Jan. 2, 1962 R. N. EICHORN 3,015,197

CARTON SLITTER AND FORMING MACHINE

Filed July 15, 1960 2 Sheets-Sheet 1

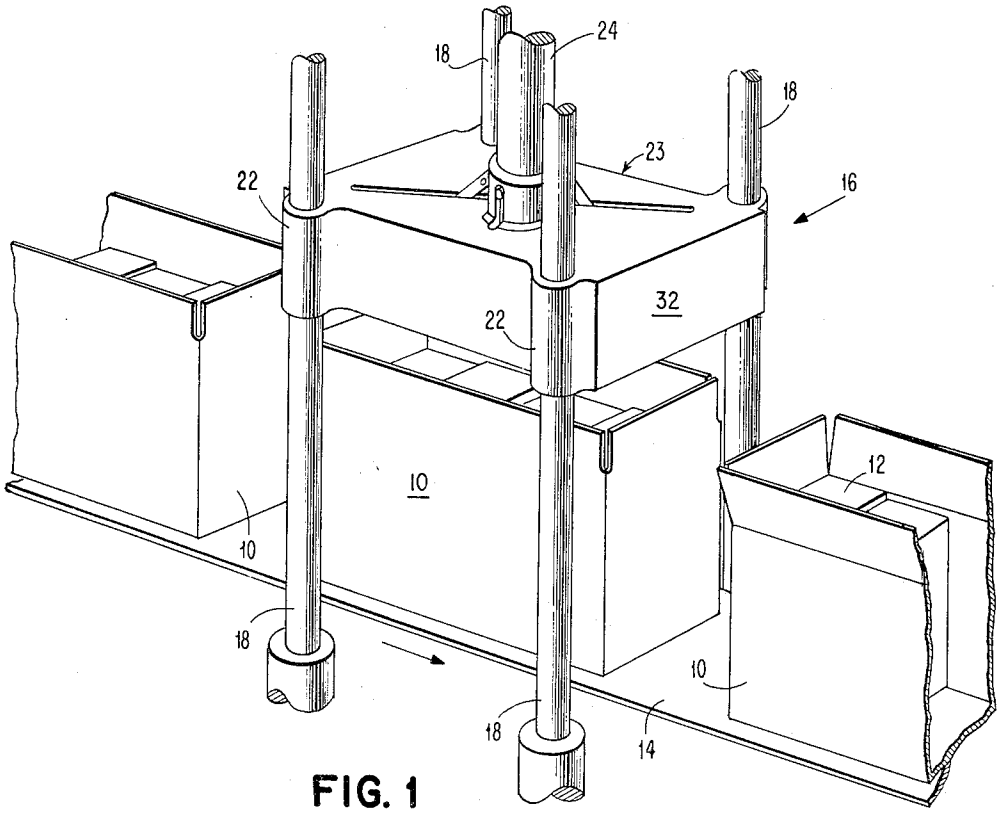


FIG. 1

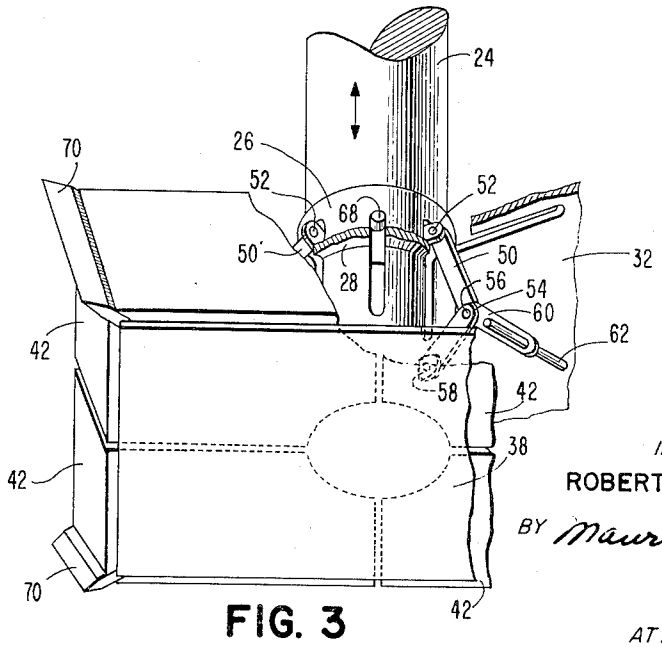


FIG. 3

INVENTOR
ROBERT N. EICHORN
BY Maurice H. Klitzman
ATTORNEY

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CARTON SLITTER AND FORMING MACHINE

