

Aug. 23, 1960

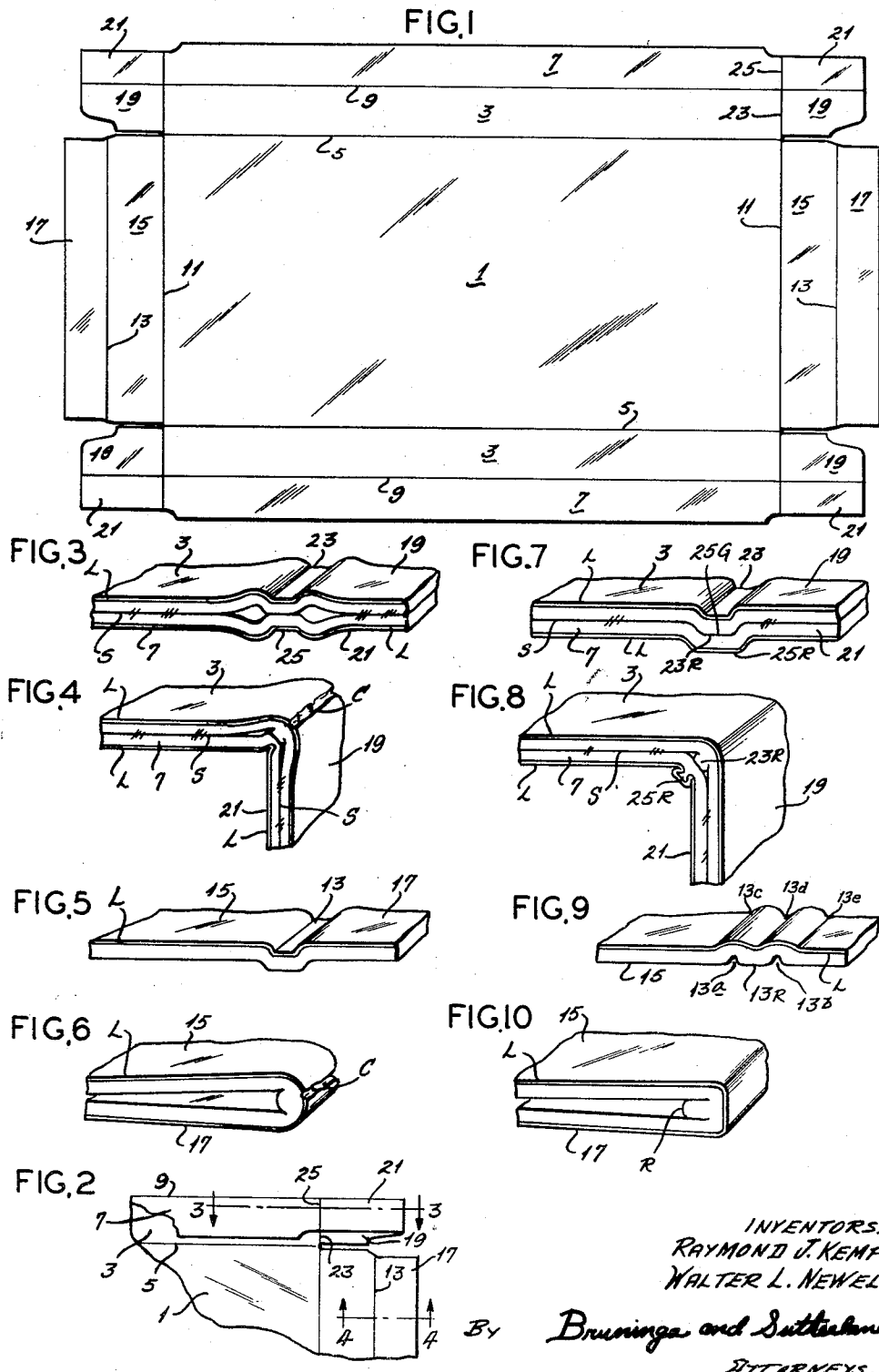
R. J. KEMPEN ET AL

2,949,827

MANUFACTURE OF BOX BLANKS FROM BOX BOARD

Filed June 11, 1958

2 Sheets-Sheet 1



INVENTORS,
RAYMOND J. KEMPEN
WALTER L. NEWELL

By *Bruninga and Sutherland,*
ATTORNEYS.

