Dec. 3, 1940. B. M. WILSON 2,223,503

SCORING METHOD AND TOOL

Filed July 7, 1939 2 Sheets-Sheet 1

Fig. 1

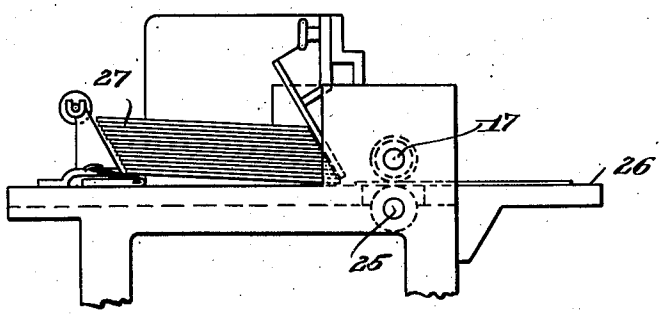


Fig. 2

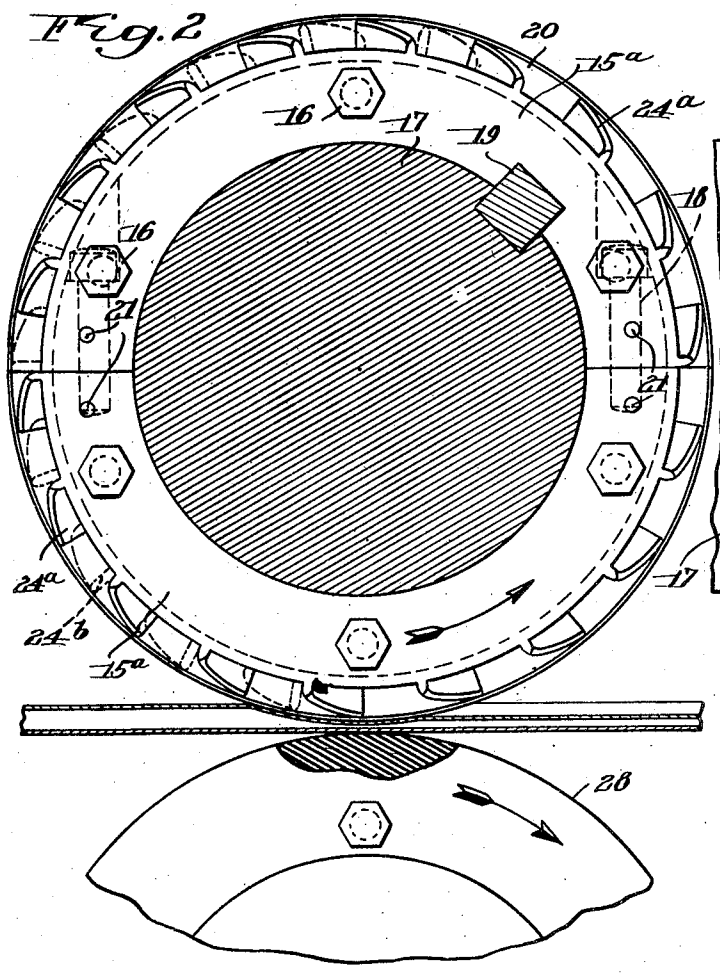
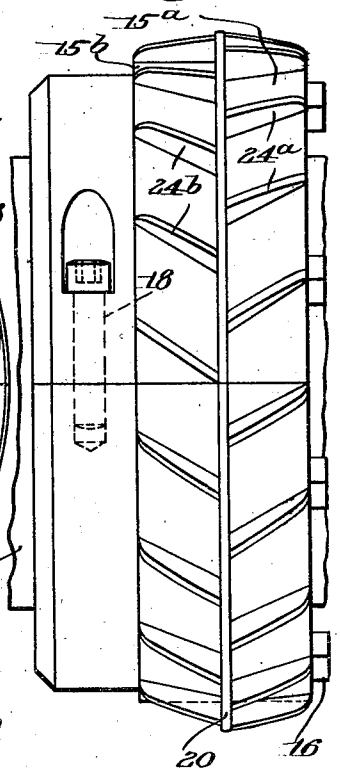