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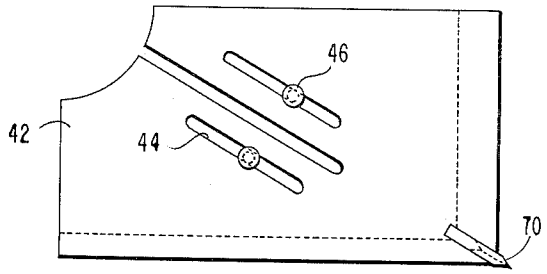


FIG. 4

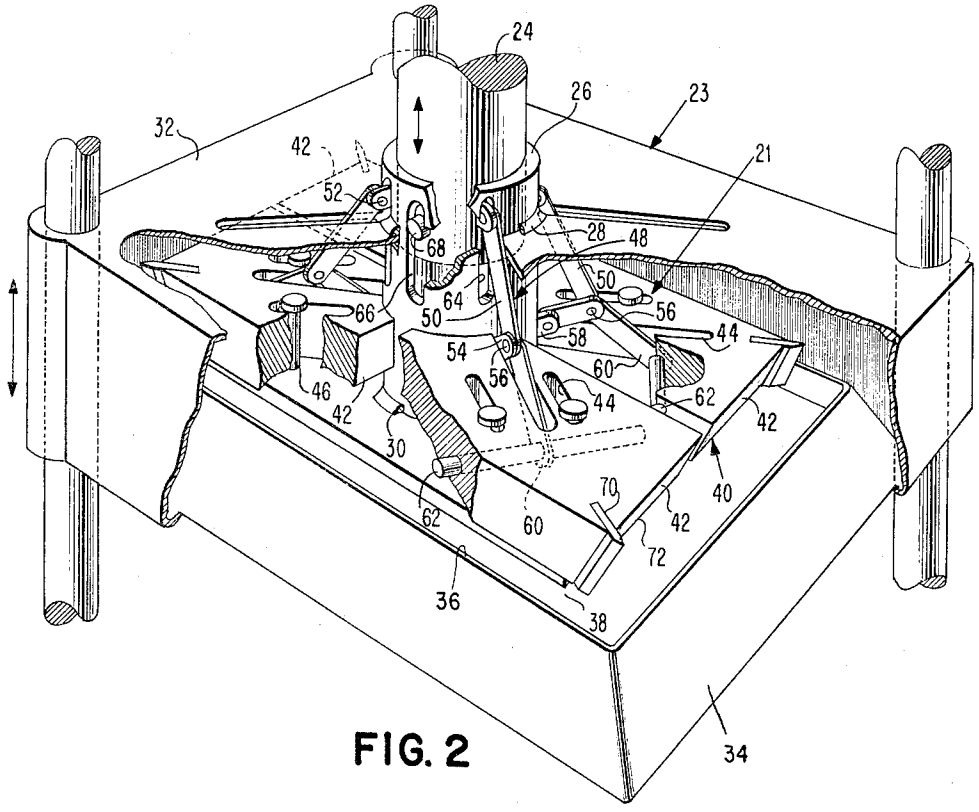


FIG. 2

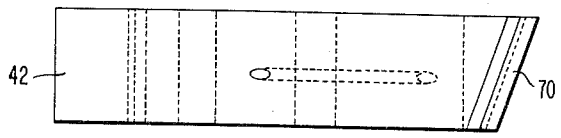


FIG. 5

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CARTON SLITTER AND FORMING MACHINE

Robert N. Eichorn, Endicott, N.Y., assignor to International Business Machines Corporation, New York, N.Y., a corporation of New York

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7 Claims. (Cl. 53—208)

This invention relates to a carton slitting and forming machine and in particular to a carton slitting and forming machine for slitting and creasing a carton to the height of the articles contained therein.