Aug. 23, 1960

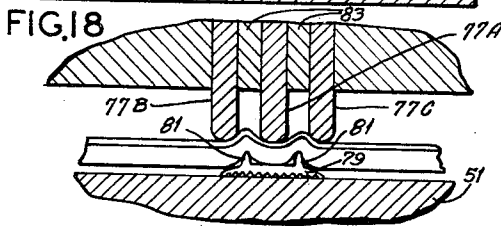
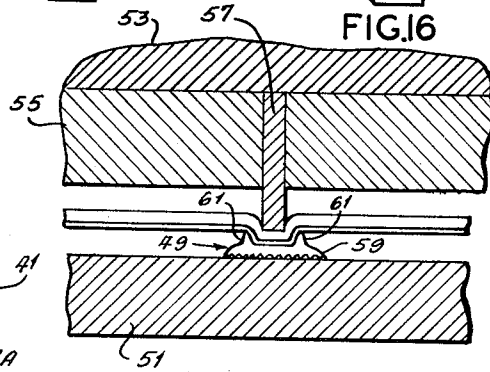
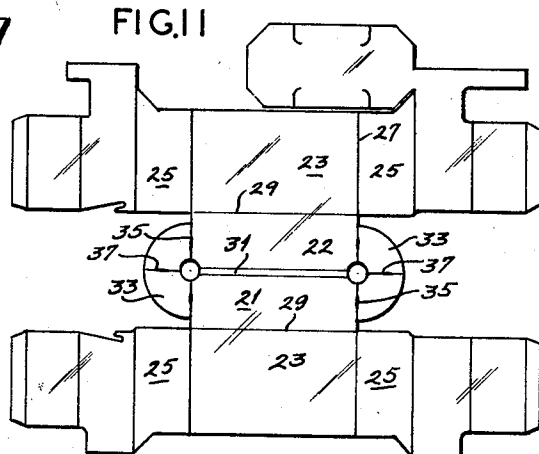
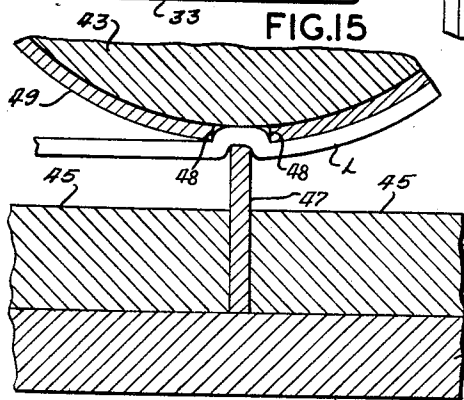
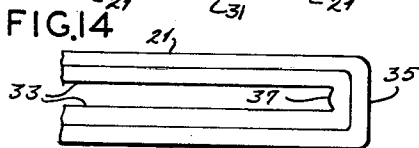
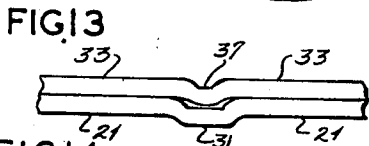
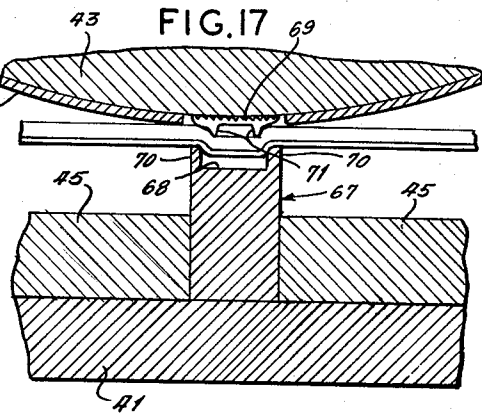
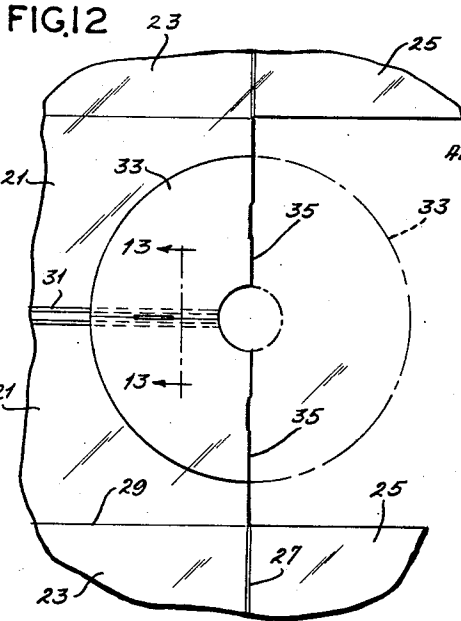
R. J. KEMPEN ET AL

2,949,827

MANUFACTURE OF BOX BLANKS FROM BOX BOARD

Filed June 11, 1958

2 Sheets-Sheet 2



INVENTORS,
RAYMOND J. KEMPEN
WALTER L. NEWELL

By *Bruninga and Sutherland,*
ATTORNEYS.