Fig. 3



INVENTOR.
Brainard M. Wilson
BY Cumpston & Shepard
his ATTORNEYS

Dec. 3, 1940. B. M. WILSON 2,223,503

SCORING METHOD AND TOOL

Filed July 7, 1939 2 Sheets-Sheet 2

Fig. 4

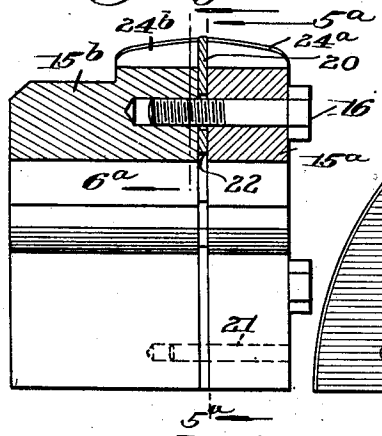


Fig. 5

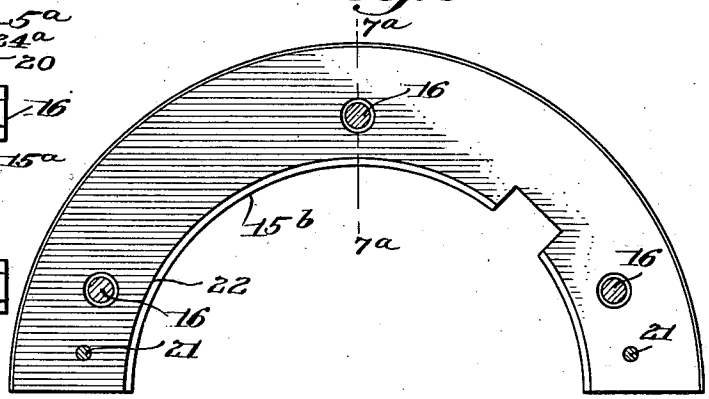


Fig. 6

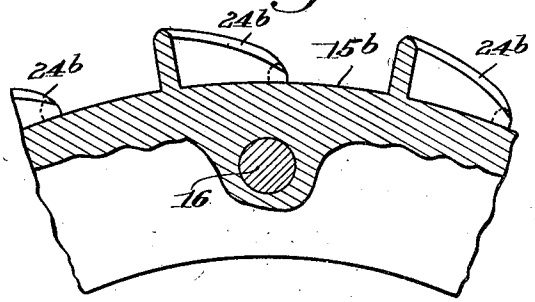


Fig. 7



Fig. 8

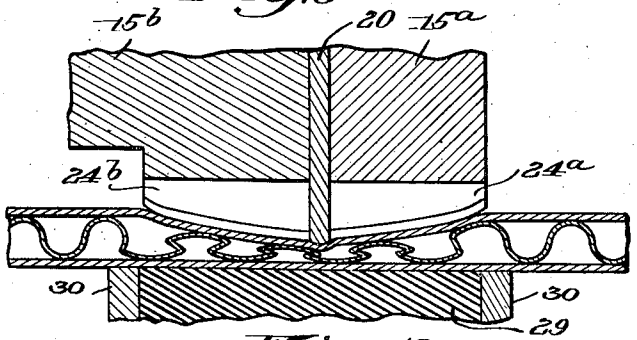


Fig. 9

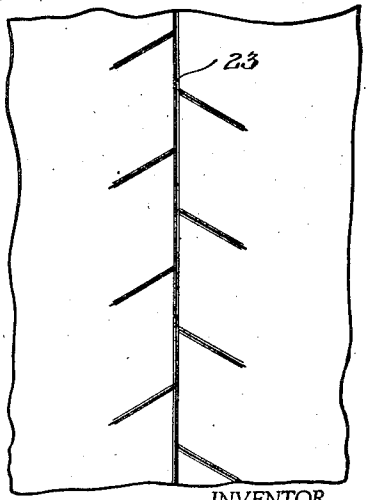


Fig. 10

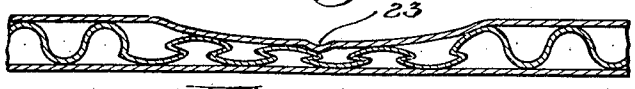
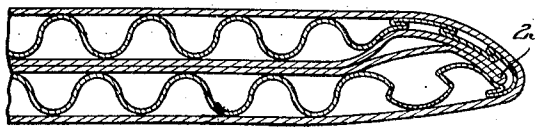


Fig. 11



INVENTOR.
Brainard M. Wilson
BY Cumpston & Shepard
his ATTORNEYS

Patented Dec. 3, 1940 2,223,503

UNITED STATES PATENT OFFICE

2,223,503

SCORING METHOD AND TOOL

Brainard M. Wilson, Rochester, N. Y., assignor of one-half to Wilber E. Bowersock, Rochester, N. Y.

