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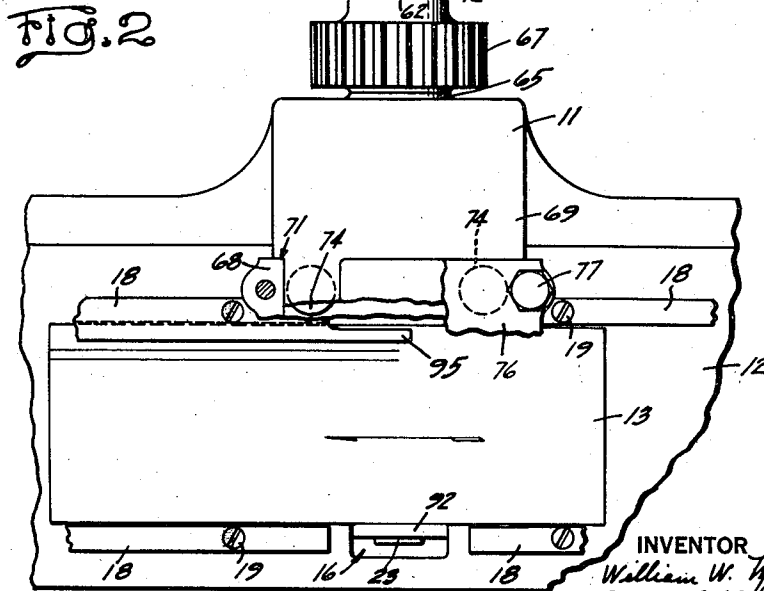
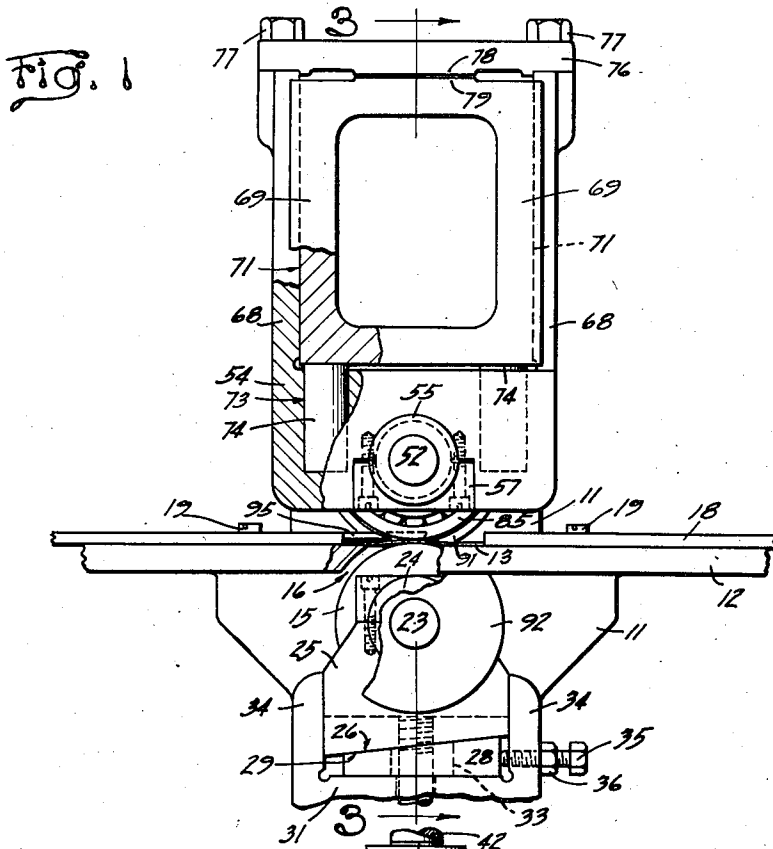
W. W. MAHER

