June 18, 1963 D. M. HOFF 3,094,266

REINFORCED SHIPPING CONTAINERS

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Fig. 1

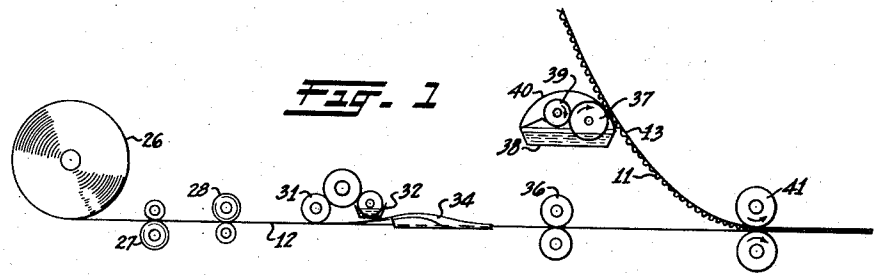


Fig. 2

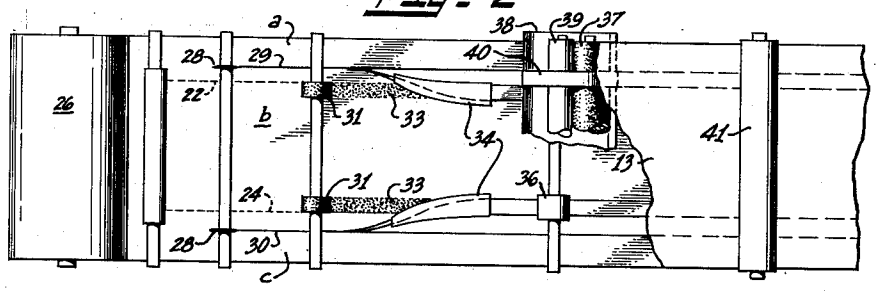


Fig. 3

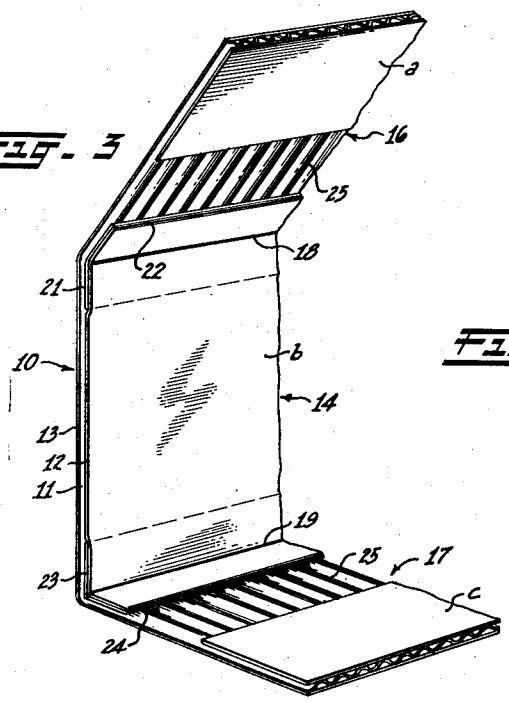
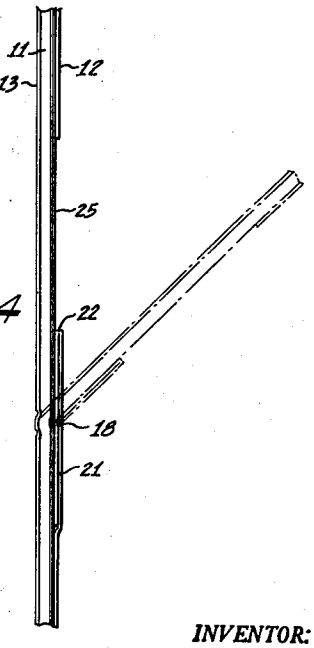


