

May 18, 1965

J. E. KNECHT  
METHOD AND MEANS FOR REMOVING THE TRIM FROM  
SHEETS TO FORM BLANKS

3,184,129

Filed Feb. 8, 1963

2 Sheets-Sheet 1

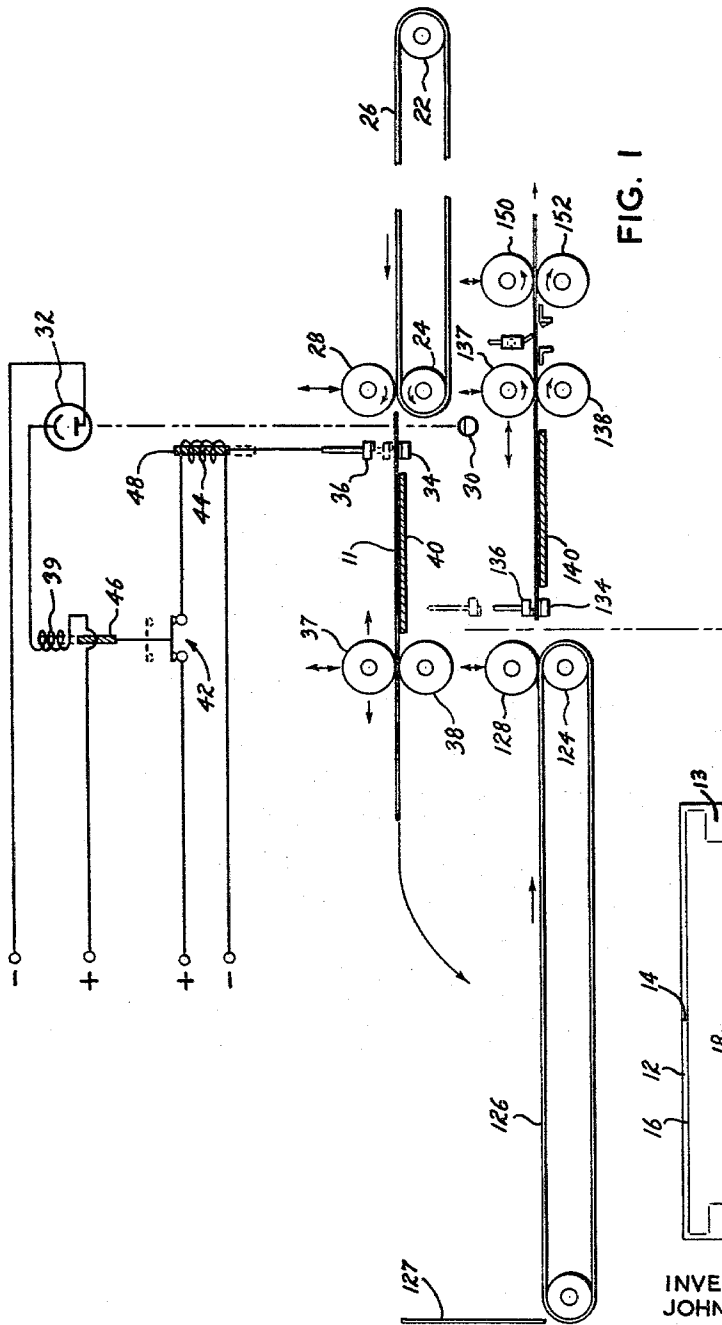


FIG. 1

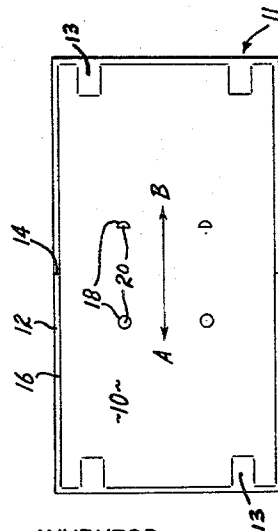


FIG. 2

INVENTOR  
JOHN E. KNECHT

BY: *Jetherstonhaugh & Co*  
ATTORNEYS

May 18, 1965

J. E. KNECHT  
METHOD AND MEANS FOR REMOVING THE TRIM FROM  
SHEETS TO FORM BLANKS

3,184,129

Filed Feb. 8, 1963

2 Sheets-Sheet 2

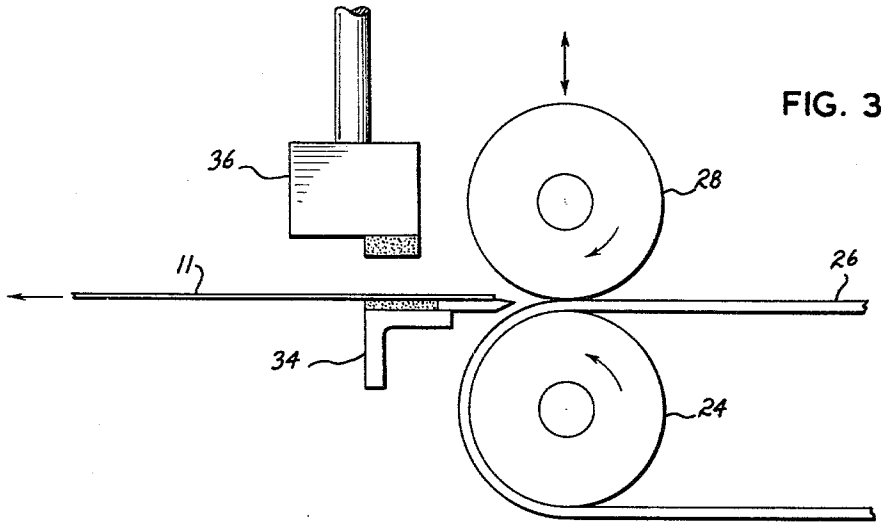


FIG. 3

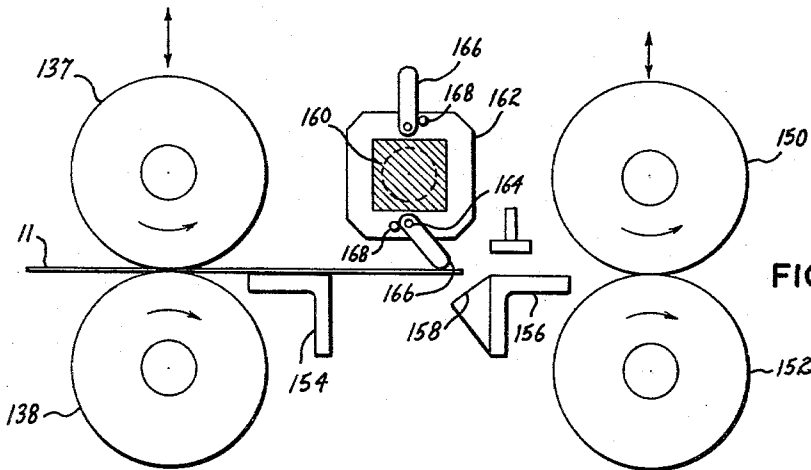


FIG. 4

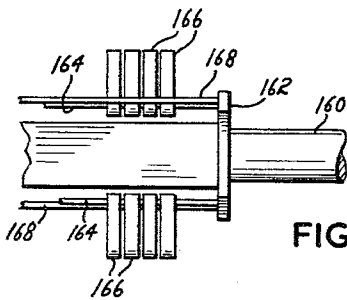


FIG. 5

INVENTOR  
JOHN E. KNECHT  
BY: *Fetherstonhaugh & Co*  
ATTORNEYS

1

3,184,129

**METHOD AND MEANS FOR REMOVING THE TRIM FROM SHEETS TO FORM BLANKS**

John E. Knecht, Pointe Claire, Quebec, Canada, assignor to Bathurst Containers Limited, Montreal, Quebec, Canada

Filed Feb. 8, 1963, Ser. No. 257,222

6 Claims. (Cl. 225-2)

This invention relates to a method and means for removing the trim from sheets to form blanks.

In the application, "blank" is the desired flat form to be obtained from a "sheet." A "sheet" comprises the blank and outside thereof the unwanted areas called "exterior trim" and unwanted areas surrounded by blank material called "interior trim." The unwanted areas, after and as a result of a process such as die-cutting, are delineated from the blank by weakened extents along the desired blank defining lines. A "sheet" may be made of paperboard (which latter term includes paper or cardboard) and the most common application of my invention appears to be with paperboard of the corrugated type.

By "restraining force" is meant a force tending to render stationary the thing to which the force is applied.

It is one object of this invention to provide means and a method for removing exterior trim from a sheet while the sheet is in motion.

It is an object of this invention to provide means and a method for successively and rapidly removing exterior trim and interior trim from a series of sheets moving in a path.