Application July 7, 1939, Serial No. 283,249

7 Claims. (Cl. 93—58.1)

This invention relates to a scoring method and rotary creasing or scoring tools, such as commonly employed for scoring or embossing corrugated board stock or sheets, to prepare them for folding to make boxes, or other articles, one object of the invention being to provide an improved and more efficient method and tool of the above character particularly useful, for example, for scoring corrugated board in a direction parallel to the corrugations therein, in such a manner that the board may be thereafter folded with substantial accuracy along said scoring, without requiring subsequent manual adjustment or straightening of the folded parts to their intended positions.

Another object is the provision of such a tool in a more practical, economical and convenient form of construction, as regards both the manufacture of the same, and its convenience in use for scoring corrugated board.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Fig. 1 is a side elevation of a known type of scoring machine in which the scoring tool embodying the present invention may be employed;

Fig. 2 is a side elevation, partly in section, showing a scoring tool or collar, embodying the present invention, cooperating with a mating, or platen, collar, in engagement with the opposite sides of a corrugated board;

Fig. 3 is a side elevation of the scoring collar as viewed from the left in Fig. 2;

Fig. 4 is a sectional elevation of a portion of the scoring collar showing the construction and assembly of certain of the parts thereof;

Fig. 5 is a side elevation of a part of the collar as viewed from the line *5a*—*5a* in Fig. 4;

Fig. 6 is a sectional elevation of another part of the collar as viewed from the line *6a*—*6a* in Fig. 4;

Fig. 7 is a section on the line *7a*—*7a* in Fig. 5;

Fig. 8 is a sectional elevation through parts of the collar and cooperating platen showing the action thereof on an interposed sheet of corrugated board;

Fig. 9 is a plan view of a board creased by a scoring collar embodying the present invention;

Fig. 10 is a sectional elevation through a board scored by a collar embodying the present invention, but before folding, and

Fig. 11 is a similar view showing the board folded on the scored line.

The same reference numerals throughout the several views indicate the same parts.

The common and well known commercial corrugated board is composed of an inner, fibreboard sheet, corrugated to form parallel, alternating ridges and depressions, with outer fibreboard facing sheets attached to the ridges on each side of the corrugated sheet by means of a suitable adhesive. In order to form such corrugated board into shipping boxes and other useful articles, it is desirable to score it along predetermined lines so that it may be folded to form panels or walls of suitable size and shape for the article to be made. Such board folds more readily, of course, along lines substantially parallel with the corrugations, and it is customary to score the board in such direction in an effort to confine the folding accurately to predetermined lines.

Such corrugated board has been commonly scored for the above purpose by passing it between two tools, or metal collars, of varying sectional contours, commonly male and female, and designed to emboss or score the board. A common form of such collar for scoring the board has a section of V-shape contour or profile, mating with a cylindrical collar, or shaft, between which the sheet to be score is fed in a straight line by suitable guides.

The well known method of scoring described above produces a V-shaped score or indented line in one side of the board. When the board is folded on such line through 180° (in the manner in which an open book is closed), the substantial thickness of ⅛'' to ½'' of the board produces a material compression in the facing sheet inside the fold, and a corresponding tension in the outer facing sheet, as illustrated in Fig. 10 of the drawings, showing the scored board before folding, and in Fig. 11 showing the result of folding on the score. As the outer facing sheet substantially resists the imposed tension, the inner facing sheet buckles, for some distance on each side of the score line about which it folds.

If the score line happens to fall symmetrically on the crest of one of the ridges, or the bottom of one of the depressions of the inner corrugated sheet, the board may fold with substantial accuracy along the score line. As it is not practicable to locate the score line in this symmetrical relation to the corrugations, it falls, in a substantial proportion of the work, between one of the ridges and the adjoining depression of the corrugations, or, in other words, between

adjacent points of attachment of the ridges of the corrugated sheet to the facing sheets, as illustrated in Fig. 8 of the drawings.

The compression of the board between the collars causes the inner corrugated sheet to buckle and fold upon itself between such points of attachment, with the result that the inner sheet is commonly folded on itself at such points in three superposed layers or plies, which, with the facing sheets, makes five superposed plies of material. Opposite the ridges or depressions, however, there are only three superposed plies. The result is an increased bunching of the material between the points of attachment of the ridges to the facing sheets which tends to bias the folding of the board to the side of the score line presenting the fewer number of plies and less aggregate thickness. This is a difficulty inherent in the construction of the board itself which has not been successfully overcome by the prior scoring collars, notwithstanding the fact they have been made with a relatively flat V-shaped contour, for the purpose of crushing the corrugations to a substantial distance on each side of the score line.