2,019,499

SCORING MACHINE

Filed Nov. 23, 1933

2 Sheets-Sheet 1



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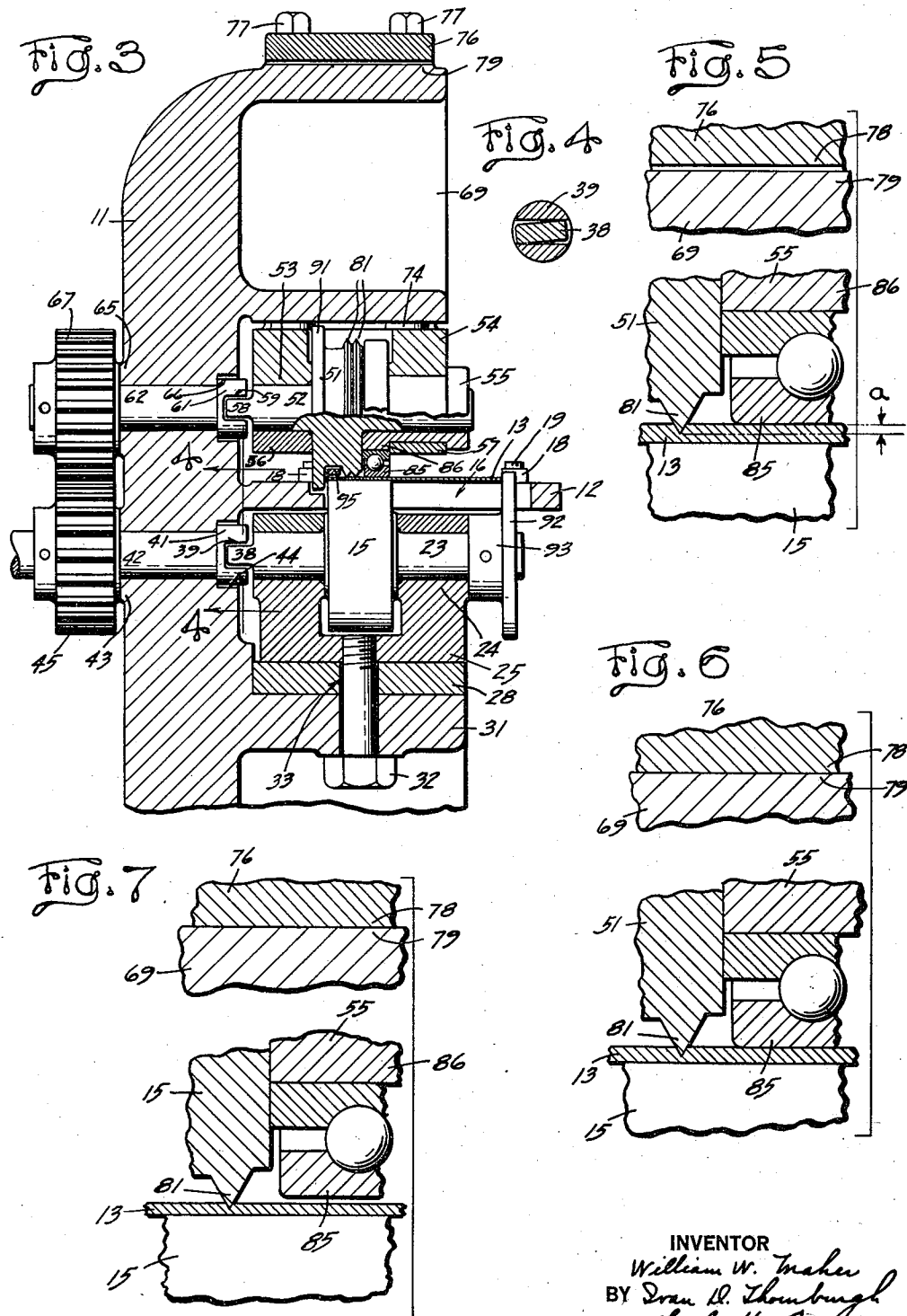
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SCORING MACHINE

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2 Sheets-Sheet 2



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SCORING MACHINE

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11 Claims. (Cl. 164—60)

The present invention relates to scoring machines for impressing weakening lines in metallic surfaces and has particular reference to controlling the depth of cutting of the score lines in a blank of sheet material.

In the manufacture of tearing strip containers or cans, adapted to be opened by the removal of a portion of the body wall bounding the weakened or score lines, it is essential that such lines be cut to a reasonably uniform depth to insure proper and easy opening and such cutting must not be too deep or the can wall may break through and leak. In a tin can having a wall thickness of ten thousandths of an inch, for example, a satisfactory scoring depth has been found to be approximately one half of this thickness or five thousandths of an inch.