It is another object of this invention to provide means and a method for removing interior trim successively and rapidly from a series of sheets.

The invention generally provides for applying a restraining force tending to halt the movement of a sheet adjacent its trailing edge, with a predetermined frictional force while pulling the sheet away from the point of application of the restraining force with a greater frictional force forwardly of said trailing edge. During this operation, where and when the pulling force and restraining force are both applied to the blank, the blank is steadily moved by the pulling force away from the point of application of the restraining force. However, where and when the pulling force is applied to the blank, while the restraining force is applied to the exterior trim, the exterior trim is removed since its attachment to the blank is weakened by the defining line. Contact by the restraining force takes place adjacent the trailing edge of the sheet, hence the exterior trim is customarily weakened along lines separating the trim into forward and rearward areas related to the intended direction of travel under the pulling force. Thus, when the exterior trim is withdrawn adjacent the trailing edge, the "side" exterior trim is also removed up to the separating lines. With approximately half the exterior trim removed, the blank is then subjected to a second application of the restraining and pulling force but with the orientation of the blank relative to the pulling force reversed. In this way the remainder of the exterior trim is removed.

In a preferred embodiment of the invention, pulling force is applied by a pair of rotating rollers applied on opposite sides of the sheet and opposite each other, and the restraining force is applied by a plurality of fingers

2

extending in a line transversely relative to the intended direction of sheet movement and actuable to reversibly move into contact with the blank adjacent the trailing edge.

The invention also provides for the passage of sheet under a device arranged to subject the sheet to localized impacts as it passes, and to generally support such sheet on the opposite side from the side receiving such impacts, while leaving it unsupported on such opposite side in a small area immediately opposite the point of incidence of such impacts.

The invention will be clearly understood by reference to the following specification taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a drawing in schematic form shown of the operation of the apparatus.

FIG. 2 is a drawing of a typical sheet in accord with the invention.

FIG. 3 shows a preferred form of the restraining means used for the removal of exterior trim.

FIG. 4 shows the preferred form of the device for removing interior trim; and

FIG. 5 shows a part of the device in FIG. 4 viewed in a direction perpendicular to the view in FIG. 4.

In FIG. 2 is shown a typical sheet 11 for operation upon by the apparatus. Such sheet has been die-cut to provide the usable blank 10 surrounded by exterior trim 12 with the die-cut line 16 separating them shaped to provide the desired outside blank contour. Note that the direction of forward or rearward movement A-B may be selected as desired but will usually be selected so that the majority of the shaped exterior trim (such as the projections 13 of FIG. 2) faces the leading or the trailing edge and so that straight line cuts defining the exterior trim are on the sides of the sheet in its movement through the apparatus to be described. It will be noted that die-cut lines 14, approximately half-way along the sheet in the forward and rearward directions, separate the exterior trim into two sections. Die-cuts 18 on the sheet delineate areas of interior trim 20 which indicate material to be removed to provide apertures in the blank.

In FIG. 1 the operating apparatus is indicated schematically. Spaced rollers 22 and 24 carrying a connecting belt 26 represent a conveyor for supplying sheets, with the predetermined forward direction conforming approximately to the direction of belt movement, to the first stage of the operating apparatus. It will be understood that conventional means, which may be any one of a number of known types, will be provided for supplying sheets in properly oriented arrangement to the belt 26, or this may be done manually.

At the "down-conveyor" end of the belt 26, an idler roller 28 is mounted to roll, on roller 24, in the absence of a sheet therebetween. The roller 28 is mounted to be moved easily upwardly by the thickness of a corrugated or other sheet to avoid crushing it but may be slightly biased toward roller 24, such as by its own weight. Just past the rollers 23-24 is the optical line, transverse to the direction of conveyor travel, defined by a light source 30 and, on the other side of the sheet path, a photocell 32. Next in the direction of conveyor travel are grippers comprising a base 34 of frictional material over which the sheet is to slide, and fingers 36 located on the opposite

side of the path of sheet travel from the base 34 and reciprocally movable, by means to be hereinafter described, into clamping relationship with the base 34. Base 34 is preferably a stationary bar extending across the operating width of the machine, and faced with a frictional sheet contacting surface such as rubber. There are preferably a plurality of closely spaced fingers 34, all reciprocally operable together, narrow in the dimension transverse to the conveyor path and extending across the operating width of the machine.