1

2,949,827

MANUFACTURE OF BOX BLANKS FROM BOX BOARD

Raymond J. Kempen, Lemay, and Walter L. Newell, Kirkwood, Mo., assignors to Alton Box Board Company, Alton, Ill., a corporation of Delaware

Filed June 11, 1958, Ser. No. 741,348

9 Claims. (Cl. 93—58)

This invention relates to the manufacture of folding cartons, and more particularly to a process of and apparatus for scoring box blanks, and to a box blank and carton formed thereby.

When a sheet of boxboard is folded, the fibers on the outer surface of the fold are subjected to tension whereas the fibers on the inside of the fold are placed under compression. If the blank is not scored properly, the fibers on the outer surface of the fold may be subjected to excessive tension, with the result that cracks are opened along this surface, thereby detracting from the appearance of the carton, as well as reducing the strength.

Accordingly, scoring or indenting of a boxboard blank should not only determine the fold line and facilitate the folding step, but should pre-stretch the fibers on what would be the outside of the fold and form a rib-like projection on the other side, so that the rib may expand inwardly during folding so as to relieve the compression of the inner fibers and tension in the outer fibers. The conventional practice is to form a single indented score line on the outer face of the boxboard blank (or what becomes the outer surface of the folded carton), thereby pre-stretching the outer fibers to a limited extent and defining a rib on the inner surface.

In commercial practice, the score ribs are all on one face and the indented grooves are all on the other face of the box blank, this procedure being necessary because of limitations in existing scoring equipment and techniques. I have discovered, however, that in certain types of cartons or in certain folding situations, a different scoring system is more advantageous. In particular, if the fold is to be through an angle of 180 degrees, better results are achieved by indenting the inner face of the blank along two closely spaced parallel lines, the outer surface being indented along a line between the two indentations on the inner surface. The outer surface may also be indented along additional lines lying outwardly of the two scores on the inner surface. The two closely spaced inner scores, in effect, define a relatively wide inwardly projecting rib, which is also more pronounced than that defined by conventional scoring techniques, with the result that there is a greater relief of the compression of the inner fibers during the folding operation, greater relief being necessary in the case of a 180 degree fold than in the case of a 90 degree fold. While this improved technique minimizes the possibility of opening unsightly cracks on the outer surface of the fold, it also forms a neater fold line and makes the actual folding manipulation considerably easier. This latter advantage is of considerable importance to the user, because it speeds up production in setting up such boxes, thereby reducing the cost.

A second instance where conventional scoring practices are not considered entirely satisfactory arises when

2

the boxboard blank is first folded upon itself to form a double-ply section (to form a double-walled side, as in a shoe box lid) and the double-ply section is then folded along a transverse line (to form a double-ply corner flap, as in a shoe box lid). If the score-defining ribs are all on the inner face of the blank, as in the conventional system, the transverse rib of the inner ply becomes reversed upon forming the double-ply side wall, hence does not function to relieve compression at the inner ply. When the corner portion is then folded, the inner ply is subjected to excessive compression tension and the outer ply is subjected to excessive tension, assuming the two plies are confined against longitudinal movement relative to one another, as by glue or by a longitudinal fold. Such an excessive tension may well result in cracking of the outer ply and an unsightly appearance.

This difficulty is herein overcome during scoring of the blank by forming the transverse corner score so that the rib on the inner ply projects from the outer rather than the inner face of the blank. When the inner ply is then folded over upon the outer ply, this rib is reversed and both transverse ribs are directed inwardly. Preferably, the transverse rib of the inner ply is also considerably wider than the corresponding rib for the outer ply.