Tin plate, that is the sheet material used for the manufacture of cans, has a relatively wide range of thicknesses and has also hard and soft spots and spots of different temper in the sheet as it comes from the tin plate mills and not only does this variation exist as between different sheets but even in the same sheet. For example in ordinary runs of plate say ten one-thousandths of an inch average thickness there may be spots in a sheet here and there as thin as six one-thousandths of an inch as well as hard and soft spots. This means a variation as to thickness of four one-thousandths of an inch which is considerable in the can making art and unless properly scored there will be a breaking through of the can wall at the thin spot where such a blank is made into a can.

Two systems of scoring have been employed one resulting in a uniform thickness of the metal left at the base of the score line, this scoring being usually done between scoring rollers having a fixed distance between axes. The other system produces a uniform depth of surface cut, this scoring being effected by a scoring roller gaging for cutting depth from one surface of the sheet.

In the example cited, i. e. of a sheet having a thin spot of six one-thousandths of an inch, were the fixed axis scoring method used with a thickness setting of five one-thousandths inch thickness at the base of the score line, then the thin spot would actually be cut only one one-thousandth of an inch deep and the scoring at that place, not being deep enough would surely fail to properly open the can.

On the other hand, if a uniform cut five one-thousandths of an inch deep were made in the thin spot the metal at the base of the score, weakened to one one-thousandth of an inch, would

surely give way during subsequent handling of the can.

The present invention contemplates utilization of an apparatus wherein a sheet, having both thick and/or thin spots, is properly scored so that opening along the score line may be uniformly made and at the same time the stock is not weakened to the point where the scored sheet is impaired.

An object of the present invention is the provision of an apparatus for automatically producing a score cut in sheet material which is sufficient in depth of cut to weaken the wall of the sheet for tearing while preventing impairment of the necessary strength of the sheet.

Another object of the invention is the provision of devices for gaging the depth of score cut in a blank of sheet material so that there is never more than a given maximum depth gaged from one side of the sheet while leaving at all times at least a minimum thickness of stock gaged from the opposite side of the sheet.

An object of the invention is the provision of a scoring apparatus having scoring rollers mounted for operation and gaged for cutting so that a predetermined depth of score cut is made in all sections of a sheet being scored that are a minimum thickness or over and so that a lesser depth of score cut is made in those sections of the sheet less than the minimum thickness.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is a front elevation of a scoring machine embodying the present invention, parts being broken away and shown in section;

Fig. 2 is a top plan view of the machine, parts being broken away;

Fig. 3 is a vertical sectional view taken substantially along the line 3—3 in Fig. 1;

Fig. 4 is a fragmentary sectional detail of a scoring roller drive shaft connection being taken substantially along the line 4—4 in Fig. 3; and

Figs. 5, 6 and 7 are enlarged fragmentary sectional views of part of a scoring roller, part of its mounting and the sheet being scored and illustrating various working conditions of the same for different thicknesses of sheet stock.

In the apparatus illustrated in the drawings, provision is made for passing the sheet or blank of material over a supporting table and between a pair of rotating scoring rollers, geared together

and driven in unison. These rollers draw it in while cutting a pair of parallel score lines longitudinally of the blank.

One of the scoring rollers is carried in a bearing block which is yieldably mounted in the frame of the machine and it is this roller that is controlled to cut the score lines to give the maximum cut in the parts of the blank that have a normal thickness, but to at no time cut too deeply into the thinner parts.

The preferred form of such an apparatus comprises a main frame 11 (Figs. 1, 2 and 3) which supports a horizontal work table 12 extending laterally beyond the sides of the frame 11. It is over this table that the work to be scored passes. An example of such work is herein shown as a can body blank 13.

The blank 13 in its passage across the top of the table 12 moves over and in frictional engagement with one of the scoring rollers mentioned, this being a lower feeding roller 15 extending up and into an opening 16 formed in the table. A pair of spaced parallel guide rails 18, secured to the top of the table by screws 19 (Fig. 2), guide the blank 13 as it is propelled along the top of the table by the lower feed roller.

Roller 15 is mounted on a shaft 23 horizontally disposed and journaled in bearings 24 formed in a bearing block 25 which has an inclined bottom surface 26. The bearing block 25 with its roller is vertically adjustable and for this purpose rests upon an adjusting wedge block 28 having an upper inclined surface. This wedge block rests upon a shelf 31 formed integrally with and extending forward from the main frame 11 and is directly under the table 12.