Spaced from the rollers 28-24 in the direction of conveyor travel are upper idler roller 37 and lower driven roller 38, arranged and rotatable like rollers 28-24 to grip a sheet passing therebetween and move it in the conveyor direction. The idler roller 37 is slightly biased downwardly and is movable up and down to avoid crushing the sheet, and the roller 38 may be driven in any desired manner in conjunction with the other driven rollers of the system.

The distance between the common center line of rollers 28-24 and rollers 37-38, is preferably adjustable to suit various sizes of sheet. Moreover, in the device as shown in the specific embodiment, the rollers 37-38 are preferably constructed and mounted to be adjustable either toward or away from the rollers 28-24. For any given length of sheet, the rollers 37-38 are adjusted in relation to the grippers 34-36 so that the cut 14 in the exterior trim is approaching, but has not reached, the rollers 37-38 when the trailing edge of the sheet is aligned with the grippers 34-36.

If necessary or desirable, a guide surface 40 may be placed below the sheet path between those two pairs of rollers to guide the sheet from rollers 28-24 between the rollers 37-38. The surfaces of rollers 37-38 and the biasing of roller 37 toward roller 38 is designed to supply a predetermined pulling frictional force on the sheet, greater than the restraining frictional force applied by fingers 36 and base 34 which would otherwise halt forward movement of the sheet.

The electric circuit for the operation of the fingers 36 will now be described. The positive terminal of a D.C. source is connected through the relay coil 39 to the anode of photocell 32. The cathode of photocell 32 is connected to the negative terminal of the same source.

One terminal of a second source, which may be D.C. or A.C., is connected to one terminal of a switch 42, the other terminal of switch 42 being connected through relay coil 44 to the other terminal of the second source. Bridging contacts for switch 42 are connected to the armature 46 of relay coil 39 for operation thereby.

Fingers 36 are connected to armature 48 of relay coil 44 for operation thereby. Although only one finger is shown, so connected, it will be understood that all fingers 36 across the path of conveyor travel are to be connected together to move in unison under the control of a single armature 48.

Without any sheet in the apparatus as so far described, the beam from light source 30 impinges on photocell 32 causing conduction therein whereby relay coil 39 is energized and consequently switch 42 is open, hence relay coil 44 is deenergized to allow the fingers to be in the "down" position resting on base 34.

When a sheet 11 travelling down belt 26 between rollers 28-24 crosses the optical path of cell 32, conduction in the cell is cut off, relay coil 39 is deenergized, and switch 42 closes to energize coil 44 which is designed to act to raise fingers 36 in time to allow the leading edge of the sheet 11 to pass therebetween. The sheet 11 then continues in its travel until it is grasped by rollers 37-38. When the trailing edge of the sheet 11 passes clear of the optical path, photocell 32 again becomes conducting to open switch 42 and deenergize coil 44 to drop the fingers 36 on the sheet adjacent the trailing edge of sheet 11. The effect is that where and when the blank is being frictionally pulled by rollers 37-38 and held by fingers 36, the greater

frictional force of the rollers will continue to move the sheet 11 out from under the fingers 36. However, where and when the blank 10 is being frictionally pulled by rollers 37-38 and parts of the exterior trim are held by fingers 36, the weak attachment of the exterior trim will cause it to be separated from the blank 10. Since the contact of the fingers 36 with the sheet 11 is adjacent the trailing edge, the exterior trim from the trailing edge forward to the die-cut lines 14 is removed.

The sheet 11 with approximately the rearward half of the exterior trim removed, escaping from rollers 37-38, falls without inversion onto a conveyor belt 126 travelling in the opposite direction to belt 26. Thus, the former leading edge of the sheet 11 now becomes the trailing edge. A stop wall, or "back-stop," 127 is located in the path of the sheet escaping from rollers 37-38 to stop the motion of the sheet away from rollers 37-38 and to cause it to drop onto the belt 126.

The belt 126 serves the same function as belt 26 to introduce the sheet to a second stage whose mode of operation is the same as that just described, and which operates in exactly the same manner, on the sheet 11 whose leading and trailing edges are reversed so that in the second stage the remaining half of the exterior trim is removed.

To clarify the reference to elements of the second stage which correspond in function to elements of the first stage, the second stage equivalent element is given a number 100 greater than its first stage equivalent.