Fig. 4



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Fig. 5

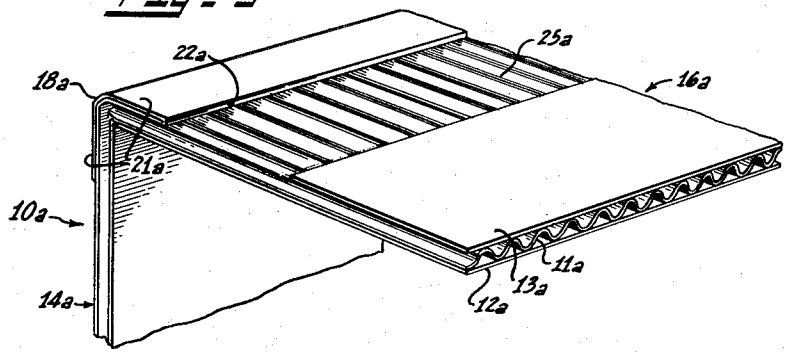
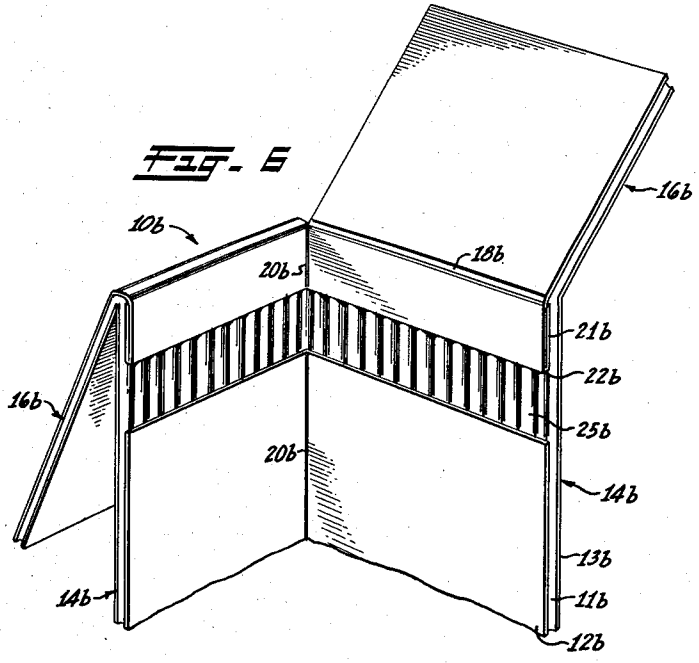


Fig. 6



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3,094,266

REINFORCED SHIPPING CONTAINERS

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5 Claims. (Cl. 229—37)

This invention relates to shipping containers and more particularly to corrugated cartons or containers having means for strengthening the relatively weak fold lines thereof.

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 present invention has been devised to reinforce the fold lines without using any extra material and without weakening the overall strength of the carton. In addition, 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.

It is the primary object of the invention to provide increased localized strength in laminated articles at a point of localized stress by folding a portion of one of the laminations back upon itself to form a double thickness thereof at the point of localized stress.

A further 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,

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

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

FIG. 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.

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

FIG. 5 is a perspective view of a portion of a carton illustrating another embodiment of the invention.

FIG. 6 is a perspective view of yet another embodiment of the invention.

Referring now to the drawings, FIG. 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**.

FIGS. 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 FIG. 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 FIGS. 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.

FIG. 5 illustrates a modification of the invention 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 FIG. 5 is manufactured by essentially the same process as previously described. As shown in FIG. 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 FIG. 3. This last detail of folding is a matter of design and illustrates how the embodiment shown in FIG. 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 FIG. 1. The scoring knives **27** and glue rollers **31** would also have to be reversed to operate on the other side of the web.

FIG. 6 shows yet another embodiment of the invention 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 FIG. 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 set up of FIG. 1 to produce the FIG. 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 be 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.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A carton comprising side wall panels and flap panels joined to said side panels by fold lines, said panels having a corrugated core, one side of said core having separate liners on said side wall panels and on said flap panels, one of said separate liners extending across said fold line and being of double thickness at said fold line, said two thicknesses being joined by a fold line at the outer end of said liner, the other of said separate liners being spaced from said one separate liner a distance substantially equal to the width of said double thickness portion of said one liner, and said corrugated core being exposed only between the said separate liners.

2. The carton of claim 1 in which said one side is the inner side of said core.

3. The carton of claim 1 in which said one side is the outer side of said core.

4. The article of claim 1 in which said one separate liner is said side panel separate liner.

5. The article of claim 1 in which said one separate liner is said flap panel separate liner.

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