As indicated previously, conventional equipment and techniques do not permit the type of scores described above, hence the invention further contemplates modifications in scoring equipment and techniques. It will be understood that the typical scoring machine has a flat die bed on which steel scoring and cutting rules are supported on edge to project from between wood blocks, the boxboard sheet then being pressed down against the edges of the rules, either by a rotating cylinder or a flat back-up plate. A backing is applied to the cylinder or back-up plate so as to form depressions into which the scoring rule projects to form the ribs. The usual practice has been to glue a hard fibrous sheet material to the cylinder or back-up plate and then to cut away strips of this material opposite the scoring rules. A more recent alternative practice has been to substitute a thin metal strip having small spaced ribs for the back-up sheet material, these thin metal strips being glued to the cylinder or back-up plate so that their ribs lie on opposite sides of the scoring rule and define a trough cooperable with the edge of the scoring rule.

These ribbed metal strips are supplied with different rib spacing, variation being desirable for different thicknesses of boxboard. It will be noted, however, that the scoring rules are all on one side of the boxboard blank and the cooperating troughs are all formed on the other side of the blank, hence it is impossible to form a reverse rib. Moreover, the character of the back-up material is such that two ribs cannot be formed closely adjacent one another. These difficulties are herein overcome by using a ribbed metal strip type of back-up member in combination with a novel arrangement of scoring rules.

In achieving the first type of score mentioned above, a ribbed back-up strip is utilized in combination with an arrangement of three closely-spaced parallel scoring rules, the center rule lying between the two ribs of the back-up strip and the outer rules lying outwardly of these ribs. With this arrangement, the ribs on the back-up strip function as scoring rules to define a pair of closely-spaced lines of indentation in the inner (rather than outer) face of the box blank, whereas the outer face of the box blank has three closely-spaced lines of indentation. The two lines of indentation on the inner face thus produce a more pronounced rib, whereas the three lines of indenta-

tion on the outer face provide additional stretching of the outer fibers.

In achieving the reverse score mentioned above, essentially the same procedure is utilized except that the ribbed back-up strip with two relatively closely-spaced ribs is used as a wide scoring rule to form a wide rib on the reverse face of the board, the ribs of the back-up strip cooperating with a pair of spaced rules or similar projections, which lie outwardly of the ribs on the back-up strip.

Other features of the invention will be in part apparent from and in part pointed out in the following detailed description taken in connection with the accompanying drawings, in which:

Fig. 1 is a plan view of a boxboard blank for forming the lid of a shoe box, the blank being die-cut and scored;

Fig. 2 is a detailed plan view of a corner portion of the Fig. 1 blank, the marginal portions of the blank having been folded over;

Fig. 3 is an enlarged detailed cross section taken on the line 3—3 of Fig. 2 to show a scoring system heretofore utilized;

Fig. 4 is a similar view illustrating a condition which may occur when the double-ply section is bent at right angles along the scores shown in Fig. 3;

Fig. 5 is an enlarged detailed cross section taken generally on the line 4—4 of Fig. 2 to show another scoring technique heretofore employed;

Fig. 6 is a similar view illustrating a condition which may occur when the board is folded through an angle of 180 degrees along the score illustrated in Fig. 5;

Fig. 7 is a view similar to that of Fig. 3, but illustrating the scoring system of the present invention;

Fig. 8 is a similar view showing the folded structure resulting from the Fig. 7 type of score;

Fig. 9 is a view similar to Fig. 5 but showing another scoring system of this invention;

Fig. 10 is a similar view but showing the structure resulting from the scoring system of Fig. 9;

Fig. 11 is a plan view of a bottle carrier blank;

Fig. 12 is an enlarged detailed plan view of a portion of the Fig. 11 blank illustrating the scoring technique of this invention as applied thereto;

Fig. 13 is a cross sectional view taken on the line 13—13 of Fig. 12;

Fig. 14 is a view similar to that of Fig. 13, but showing the double-ply bottom portion of the blank after it is folded upon itself;

Fig. 15 is a diagrammatic sectional view illustrating certain portions of a cylinder-type cutter-creaser as commonly employed in scoring die-cut boxboard blanks;

Fig. 16 is a view similar to that of Fig. 14, but showing another type of machine and another way of forming the score;

Fig. 17 is a view similar to that of Fig. 14, but showing the cutter-creaser modified to form a score in accordance with the present invention; and

Fig. 18 is a view similar to that of Fig. 15, but showing another modification embodying features of the present invention.