The above facts have presented the problem that such corrugated board, under the scoring treatment heretofore applied, has not uniformly folded with accuracy along the predetermined score line because, in the compression and buckling of the inner facing sheet, shown in Fig. 11, the unequal bunching or thickness of the plies of material, at the opposite sides of the score line, has caused the folding to follow the line of corrugation, rather than the line of scoring, with the result that the folded parts have not fallen into proper position, or registration, relative to one another, and the resulting articles have tended to be irregular in size and shape. It has therefore been necessary to withdraw from the production, and manually adjust, or straighten, a large proportion of the folded sheets, with a large wastage of labor and materials, as well as impaired quality in the finished articles.

I have found that the above difficulty may be largely overcome by a new construction of the scoring tool, which operates to score the board in such a manner that the folding conforms with substantial accuracy to the scoring line, and without being deflected to one side of it in cases where the scoring line falls unsymmetrically in relation to the ridges of the corrugations.

My improved method is carried out in the present instance, by way of illustration, in a scoring tool preferably in the form of a metal collar, or ring, comprising an annular body portion indicated generally at **15**, for mounting on a driving shaft. Such body portion is preferably made in halves **15***a* and **15***b*, clamped together as shown (Fig. 4) by means of bolts **16**. The portions **15***a* and **15***b* are preferably each made also in halves as shown in Figs. 2 and 3, for convenience in assembly on the supporting and driving shaft **17**, Fig. 2, about which they are clamped together by means of bolts **18**. A key **19** secures the assembled body portion in driven relation with the shaft.

Located and clamped between the body portions **15***a* and **15***b* is a relatively thin, annular, disk-like ring **20**, Figs. 4 and 5, also preferably made, as shown, in halves for convenience in assembly on the shaft, each half being accurately located in relation to the body portion, as by means of dowel pins **21**, with openings to receive and clear the bolts **16**, this annular disk **20** being spaced from the shaft **17** by an internal diameter **22** larger than that of the bearing surface of the body portion.

The annular disk **20** thus forms a rib projecting radially from and extending substantially continuously circumferentially of the body portion **15**. Its outer edge is rounded as shown to produce a smooth score line or indentation in the board, as indicated at **23**, Fig. 9. The diameter of the body portion **15** and disk **20** is preferably about 8 inches, more or less, but may vary, of course, to suit different applications and uses. The disk **20** projects radially from the body portion to a substantial distance, as shown, somewhat greater than the depth of indentation desired in the board.

The body portion **15** is preferably formed with a series of milled ribs **24***a* and **24***b*, projecting radially from the body portion **15**, in uniformly circumferentially spaced relation with one another, and extending laterally to a substantial distance from opposite sides of the circumferential rib **20**. The inner ends of these lateral ribs preferably project to the same or a slightly less height from the body portion than the circumferential rib **20**, as shown, and decrease in height toward their outer ends, having, preferably, the slightly rounded contour shown in the drawings, for indenting or scoring the material to a substantial depth adjacent the circumferential rib **20**, but to a progressively less depth toward their outer ends. These lateral ribs on one side of the circumferential rib **20** are preferably arranged in staggered relation to such lateral ribs, respectively, on the other side of the circumferential rib **20**, as shown.

It has been found that a good result is obtained by arranging the lateral ribs at an angle of approximately 60° to the circumferential rib, as shown, but such angularity may be varied to suit different conditions. The effective width of indentation from the outer ends on one series of lateral ribs across to the outer ends of the other series of lateral ribs is preferably somewhat in excess of the area of bending of the board and will also vary to suit different conditions, a width of one, to one and one quarter inches having been found desirable, for example, for commercial board of a thickness up to three-eighths of an inch. The lateral ribs on the same side of the circumferential rib may be spaced apart circumferentially about three-quarters of an inch but this dimension likewise will vary with varying conditions.

In use, the scoring tool or collar is preferably mounted, as well understood in the art, on one of two parallel shafts forming part of any standard or suitable rotary scorer or slitter of the character described. A suitable machine of this type is shown schematically in Fig. 1, where a scoring collar is mounted on an upper shaft **17**, cooperating with a lower shaft **25**, on opposite sides of a bed **26** over which the board sheets are fed in any suitable way from a stack **27**. The shaft **25** opposite the one on which the collar is mounted may be either the upper or lower shaft, as well understood in the art, and serves as a platen for supporting the work against the scoring collar. This shaft **25** may be of sufficient diameter to serve in itself as a platen, but it may be provided instead with a platen collar **28**, Figs. 2 and 8, having preferably a smooth face to serve as a platen for the scoring collar. The face of such secondary or platen collar may be cylindrical, or somewhat convex, or concave, as

found desirable for the particular work to be done, and may be formed with an annular body, or tread, of rubber, or some other yielding material, **29**, supported at its sides between flanges **30** on the body of the platen collar, as shown in Fig. 8.