Both bearing block 25 and wedge block 28 are locked in position on the shelf 31 by a bolt 32 which is threadedly engaged in the upper block 25. This bolt passes through a clearance slot 33 formed in the wedge block 28. Vertical end walls 34, (Fig. 1) extend up from and are an integral part of the shelf 31 and these walls confine the block 25 against any sidewise shifting.

Longitudinal movement of the wedge block 28 (to the left Fig. 1) raises the feeding roller and its bearing block. This movement is made by a set screw 35 which is threadedly mounted in one of the vertical walls 34, the end of the screw engaging the large end of the wedge 28. When the screw is backed off and the wedge block moved to the right the feeding roller is lowered. The screw is locked in position by a nut 36.

The shaft 23 is loosely connected with a drive shaft and one end is cut away in a tongue 38 (Figs. 3 and 4) which engages within a slot 39 cut into an enlarged end 41 of a main drive shaft 42. Such a flexible connection permits variation in vertical position of the shaft 23 without changing the position of the drive shaft 42.

The shaft 42 is journaled in a bearing 43 formed in the main frame 11 and is rotated in any suitable manner. The enlarged head 41 of the drive shaft is located within a recess 44 formed in the bearing. The drive shaft 42 carries a gear 45.

The rotating feeding roller 15, propelling the blank 13 across the table 12 and between the guide rails 18, cooperates with an upper score cutting roller 51. Roller 51 is preferably formed as an integral part of a horizontal shaft 52. One end of this horizontal shaft is journaled in a bearing 53 formed in a bearing block 54 and its other end is journaled in a shouldered sleeve 55 which is held stationary in the bearing block 54. The one end of the shaft 52 is rotatably held

within its bearing 53 by a bearing cap 56 and the sleeve 55 is held clamped in the block 54 by a cap 57.

One end of the shaft 52, like the lower shaft 23, is provided with a tongue 58 which is adapted to engage within a slot 59 cut into an enlarged head 61 of a short shaft 62. The shaft 62 is journaled for rotation in a bearing 65 formed in the main frame 11 and is secured against longitudinal movement by the head 61 at one end, which fits into a recess 66 formed in the frame 11, and by a gear 67 pinned to the shaft 62 at the other end. This gear meshes with the gear 45 on the lower shaft 42.

In this way the scoring roller 51 is revolved from the shaft 42 and in unison with the feeding roller 15 and the tongue 58 and slot 59 forms a flexible connection between the shafts 52, 62 (Fig. 4) so that the former may change its vertical position while remaining in driving connection with the shaft 62. Such a change of position permits control of the depth of cut in the score lines which will now be more fully explained.

The bearing block 54 is of U-shape, having vertical legs or side members 68 (Fig. 1) which extend up alongside of the side walls of an overhanging frame section 69 (Fig. 3) which projects out from the front of the main frame 11 directly over the table 12. Vertical grooves 71 are formed in the side walls of this frame section and hold the bearing block legs 68 against lateral displacement while permitting free vertical sliding movement.

The block 54 adjacent the base of its legs 68 is provided with four vertical recesses 73 and a resilient rubber plug 74 is located in each recess. The upper ends of the plugs project out of their recesses and engage the under side of the stationary frame section 69. These rubber plugs tend to force the block 54 down and away from the frame part so that the scoring roller 51 carried in the block is moved toward the lower feeding roller 15.

The amount of this downward movement is limited by a stop plate 76 which is secured to and carried on the upper ends of the bearing block legs 68 above the frame section 69. Cap screws 77 tie the plate and the block together in a single unit. The stop plate 76 is formed with a lower finished part or boss 78 and this rests on a boss 79 formed in the top of the stationary frame section 69 when the apparatus is not operating on a can body blank 13. In this limited, stop position the rollers 15, 51 are held out of contact a certain distance which is the minimum distance allowed for a depth of score cut made on the body blank as will now be more fully explained.

The scoring roller 51 is provided with suitable scoring die surfaces arranged on its periphery, these surfaces depending on the type of score lines it is intended to make. In making the regular parallel line score as herein shown, the scoring roller carries a pair of annular knife edges 81 which are larger in diameter than the body of the roller. As a body blank 13 is fed into the machine over the upper surface of the table 12 these scoring die knife edges cut into the upper surface of the blank as it is backed up on the feed roller 15.