Referring now to Fig. 1, there is shown a blank of boxboard which has been die-cut and scored to form a lid for a shoe box. The center panel 1 becomes the top and narrow panels 3 defined by scores 5 extend along opposite margins of the top panel 1. A second pair of panels 7 defined by scores 9 lie outwardly of panels 3, the panels 7 being adapted to fold over the panels 3 and form double-walled sides. In the finished box lid, the panel 7 would be disposed inwardly of the panel 3 hence panel 7 constitutes the inner ply and panel 3 constitutes the outer ply of a double-walled section.

At the ends of the center panel, there are scores 11 and 13 defining end panels 15 and 17 of similar character to those referred to above. In the finished lid, the panel 15 forms an outer ply and the panel 17 the inner ply of

double-ply end flanges or sections. The side panels 3 and 7, in turn, have projecting corner flaps 19 and 21 defined respectively by a score 23 on the outer ply 3 and a score 25 on the inner ply 7, the terms "inner" and "outer" again being used with respect to the folded lid. In practice, the inner ply panels 7 are folded over and glued to the outer ply panels 3, and the inner corner plies 21 are similarly glued to the outer corner plies 19. The box is then set up by folding the double-ply side sections at right angles to the top panel 1, thereafter folding the double-ply corner sections inwardly at right angles to the side sections, then folding the end panels 15 about their fold lines 11 so as to overlie the double-ply corner sections, and finally folding the end flaps 17 downwardly so as to lock the corner flaps within the double-ply end flange so formed.

The practice heretofore in scoring die-cut blanks has been one wherein the aligned scores at 23 and 25 were identical to one another. Also, no distinction was made between the score for a fold line (such as 13) for 180 degree fold and a fold line (such as 11) for a 90 degree fold. More important, however, the practice heretofore has been one of forming all of the scores so that the indented grooves appear in that surface of the blank which ultimately forms the outside surface of the carton, whereas all of the complementary ribs appear on the other face of the blank.

With this prior practice, once a marginal portion (such as 7 and 21) was folded over upon another portion (3 and 19), the rib at score 25 pointed outwardly, rather than inwardly, with the result that the two ribs at 23 and 25 abutted against one another, as shown in Fig. 3. When the parts 19 and 21 were then bent at right angles to parts 3 and 7, the butting ribs subjected the fibers on the outer surface on the outer ply to excessive tension, with the result that a crack C might open along the outer corner, as shown in Fig. 4.

Similarly, when one part of the blank (such as that indicated at 17) is folded over against another part (such as 15) through a 180 degree bend, the compression of the fibers on the outer surface of the board is considerably greater than would be the case in a 90 degree bend, and for this reason, a crack C might also open along the outer edge of the fold, as shown in Figs. 5 and 6. It will be understood that the tendency to crack is sometimes stronger in one direction than in another direction because of the grain effect present in some boxboard sheet material. For example, the grain effect might account for a greater tendency to crack along the end scores of Fig. 13 of the blank as compared with the side scores 9, although both are folded through a 180 degree angle.

Another factor of some importance is the ease of folding, particularly in boxes which are completed by the user. For example, it is customary for the box manufacturer to fold and adhere the parts 7 and 21 against the parts 3 and 19 before delivery to the user, the user then completing the box by folding the corner portion 21 and the end portions 15 and 17. It has been found, however, that the conventional type of score of Figs. 5 and 6 is not entirely satisfactory for the fold line 13.

A condition which results in cracking at a fold is especially undesirable when the carton is formed from boxboard having a so-called liner L on the outer surface, which is a sheet or ply of relatively high quality paper superimposed on a thicker layer or multi-ply section of paper whose quality is comparatively inferior. The liner provides a neat appearance, whereas the remainder of the board supplies strength. For example, the liner might be white, whereas the remainder of the board may be dark in color, hence the presence of a crack is more readily apparent in lined boxboard, and by the same token, the invention is more particularly suited for cartons formed from boxboard having a liner.

The difficulties above mentioned are overcome herein by forming the score at 25 in a reverse direction and

relatively wide as compared with the score at 23, so that the resulting ribs 23R and 25R project in the same direction or inwardly when the parts 7 and 21 are folded over upon the parts 3 and 19, the narrow rib 23R fitting within the wide groove 25G (Fig. 7). When the corner is then formed by folding corner flaps 19 and 21 at right angles to the parts 3 and 17, both inner and outer plies have ribs directed inwardly of the corners to accommodate the inward compression or consolidation of fibers (Fig. 8). When the inner and outer plies are secured together, the compression is considerably greater in the inner ply, hence its score or rib 25R preferably is somewhat wider than that defined at 23R, thereby accommodating the correspondingly greater pressure in the inner ply and minimizing tension in the outer ply.