In operation, the scoring collar and cooperating platen surface are located at such a distance from each other, with due regard to the work to be handled, as to somewhat compress the work, and substantially indent it by the projecting ribs **20** and **24***a* and **24***b*. The rib **20** forms an indentation **23**, extending along the desired line of fold, while the lateral series of ribs form lateral indentations extending more or less transversely of the area of bending, as shown, for example, in Figs. 9 and 10.

Thereafter, as the board is folded, as shown in Fig. 11, the inner facing sheet may buckle somewhat, toward or from the outer facing sheet, as shown, but the folding of the inner facing sheet is confined substantially to the score line or indentation, **23**, made by the circumferential rib **20**, regardless of the point at which such score line falls with relation to the corrugations of the inner sheet, and without substantial deflection of the folding from the score line. The portions of board adjacent and on opposite sides of such score line are effectively conditioned for substantially accurate folding along the said line, and the result is that the sections of the board on opposite sides of the fold may be accurately brought together in the desired relation, or registration, with one another, for accurately producing the size and shape of box or other article to be manufactured from the board, thus obviating the wastage of materials, as well as the expensive labor heretofore required, in adjusting and straightening the folding of a large proportion of the folded work.

While the scoring tool or collar is herein disclosed in a form of construction and arrangement of parts which has been found practicable and advantageous, for economy in manufacture and convenience in assembly and use in the scoring machine, various modifications and improvements of such construction and arrangement will readily occur to those skilled in the art, within the general principle of construction described above, which is intended, of course, by way of illustration of the form of embodiment now preferred, rather than by way of limitation thereto, except as specified in the appended claims.

I claim:

1. A tool for scoring sheet material to prepare the same for folding, comprising a body portion having projecting therefrom a plurality of scoring ribs, one of said ribs extending substantially circumferentially of said body portion in the plane of the desired line of fold and others of said ribs extending transversely thereto outside said line of fold for conditioning said material to confine the folding thereof to said desired line of fold.

2. A scoring tool for scoring work for folding comprising a body portion, a scoring rib projecting radially from and extending substantially continuously circumferentially of said body portion, for scoring the work in a predetermined line of folding, and a series of scoring ribs projecting radially from said body portion in circumferentially spaced relation with one another and extending laterally from opposite sides of said circumferential rib, for scoring the work outside said line of folding.

3. A scoring tool for scoring work for folding comprising a body portion, a scoring rib projecting radially from and extending substantially circumferentially of said body portion, a series of scoring ribs projecting radially from said body portion in circumferentially spaced relation with one another and extending laterally from said circumferential rib, said lateral ribs having their ends adjacent said circumferential rib projecting to substantially the same height from said body portion as said circumferential rib and decreasing in height outwardly therefrom.

4. A scoring tool for scoring work for folding comprising a body portion, a scoring rib projecting radially from and extending substantially continuously circumferentially of said body portion for scoring the work in a predetermined line of folding, and a series of scoring ribs projecting radially from said body portion in circumferentially and substantially uniformly spaced relation to one another and extending laterally from opposite sides of said circumferential rib for scoring the work outside said line of folding, said lateral ribs on one side of said circumferential rib being arranged in staggered relation to said lateral ribs, respectively, on the other side of said circumferential rib.

5. A scoring tool for scoring work for folding comprising a body portion, a scoring rib projecting radially from and extending substantially circumferentially of said body portion, and a series of scoring ribs projecting radially from said body portion in circumferentially spaced relation to one another and extending laterally and angularly from opposite sides of said circumferential rib, said lateral ribs on one side of said circumferential rib being staggered in relation to said lateral ribs on the other side of said circumferential rib, and said lateral ribs projecting at their inner ends to substantially the same distance from said body portion as said circumferential rib and decreasing in height adjacent their outer ends.

6. The method of scoring sheet material to prepare the same for folding, comprising the steps of indenting said material in the plane of the desired line of fold to facilitate folding along said line, and also indenting said material in lines extending transversely of and outside said line of fold on both sides thereof for conditioning said material to confine the folding thereof to said desired line.

7. The method of scoring sheet material to prepare the same for folding, comprising the steps of indenting said material in the plane of the desired line of fold to facilitate folding along said line, and also indenting said material in lines extendng transversely to and outside said line of fold for conditioning said material to confine the folding thereof to said desired line.

BRAINARD M. WILSON.