It is known to provide a flap slitting machine which cuts the corners of a carton after the carton has been loaded. However, in such cartons it is intended to contain loose material which initially fills the entire carton before the top flaps are folded. Upon being vibrated mechanically, the contents then settle down to a predetermined height at which the score lines of the flaps are located. The knives then cut the flaps to a predetermined depth which never varies, and the height of the score lines likewise is constant. Therefore, in such an arrangement, the carton is intended to contain loose material which initially fills the entire carton and then vibrated so that the contents are packed so that the contents are below a predetermined height from carton to carton before the top flaps are folded. Such arrangements are not automatically capable of slitting the flaps at different heights from carton to carton for different levels of articles contained therein.

It is also known to use a relatively flexible paper bag for manually packaging merchandise. The paper bag is positioned within a packing frame which is vertically adjustable in accordance with the height of the contents as manually gauged by the packer. The packing frame is not positioned with respect to the contents of the bag. The corners of the flaps are manually torn down to the upper edge of the packing frame and the flaps are then bent outwardly over the edge of the frame to form the crease lines. This arrangement relies on the operator to mentally judge the approximate height of the contents so as to manually position the packing frame. It is not an accurate means of determining the height of the contents and to position the crease and slits accurately with respect to that height.

These prior arrangements have not provided automatic means for positioning or slitting the corners of the flaps according to the height of the contents within the carton, nor do they provide for automatically positioning means for creasing or scoring the carton to the height of the contents.

Therefore it is an object of this invention to provide a carton slitter to automatically slit corners of a carton to a variable level from carton to carton.

It is another object of this invention to provide a carton forming device to automatically bend or crease the sides of the carton to a variable level according to the height of the contents from carton to carton.

It is still another object of this invention to provide an automatic means for measuring the height of the contents in a carton and for slitting the corners of the carton to the measured height and simultaneously position creasing means to substantially the same height of the contents of the carton for forming the sides of the carton.

Briefly stated, and in accordance with one aspect of this invention, a punch assembly and die assembly are provided where the punch assembly and die assembly are in fixed relationship to one another and move together in the same direction. When the punch assembly engages the top of the contents in the carton, means are

provided to expand the punch assembly which includes slitting knives and forming blocks to simultaneously slit the corners of the flaps and break the sides of the carton at the position indicated by the height of the contents in the carton.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of the invention, as illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a perspective view showing a conveyor containing partially filled cartons passing beneath the expandable punch assembly and die assembly.

FIGURE 2 is a perspective view of the punch assembly and die assembly partially in broken section.

FIGURE 3 is a view showing the details of the punch assembly.

FIGURE 4 is a plan view of one of the segments of the forming blocks.

FIGURE 5 is a side view of a segment of an expandable forming block taken on lines 5—5 of FIGURE 4.

Referring to FIGURE 1, a plurality of cartons 10 are shown mounted on a conveyor belt 14. Each of the cartons 10 contains a plurality of inner cartons 12 of variable height. It is noted that the carton itself does not contain a scoring line and the corners of the flaps may be slit partially or not slit at all.

A slitting and forming station is shown generally at 16. It is at this station that the slitting and scoring operation takes place. In order to accomplish this, support rods 18 are provided which straddle the conveyor belt and cartons. Mounted above the belt and cartons is a slitting and forming machine for slitting the corners of the carton and creasing the sides of the carton 10. The ram head housing is provided with a plurality of lobes 22 which contain bearing openings therein for slideably mounting the machine on the supports 18.