As mentioned previously, Figs. 5 and 6 illustrate a conventional end score 13 where parts 15 and 17 are to be folded through an angle of 180 degrees. The present invention contemplates a different scoring operation (Fig. 9) wherein the score generally designated 13 is in effect defined by a pair of grooves 13a and 13b indented from back side between grooves 13c, d and e on the front side. With this arrangement, the grooves 13a and 13b define therebetween a rib 13R on the back side of the blank which functions in the same manner as that previously formed by a conventional score, the indenting at 13c, d and e pre-stressing the fibers so as to minimize cracking in the subsequent folding operation (Fig. 10). The grooves 13a and b are relatively closely spaced, for example, about one-eighth of an inch. This scoring pattern not only minimizes cracking but makes the actual bending somewhat easier.

Figs. 11-14 illustrate another embodiment of the invention, such as might be utilized in making a bottle carrier. Figs. 11 and 12 illustrate a part of the bottle carrier wherein panel portions 21 form the bottom, the sides being designated 23 and end flap portions being shown at 25. The end-forming panels 25 are hinged to the side walls 23 along scores 27 and the side panels are hinged to the bottom panels 21 along scores 29. In order to permit collapse of the bottle carrier blank, a score 31 is then formed centrally of the bottom so that the panels 21 may fold back to an angle of 180 degrees. In some instances, it is further desirable to provide sections 33 at the end of the bottom which is first folded over along scores 35 onto the bottom panels 21 and which itself folds along a score 37 when the bottom panels 21 are collapsed. The sections 33 are restrained against movement relative to the panels 21 by the scores 35, hence the compression-tension problem exists as discussed previously in connection with Figs. 3 and 4.

In the embodiment illustrated in Figs. 11-14, a somewhat different scoring technique is disclosed. Essentially, the system is the same as that described in connection with Figs. 7 and 8, except the grooves and complementary ribs project in the opposite direction with respect to the direction with which the fold is ultimately made. For example, in Figs. 7 and 8, the ribs appear on the inside of the ultimate fold and thereby permit an inward expansion which tends to relieve the compression of fibers at the inside of the fold. In the Fig. 11 embodiment, the ribs project to what is ultimately the outside of the folds, both ribs being in the same direction, however.

The scores at 27, 29, 35 and 37 are all formed in the conventional manner with the grooves indented into the outer printed or lined surface of the board but the score at 31 has its groove formed in the other face of the board and the complementary rib projects from the printed or lined face. Also, both the groove and rib at 35 are considerably wider than those at the other fold lines, particularly 37 (Fig. 13). The portions 33 are folded over upon the bottom portions 21, and when the bottom is then folded upon itself, the resulting shape is as indicated in Fig. 14. With this arrangement, the bottom panels, in effect, fold along the margins of the relatively wide rib

at 35, this portion of the boxboard being stretched during the scoring operation, thereby minimizing any undue forces resulting during the actual folding operation.

In addition to the scoring patterns mentioned above, the invention further contemplates a method of producing the above described scores by a relatively simple and inexpensive modification of existing machinery. For example, Fig. 15 illustrates certain details of a cylinder cutter-creaser, as commonly used in making die-cut boxboard carton blanks (as distinguished from corrugated containers). The machine has a horizontal die-supporting pressure plate, part of which is shown at 41, and a cooperating back-up pressure member in the form of a cylinder partially shown at 43. A cutting and creasing die is made up from rules of steel strip supported vertically with their bottom edges resting on the pressure plate 41 and held in proper position by wood blocks 45. It will be understood that the cutting rules have relatively sharp edges adjacent the periphery of the cylinder, whereas the scoring rules (one being shown at 47) have rounded edges. Trough-like recesses 48 cooperable with the scoring rules are formed on the periphery of the cylinder by means of a hard fibrous back-up sheet material 49. In setting up the machine, a sheet of back-up material is glued to the cylinder and strips thereof are then cut away and removed in order to define a recess opposite each scoring rule. In operation, a sheet of boxboard is gripped by means on the cylinder and then is rotated with the cylinder over the die, so that the blank is substantially simultaneously cut and scored, the die and pressure plate 41 reciprocating horizontally as the cylinder rotates.