The rubber cushions 74 are sufficiently strong if allowed free action, to hold down the scoring roller 51 to cut a score line leaving only a minimum thickness of stock in the base of the score groove as gaged by the abutting bosses 78, 79

and this irrespective of the thickness of the cut parts of the blank. To change this and prevent deep cutting when the thicker parts of the blank are scored provision is made for also gaging from the upper surface of the blank.

This gage device, as herein shown, may preferably take the form of a ball bearing unit 85 (Figs. 1 and 3) mounted upon a shoulder 86 of the stationary sleeve 55. The outer or movable ring of this unit rides on the upper surface of the blank at those places where it is as thick or thicker than a given amount. The outer periphery of the scoring die knife edges 81 is greater than the diameter of the movable ring of the unit 85 and these two dimensions being fixed there is always a given distance a (Fig. 5), between the lowermost point of the scoring die and the lowermost point of the ring and blank engagement. This represents the maximum depth of cut possible for the scoring roller 51, for as long as the gage ring rides on the blank the score cut equals the distance a .

The scoring roller 51 is formed with a flange 91 which is larger in diameter than the knife edges 81 and this flange extends below the latter and into the opening 16 of the table 12. The distance between the inner wall of the flange 91 and the knife edges 81 determines the location of the score lines in relation to the edge of the blank. The inner flange wall of the score cutting roller acts as a guide for the back edge of the blank 13 as the latter passes through the machine (Fig. 3).

The front edge of the blank is engaged by a flange 92 of a guide disc 93 which is pinned to the front end of the feeding roller shaft 23 beyond the bearing block 24. The disc flange 92 projects up into the opening 16 of the table 12, thus locating the blank as to its lateral position by holding its rear edge against the roller flange 91 as has been mentioned. The rear guide rail 18 extends back and below the scoring roller 51 (Figs. 1 and 3) as at 95 and acts as a stripper for the blank preventing its sticking to the knife edges 81 of the scoring roller and thus preventing its lifting away from the table surface. Examples of different scoring conditions will now be given.

Fig. 5 illustrates the relation of a scoring roller 51 operating on an average section thickness of ten one-thousandths of an inch for example. The distance a is five one-thousandths of an inch so with the bearing ring 85 engaging the upper surface of the blank a score cut of five one-thousandths of an inch in depth is being made.

It will be remembered that the rubber cushions 74 are holding the knife edges 81 into the work. As also shown in this figure there is a clearance space between the bosses 78, 79 of the stop plate 76 and the frame section 69. At such a time the maximum depth cut gage (bearing ring 85) is in operation, but the minimum thickness gage for the minimum amount of stock at the base of the score is not operating. If a thicker section of the blank were encountered by the roller the clearance space between the bosses 78, 79 would only be increased and the same depth of surface cut made.

Fig. 6 illustrates a section thickness being scored of say eight one-thousandths of an inch. Since the bearing ring 85 still rests on the upper surface of the blank the depth of cut is still five one-thousandths of an inch from the upper surface. There is left at the base of the score cut three one-thousandths of an inch which we will

assume is the minimum thickness of stock to be left in the base of the score. The boss 78, therefore, has just engaged the boss 79 and the scoring roller 51 cannot cut any deeper.

Fig. 7 shows an extremely thin spot in the blank 13 being, for example, six one-thousandths of an inch thick. Conditions are now reversed from those obtaining in the first example. The surface depth (maximum gage) is of no use while the minimum thickness control is governing the operation. The bosses 78, 79 are now engaged so that the scoring roller is held against too low a cutting position and the minimum thickness of three one-thousandths of an inch obtains in the metal at the base of the score. The bearing ring 85 is now held above the upper surface of the blank this time a distance of two one-thousandths of an inch and the actual depth of surface cut is, therefore, three one-thousandths of an inch.

Any of the scores in the three different cases cited is the proper score and will allow for a correct opening of the can when the scored area is removed. Since the can is not weakened beyond a safe point there will be no danger of a breaking through of the can wall and no leaky can. In this way a new result is obtained and the usefulness of the apparatus is extended to operate on a wider variation of blank conditions.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. In a scoring machine the combination of, cooperating rollers adapted to perform a scoring operation upon a blank of sheet material positioned therebetween, means for rotating said rollers, and means associated with a said roller for gaging the depth of score cut, from both surfaces of said blank.