In order to move the machine up and down in a vertical direction on the support rods 18, a supporting ram rod 24 is connected to the machine for this purpose. The machine includes a punch assembly 21 and die assembly 23. The supporting ram rod 24 can be moved by a pneumatic piston and cylinder arrangement. Since this forms no part of the invention, any well-known means for moving the supporting ram rod 24 could be used. A collar 26 is slideably supported on the shaft or rod 24. The collar 26 is fixed to the die assembly 23 by welding or the like at 28 and fixed to the punch assembly 21 by welding or the like at 30. This is to insure that the die assembly and punch assembly remain in fixed relation to one another, the details of which will be hereinafter more fully explained.

The die assembly 23 includes a housing portion 32 and an inverted truncated portion 34 terminating in a forming or creasing flange 36 over which the sides of the carton are creased.

The punch assembly 21 includes a flat plate 38 to which the collar 26 is welded at 30. A forming block is generally shown at 40 and includes four segments 42. These block segments are slideably supported on the flat plate 38, the purpose of which will become apparent. In order to permit the blocks to slide in a constrained or guided fashion, guide slots 44 are provided in the block segments 42 and guide bolts 46 slide in the guide slots. The guide bolts can be threaded into the plate 38 to maintain their fixed relation. Also each block segment is provided with two slots 44 and guide bolts 46 to maintain proper alignment of the guide blocks. The guide blocks are therefore mounted for radial movement with respect to the center line of the supporting ram rod 24.

In order to move the guide blocks radially inwardly

and radially outwardly a toggle linkage arrangement 48 is provided. The toggle linkage arrangement includes a link 50 pivotally connected to a bracket 52 fixed to the support rod 24. The link 50 is pivotally connected to another link 54 at 56. Link 54 is pivotally connected to bracket 58 which is fixed to the collar 26. Now pivotally connected to the pivot 56 is another link 60 which in turn is pivotally connected to a guide block segment 42. A pin 62 is provided for the pivotal connection of the link 60 to one of the guide blocks 42. Each of the guide block segments are provided with a similar linkage arrangement so that all of the guide block segments move together.

It is preferred that the guide block segments expand radially outwardly when the plate 38 engages the top of articles in the carton. Therefore a slot 64 is provided in the collar for permitting continued movement of support ram rod 24. Also, a guide slot 66 and guide pin 68 are provided for maintaining the proper relationship between the rod 24 and punch assembly 23. There are four slots 64 and four slots 66 preferred in this embodiment.

The corner of each forming guide block segment 42 contains a slot for receiving a slitting knife 70 for slitting the corners of the carton. There is sufficient play to permit the knife to hunt the exact corner of the carton. The knives are positioned at an angle so that an edge on each knife will pierce and then slit the carton.

The sides 42 of the punch assembly 21 are at an angle as shown at 72 so that the sides of the carton are "broken" over the creasing edge 36 by first pushing the top of the flap outwardly. This will tend to avoid a shearing action taking place on the carton between the punch and die. Further, the top of plate 38 is fixedly positioned slightly above the creasing flange 36 so the bottom of each forming block segment 42 is slightly above the creasing flange, to avoid the shearing of the flaps. It has been found that by breaking the flap outwardly it will bend inwardly at the same crease line.