Another type of conventional machine used in die-cutting and scoring boxboard blanks has upper and lower pressure plates, the upper plate being reciprocated vertically and being adapted to carry the cutting and creasing die. Referring to Fig. 16, a lower pressure plate is shown at 51 and an upper plate at 53. As before, wood blocks 55 are employed to hold the cutting and scoring rules, a scoring rule being shown at 57. In this instance, the rules are held against the upper plate 53, and also, a different type of trough or recess-forming system is illustrated. Back-up sheet material, such as shown at 49 in Fig. 15 may be applied to the lower pressure plate 51, or alternatively, the recesses cooperable with the scoring rules may be provided by specially manufactured ribbed strips 59, such being known in the art. The ribbed strip 59 has a knurled bottom surface to facilitate gluing to the back-up pressure plate 51, and a pair of ribs 61 project upwardly in spaced parallel relationship to one another, so as to define a trough-like depression therebetween. These ribbed strips are supplied with ribs of varying spacing, it being understood that the width of the trough or recess may be different in scoring different thicknesses of boxboard material. For example, ribs may be spaced a distance of about one-eighth of an inch, the strip having a thickness of about one-fiftieth of an inch and the ribs having a height of about one-thirtieth of an inch. With the machine of Fig. 16, all cuts and scores are formed when the upper pressure plate and die are brought down against a boxboard sheet resting on the lower back-up plate.

It will be apparent that the conventional scoring machinery and systems above described are adapted to indent only one surface of the boxboard sheet material. In other words, the scoring rules (and cutting rules) are all mounted against one pressure plate and the cooperating recesses are all located on the back-up pressure plate or cylinder, as the case may be. The present invention contemplates an arrangement for indenting either side of the boxboard sheet material by using conventional machinery and equipment similar to that heretofore employed, and with all of the scoring and cutting rules still mounted against only one of the pressure plates.

Referring more particularly to Fig. 17, a portion of the cylinder cutter-creaser is shown, but the scoring parts

have been modified so as to form a relatively wide groove on the reverse side of the boxboard. More particularly, a ribbed strip 69 similar to that described at 57 in connection with Fig. 16 is secured to the cylinder 43, as by adhesive, and a trough-forming member 67 or equivalent is mounted on the flat die plate 41. The ribbed strip 69 has ribs 71 which are relatively closely spaced, this spacing being the desired width of the groove to be formed in the boxboard. Necessarily, the strip 69 might have a single relatively wide rib as a substitute for the two spaced ribs 71 illustrated. The trough-forming member 67 is a bar whose width is substantially similar to that of a conventional scoring rule but whose thickness is greater. The top marginal portion of the bar is then recessed at 68 so as to define two upwardly projecting ribs 70. The ribs 70 are spaced so as to lie outwardly of the ribs 71, thereby defining a trough into which the boxboard is depressed by the ribs 71. It will be understood, however, that the bottom or trough-forming part may be formed from a pair of scoring rules which are held in spaced relationship by a thin spacer strip or piece. Otherwise, the machinery and method are similar to those employed heretofore for scoring boxboard blanks.

Referring now to Fig. 18, a machine of the type shown in Fig. 16 has been modified to produce the second type of score described heretofore as a part of this invention. As before, a ribbed metal strip 79 is adhered to the back-up plate 51, but two or three separate scoring rules are arranged in closely-spaced relationship to one another. One scoring rule 77A is centered with respect to the ribs 81 of the strip 79, a second scoring rule 77B is then spaced outwardly of one of the ribs 81, while a third rule 77C is disposed outwardly of the other rib 81. Spacers 83 are inserted between the rules to maintain them in properly spaced relationship, the machinery and system otherwise being the same as that conventionally employed.

In operation, the set-up illustrated in Fig. 18, produces a pair of closely-spaced narrow grooves in the unlined surface of the boxboard sheet, this surface being a lower surface and the grooves being formed by the ribs 81. The upper scoring rules 77A, B and C have relatively blunt or rounded edges hence function as trough-forming members and partially stretch the fibers on the lined surface of the board, which would be the outer surface of the ultimate carton.