2. In a scoring machine the combination of, cooperating rollers having respectively knife edged and smooth surfaces adapted to perform a scoring operation upon a blank of sheet material positioned therebetween, means for rotating said rollers, and gaging means associated with said knife edged roller to effect a variable depth of score cut depending upon the thickness of said blank at the point of scoring.

3. In a scoring machine the combination of, cooperating rollers having respectively knife edged and smooth surfaces adapted to perform a scoring operation upon a blank of sheet material positioned therebetween, means for rotating said rollers, and means associated with a said roller for gaging the depth of score cut, from one or the other of the surfaces of said blank to insure sufficient depth of score cut while maintaining a sufficient thickness of stock at the base of said cut.

4. In a scoring machine the combination of, cooperating rollers for producing score cuts in a blank of sheet material positioned therebetween, means for rotating said rollers, and gaging means associated with a said roller for gaging the depth of said score cuts so that a predetermined depth of cut is made in all sections of said blank of a predetermined minimum thickness or over and a lesser depth of cut in those

sections of said blank which are less than the minimum thickness.

5. In a scoring machine the combination of, cooperating rollers for producing score cuts in a blank of sheet material positioned therebetween, means for rotating said rollers, and gaging means associated with a said roller for gaging the depth of said score cuts so that there is never more than a given maximum depth gaged from one side of said blank while leaving at all times at least a minimum thickness of stock gaged from the opposite side of said blank.

6. In a scoring machine the combination of, a frame, rotating cooperating rollers carried by said frame and adapted to perform a scoring operation upon a blank of sheet material positioned therebetween, a slide mounted upon said frame and providing support for a said roller, yieldable members interposed between said frame and said slide for holding the latter in position to cause said roller to produce a score cut in said blank, and gaging means associated with said slide and with said frame for gaging the depth of said score cut to insure a sufficient depth of cut while maintaining a sufficient thickness of stock at the base of said cut.

7. In a scoring machine the combination of, a frame, cooperating rollers carried by said frame and adapted to perform a scoring operation upon a blank of sheet material positioned therebetween, means for rotating said rollers, a slide mounted upon said frame and providing a support for a said roller, yieldable members interposed between said frame and said slide for holding the latter in position to cause said roller to produce a score cut in said blank, and gaging means carried by said roller and having engagement with said blank for gaging the depth of said score cut so that a predetermined depth of cut is made in all sections of said blank of a predetermined minimum thickness or over.

8. In a scoring machine the combination of, a frame, cooperating rollers carried by said frame and adapted to perform a scoring operation upon a blank of sheet material positioned therebetween, means for rotating said rollers, a slide mounted upon said frame and providing a sup-

port for a said roller, yieldable members interposed between said frame and said slide to cause said roller to produce a score cut in said blank, gaging means associated with said slide and engaging with said frame for gaging the depth of said score cut to insure a sufficient depth of cut while maintaining a sufficient thickness of stock at the base of said cut, and other gaging means carried by said roller and having engagement with said blank for gaging the depth of said score cut so that a predetermined depth of cut is made in all sections of said blank which are of a predetermined minimum thickness or over.

9. In a scoring machine the combination of, cooperating rollers for performing a scoring operation along predetermined lines upon a blank of sheet material positioned therebetween, means for rotating said rollers, means cooperating with one of said rollers for controlling the depth of score cut in said blank, and guiding means constituting a part of one of said rollers for locating and guiding said blank along said predetermined lines as it passes between said rollers.

10. In a scoring machine the combination of, cooperating rollers for performing a scoring operation along predetermined lines upon a blank of sheet material positioned therebetween, means for rotating said rollers, means cooperating with one of said rollers for controlling the depth of score cut in said blank, and guiding means constituting an integral part of a said roller for locating and guiding said blank along said predetermined lines as it passes between said rollers.

11. In a scoring machine the combination of, a feeding roller, a scoring roller adapted to perform a scoring operation along predetermined lines upon a blank of sheet material positioned between said feeding roller and said scoring roller, means cooperating with one of said rollers for controlling the depth of score cut in said blank, guiding means constituting a part of one of said rollers for guiding said blank along said predetermined lines during its passage between said rollers, and a stripper plate for maintaining said blank in a straight path of travel during and after the scoring operation.

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