In operation, outer cartons filled with inner cartons are conveyed on the conveyor belt 14 to a position underneath the slitting and forming machine at slitting and scoring station 16. The carton 10 is aligned to the machine so the flaps will pass between the punch assembly 21 and die assembly 23. The punch assembly and die assembly are lowered by activating the support rod 24 downwardly toward the carton. The downward movement continues until plate 38, which also supports the slitting and forming block segments 42, contacts the top of the inner contents of the carton. Continued downward movement of the support rod 24 with respect to the plate 38, which will now be stationary, will cause pivot points 56 to move radially outwardly because of the toggle link action of linkage arrangement 48. This will cause link 60 to move the forming block segments 42 radially outwardly on the plate 38. Since the flap of the carton should now be between the punch assembly 21 and die assembly 23, the slitting knives 70 will first pierce and then slit the corners of flaps of the carton. There is sufficient play so that the knives will "hunt" the exact corner and thereby eliminate any bended portions after the flaps are slit. Now, substantially simultaneously with the slitting of the corners, the top of each of the forming block segments 42 will engage each flap and start it outwardly. The bottom of each forming block segment 42 will then "break" or crease the flaps over the creasing flange 36. The depth of the slit in the carton flaps, and the height of the "break" or crease will be at that position determined by the height of the articles in the carton.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. In a carton slitting and forming machine for slitting and creasing the flaps of a carton to the height of the articles in a carton comprising a punch assembly, a die assembly, means for lowering the punch and die assemblies together until the punch assembly engages the articles in the carton to establish the depth of the slit and position for creasing, the punch assembly including an expandable forming block and slitting knife assembly, means for expanding the forming block and slitting knife assembly, the die assembly having a creasing frame against which the flaps of the carton are creased by the expandable forming block to the height of the articles in the carton, the slitting knives simultaneously slitting the corners of the flaps to a depth equal to height of the articles in the carton.

2. In a carton slitting and forming machine for slitting and creasing the flaps of a carton to the height of the articles in the carton comprising a punch assembly and a die assembly, means for positioning a loaded carton under the machine so that the flaps of the carton are aligned to pass between the punch assembly and die assembly, means for activating the punch assembly and die assembly toward the carton to position said flaps therebetween, means for expanding the punch assembly against the flaps of said carton and said die assembly to simultaneously slit and crease the flaps of the carton to the height of the articles in the carton.

3. In a carton slitting machine for slitting the flaps of a carton to the depth of the height of the articles in the carton comprising a slitting assembly and a die assembly, means for positioning a loaded carton under the machine so that the flaps of the carton are aligned to pass between the slitting assembly and die assembly, means for actuating the slitting assembly and die assembly to position said flaps therebetween, means for expanding the slitting assembly against said flaps and die assembly to slit the flaps of the carton to the depth of the height of the articles in the carton.

4. In a carton scoring machine for forming the flaps of a carton to the height of the articles in the carton comprising a punch assembly, a die assembly, means for lowering the punch and die assemblies together until the punch assembly engages the articles in the carton to establish the position for creasing the carton, the punch assembly including an expandable forming block assembly, means for expanding the forming block assembly when the punch assembly is stationary and has engaged the top of the contents of the carton, the die assembly having a creasing frame against which the flaps of the carton are creased by the expandable forming block assembly to the height to the articles in the carton.

5. In a carton forming machine for creasing the flaps of a carton to the height of the articles in the carton comprising a forming block assembly and a die assembly, means for positioning a loaded carton under the machine so that the flaps of the carton are aligned to pass between the forming block assembly and die assembly, means for activating the forming block assembly and die assembly to position said flaps therebetween, means for expanding the forming block assembly against said flaps and die assembly to crease the flaps of the carton to the height of the articles in the carton.

6. In a carton slitting and forming machine for slitting and creasing the flaps of a carton to the height of the articles in the carton comprising a punch assembly and a die assembly, rod means for moving the punch assembly and die assembly to position the flaps of said carton therebetween, support means for slidably supporting the punch assembly and die assembly on the rod means, the punch assembly having expandable forming blocks and slitting knives to simultaneously slit and crease the carton against said die means while the punch assembly is stationary and the rod means continues to move downwardly.

7. In a carton slitting and forming machine for slitting

and creasing the flaps of a carton to the height of the articles in the carton comprising a punch assembly and a die assembly, means for positioning a loaded carton under the machine so that the flaps of the carton are aligned to pass between the punch assembly and die assembly, support means for supporting the punch assembly and die assembly in fixed relation to one another, a creasing frame in the die assembly, a support shaft slidably supporting the support means, a linkage arrangement connected to the support shaft and punch assembly, the punch assembly including a plurality of slitting knives and

segmented forming blocks, upon the punch assembly engaging the top of the contents in the carton, further movement of the support shaft activates the linkage to expand the knives and forming blocks to simultaneously slit and crease the flaps of the carton to the height of the articles in the carton.

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