Thus, the belt 126 running between rollers 122 and 124 sends sheets to be pulled between rollers 128-124. Fingers 136 are operable by a photocell and circuit (not shown but similar to those in stage 1) to perform removal of the remaining exterior trim when operated by the photocell and circuit.

It will be understood that the principle of operation comprises the simultaneous use of a stationary frictional restraining force opposed by a greater pulling frictional force to remove the trim as described. Although photocells and an electric circuit are the means shown for sensing the location of the sheet, and actuating the fingers in accord therewith, it will be understood that the sensing and actuating means can be achieved in other ways, all considered to be within the scope of the invention. For example, the means for sensing the location of the sheet can be by mechanical limit switch actuated independently by the sheet or by the movement of one or both of the idler rollers 28 or 37 (or 128 or 137). The fingers 36 may be actuated pneumatically, hydraulically or mechanically as well as electrically as shown. Moreover, they may be actuated by the sensing means from a normally upward position to grip the trailing edge of a sheet and may move upward after a set time delay rather than on the actuation of a sensing means. Time delays, to allow for the difference of location between sensing means and fingers 136 or between raising and lowering the fingers 136, may be chosen in type according to the mode of operation selected. These and other alternatives in the means of actuating the fingers to oppose the movement of the pulling rollers are considered within the scope of the invention. Also considered within the scope of the invention are the many alternatives for design and mounting of the grippers 34-36, the critique of operation being that they supply a frictional force tending to halt movement of the sheet subject to such force being overcome by the rollers 37-38.

The method and apparatus for removing the interior trim will now be described:

Blanks 10 with the exterior trim stripped away issue from between rollers 137-138 and pass between rollers 150-152. Rollers 150-152 are relatively closely located thereto and are similar in design and operation to the other pairs, rollers 152 being a driven roller for moving

the sheet and roller 150 being an idler roller movable upwardly by a sheet to avoid crushing it.

Midway between the two pairs of rollers 137-138 and 150-152 and located to be in sliding contact with the lower surface of a sheet traveling between the two pairs of rollers are spaced supports 154 and 156 adapted to support the blank passed thereover in spaced locations, and with the forward support provided at its "up-conveyor" and with a chamfered face 158 sloping upwardly in the direction of conveyor travel to guide the approaching blank between the rollers 150 and 152.

Above the conveyor path and between the spaced supports 154-156 is a device to supply a plurality of localized impacts to the passing blank to remove the interior trim. In the preferred embodiment, a shaft 160 connected to be rapidly rotatable extends across the conveyor path. Adjacent each side and keyed to the shaft are a plurality of rings 162 preferably spaced two to three inches apart across the width of shaft 160. A plurality of rods 164 (here two) arranged symmetrically about the axis of rotation of the shaft are mounted on and extend through the rings 162, to extend across the conveyor path. On each of such rods 164 is individually pivotally mounted a large number of thin bars 166 of a length to contact the blank 10 when rotating, fully radially extended, about the shaft axis. The bars 166 act as individual centrifugal hammers to impinge upon the blank 10 and to knock the portions 20 of interior trim free of the blank and onto the space between the spaced supports. Corresponding to each rod 164 is a rod 168 located just forwardly, relative to the sense of rotation of shaft 160, of the position of the bars 166 in their radially extended position relative to said shaft 160. Thus, the rod 168 prevents movement of a bar 166 forwardly in the direction of rotating mounting.

Preferably the shaft 160 with bars 166 mounted thereon is extended across the width of a blank 10 travelling thereunder. The rate of rotation of the shaft 160 is preferably very rapid, so that there are a multitude of localized impacts on the passing blank 10. The bars 166 are weighted so that the force of the impact is sufficient to detach interior trim but insufficient to break the blank.

Although not shown, it will often be found preferable to provide a series of shafts with such hammers located above spaced supports to successively contact the sheets.

In practice, the die-cut patterns usually encountered will be as shown with two straight sides defining the exterior trim. However, in some cases, exterior trim projections similar to those shown at 13 will exist at the four sides of the sheet. In this event, those projections 13 at the leading and trailing edges will be removed by grippers 36-34 and 136-134. Those projections 13 on the sides of the sheet will often be removed by the hammers 166. In some cases, however, after passing through the inventive process, the side exterior trim projections 13 would remain after passing the hammers and if this is the case, it will be understood that the sheets may again be run through the device with the former side edges becoming the leading and trailing edges, or the side projections 13 may be originally die-cut into smaller pieces for the hammers 166 to remove. These alternatives are considered to be within the scope of the invention.

