional reinforcing such as steel tape or the like could be inserted between the doubled-over portion of the inner liner 12*b* during the steps of manufacture thereof. For example, this step could be performed after the application of the glue strip 33 and before the folding over by the folding shoes 34.

Although the above description has been directed to the folding back of portions of the liner web 12, it is of course to be realized that the other liner web 13 could be similarly operated upon by similar equipment before it is glued to the corrugated core. Further, either one or both liners could be so reinforced depending upon the results desired. For example, if it were desired to reinforce the fold lines on both the inside and outside of a carton both liners would be folded back to reinforce the desired area. Or, one liner could be folded back to reinforce one particular area and the other liner could be folded back to reinforce another desired area, again depending upon the particular results desired. It is also to be realized that folding shoes 34 are readily available to form triple or

quadruple folds, and it is intended that these could be used for the purpose described in this application, if so desired.

A further operation which can be performed by conventional box-making apparatus, if desired, is to spray the exposed strips of the corrugated core with waterproofing solution to prevent core failures in the event that moisture is to be encountered in the use, storage or handling of the cartons.

Although the invention has been shown as used with corrugated shipping cartons it can also be applied to articles made from solid fiberboard wherein the liner is doubled back to provide a greater localized strength. In addition, the invention finds applicability in other uses of corrugated articles wherever localized stresses are encountered. Of course, in such use, the stress must be such that the gap in the liner, resulting from doubling over a portion thereof, does not unduly weaken the article.

It is to be further realized that the forms of the invention herein shown and described are to taken as preferred embodiments of the same and that various changes may be made in the shape, size and arrangement of parts without departing from the spirit of the invention or the scope of the attached claims.

I claim:

1. In a method of making corrugated containers, the steps of continuously advancing a web of liner material, slitting said web along a line parallel to the edge of said web, scoring said liner along a line parallel and closely adjacent to said slit line, gluing said web adjacent said score line, folding said web adjacent one side of said slit line onto itself along said score line to adhere the web to itself and form a double thickness of said liner web and leaving a gap between the folded and unfolded portions of said liner web equal to the width of said double thickness portion, continuously advancing a web of corrugated core material, gluing one surface of said core web

while leaving a lengthwise strip of said one surface unglued, bringing the liner material web into engagement with the glued surface of said core material web with the gap in said liner web coinciding with the unglued strip of said core web and subsequently scoring said material along said double thickness portion.

2. In a method of making corrugated containers, the steps of continuously advancing a plurality of webs of liner material, gluing at least one of said webs longitudinally of said web, folding at least one side of said web onto itself with said glue being between said foldled web portions to form a double thickness portion of said liner web, said double thickness portion being adjacent one of the other of said plurality of webs and being spaced from said adjacent web a distance equal to the width of said double thickness portion, continuously advancing a web of corrugated core material, gluing one surface of said core web while leaving a lengthwise strip of said one surface unglued, and bringing the liner material webs into engagement with the glued surface of said core material web while maintaining said space between said double thickness portion and said adjacent web and aligning said unglued strip of said core web with said space, and subsequently scoring said material along said double thickness portion.

3. The method of claim 2 in which said plurality of webs comprises at least three webs.

4. The method of claim 3 in which at least one of said edges of said center web is folded.

5. The method of claim 3 in which the inner edge of at least one of said side webs is folded.

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FRANK E. BAILEY, *Primary Examiner.*