From the foregoing description, it is apparent that those skilled in the art will understand the structure, function and mode of operation of the invention herein disclosed, and appreciate the advantages thereof. Although several embodiments have been disclosed in detail, it is to be understood that the invention is not limited thereto, but the drawings and description thereof are to be understood as being merely illustrative. It is realized that many modifications and variations will present themselves to those skilled in the art without departing from the spirit of this invention or the scope thereof as set forth in the appended claims.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

1. In the process of forming a box blank from boxboard sheet material, portions of which are to be folded along two different scores, one of the folds having greater tendency to crack than another fold and the same surface of the blank being on the same side of both folds, the method of avoiding cracking at the folds which comprises forming one of the scores by pressing a single scoring rule against the outside surface of the board centrally of closely spaced trough-defining back-up means engaging the inside surface of the blank and forming a second score by substantially simultaneously pressing trough-defining means against the outside surface of the board outwardly of rib-forming back-up means engaging the inside surface of the board at another place thereon.

2. In the process of forming a box blank from boxboard sheet material, a portion of which is to be folded through an angle of 90° along a first score and a portion of which is to be folded through an angle of 180° along a second score with the same surface of the blank being on the outside of both folds, the method of avoiding cracking at the folds which comprises forming said first score by pressing a single scoring rule against the outside surface of the blank opposite trough-defining back-up means on the inside surface of the blank, and forming said second score by pressing a set of three closely-spaced parallel rules against the outside surface of the board opposite a pair of back-up ribs on the inside surface of the board, whereby said blank is conveniently manufactured with scoring rules all on the same side thereof but with the first score defined by a single crease projecting on the inside surface of the board while said second score is defined by a pair of creases projecting on the outside surface of the board.

3. In the process of forming a box blank from boxboard sheet material, a portion of which is to be folded through an angle of 180° along a first score to provide a doubled section, said doubled section to be folded along registered second and third scores in the outer and inner plies of said doubled section, and with the same surface of the blank being on the outside of the several folds; the method of avoiding cracking at said folds which comprises forming said first and second scores by pressing single rules against the outside surface of the blank opposite trough-defining back-up means, and forming said third score by pressing a pair of closely-spaced parallel scoring rule means against the outside surface of the blank on opposite sides of the back-up means which is relatively wide with respect to said first and second scoring rules, whereby said first and second scores are defined as creases projecting on the inside surface of the board while said third score is defined by a wider crease projecting on the outside surface of the board.

4. In a cutter-creaser machine of the type wherein a plurality of scoring rules are mounted against a first pressure member for cooperation with back-up means on a second pressure member; the improvement that comprises first back-up means defining a trough, a first cooperating scoring rule mounted on the first pressure member and adapted to register centrally of said trough, thereby to crease intervening boxboard toward the second pressure member, second back-up means defining a rib, and second cooperating scoring rule means mounted on the first member and defining closely-spaced shoulders adapted to register on opposite sides of said rib, thereby to crease intervening boxboard toward the first pressure member.

5. Apparatus as set forth in claim 3 wherein the rib means is relatively wide in comparison to the width of said first scoring rule, whereby the crease formed which projects toward the first pressure member is relatively wide in comparison to the crease which projects toward the back-up member.

6. Apparatus as set forth in claim 5 wherein said rib means comprises a pair of spaced ribs, both of which lie within the cooperating two scoring rule means.

7. Apparatus as set forth in claim 6 further including an additional scoring rule means adapted to register between said pair of spaced ribs.

8. In a cutter-creaser machine of the type having a plurality of scoring rules mounted against a first pressure member for cooperation with back-up means on a second pressure member; the improvement that comprises said scoring rules being relatively thin strips mounted on edge relative to the first pressure member, so as to project therefrom a substantial distance relative to their width, supporting blocks engaging the relatively wide sides of said scoring rules, said back-up means being in part constituted by a relatively thin strip mounted flat against the surface of said second pressure member, said strip

9

having rib means projecting outwardly therefrom toward said first pressure member a distance less than the width of the strip, and scoring rule means on said first member cooperable with said strip and defining shoulders spaced a distance greater than the width of said rib means, whereby said rib means is adapted to form a crease in intervening boxboard projecting toward said first pressure member.

9. Apparatus as set forth in claim 7, wherein the rib means is constituted by a pair of spaced ribs.

5

10

10

References Cited in the file of this patent

UNITED STATES PATENTS

1,488,756	La Bombard et al. -----	Apr. 1, 1924
1,798,475	Lange -----	Mar. 31, 1931
2,062,086	Claff -----	Nov. 24, 1936
2,085,491	Claff -----	June 29, 1937
2,112,121	Sidebotham -----	Mar. 22, 1938
2,749,523	Goldstein et al. -----	Aug. 21, 1956
2,765,716	Andersson -----	Oct. 9, 1956