There is thus shown a method and apparatus for removing exterior and interior trim.

What I claim as my invention is:

1. Means for stripping the exterior trim from a sheet comprising: a pair of contrarotating opposed rollers biased toward contact with one another, for conveying a blank in a predetermined direction; said rollers being designed, constructed and mounted to exert a predetermined frictional pulling force on such sheet; opposed gripping members located on opposite sides of the path of a blank when viewed edgewise, said gripping members

being located in the opposite of said predetermined direction from said rollers; said gripping members being actuable: from an inactive position wherein at least one of said gripping members is out of contact with such sheet, to an active position wherein a sheet therebetween would be clamped with a predetermined restraining frictional pulling force less than said predetermined frictional force; and means responsive to the movement of such sheet, to actuate said gripping members from said inactive position to an active position to grasp said sheet, adjacent the trailing edge thereof and means operable on movement of the useful portion of said sheet away from said grippers to actuate said grippers to an inactive position.

2. A method of removing the exterior trim from a sheet whereon it is delineated by weakened lines, comprising: dividing said trim into at least two sections by weakening said blank along delineating lines, grasping said sheet with a predetermined frictional force and moving it in one direction, at a common time applying a holding frictional force less than said predetermined force to said blank adjacent the trailing edge thereof, taking that part of the sheet moving free of said holding force and grasping said part with a second predetermined frictional force and moving it in a direction so that said trailing edge becomes the leading edge, simultaneously applying a holding frictional force, less than said second predetermined force, to said sheet adjacent the new trailing edge thereof.

3. A method of removing trim from a sheet comprising, continuously subjecting said sheet to a plurality of localized impacts having a force to remove trim delineated on said sheet by a weakened line while supporting said sheet between the location of said impacts.

4. Means for removing trim from a sheet comprising means defining a path for said sheet, spaced supports for said sheets on one side of the path thereof, percussive means rotatably mounted on the opposite side of the path, said percussive means having striking members, said striking members being yieldable with respect to their mounting means upon striking a sheet of material traveling said path in use, means for continuously operating said percussive means to carry the striking members thereof into and out of said path at said locations between said spaced supports whereby said striking members continuously strike a sheet of material travelling said path and remove trim therefrom that is joined thereto by a weakened line.

5. Means for removing trim from a sheet as claimed in claim 4 in which said percussive means includes a shaft adapted to be carried in a circular path by said percussive means, said striking members thereof comprising a plurality of longitudinally extending members pivotally mounted on said shaft said striking members having stop means associated therewith for limiting movement of said striking members forwardly from a radial position on said shaft in the direction of rotation of said percussive means.

6. Means for stripping the exterior trim from a sheet comprising: a pair of contrarotating opposed rollers biased toward contact with one another, for conveying a blank in a predetermined direction; said rollers being designed, constructed and mounted to exert a predetermined frictional pulling force on such sheet; opposed gripping members located in opposite sides of the path of a blank when viewed edgewise, said gripping members being located in the opposite of said predetermined direction from said rollers; said gripping members being actuable: from an inactive position wherein at least one of said gripping members is out of contact with such sheet, to an active position wherein a sheet therebetween would be clamped with a predetermined restraining frictional force less than said predetermined frictional pulling force; means responsive to the movement of such sheet, to actuate said

7

gripping members from said inactive position to an active position to grasp said sheet, adjacent the trailing edge thereof and spaced supports for supporting said blank on one side of its path, percussive means mounted on the opposite side of the path, said percussive means having striking members, said striking members being yieldable with respect to their mounting means, means for continuously operating said percussive means to carry the striking members thereof into and out of said path at said locations between said spaced supports whereby said percussive members continuously strike a sheet of material travelling said path and removed trim therefrom that is joined thereto by a weakened line.

8

## References Cited by the Examiner

## UNITED STATES PATENTS

168,531	10/75	Ruger	-----	225—99	X
1,585,275	5/26	Albrecht	-----	198—84	
2,171,769	9/39	Stolar et al.	-----	225—100	X
2,237,320	4/41	Spayd et al.	-----	225—3	
2,655,842	10/53	Baumgartner	-----	225—96	
2,698,659	1/55	Kosek	-----	225—96	X

10 ANDREW R. JUHASZ, *Primary Examiner*.

WILLIAM W. DYER, JR., *Examiner*.