

[54] **CARD SCORING DEVICE**
[75] **Inventor:** John Albert Long, Toronto, Ontario, Canada
[73] **Assignee:** Longford Equipment International Limited, Ontario, Canada
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[52] **U.S. Cl.**..... 83/12, 83/89, 83/156, 83/422, 83/424, 83/430, 83/431, 83/506, 83/700
[51] **Int. Cl.**..... B26d 3/08
[58] **Field of Search.**..... 83/12, 426, 431, 83/506, 505, 424, 430, 156, 422, 507, 699, 700, 89

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Primary Examiner—Frank T. Yost
Attorney—Westell & Hanley

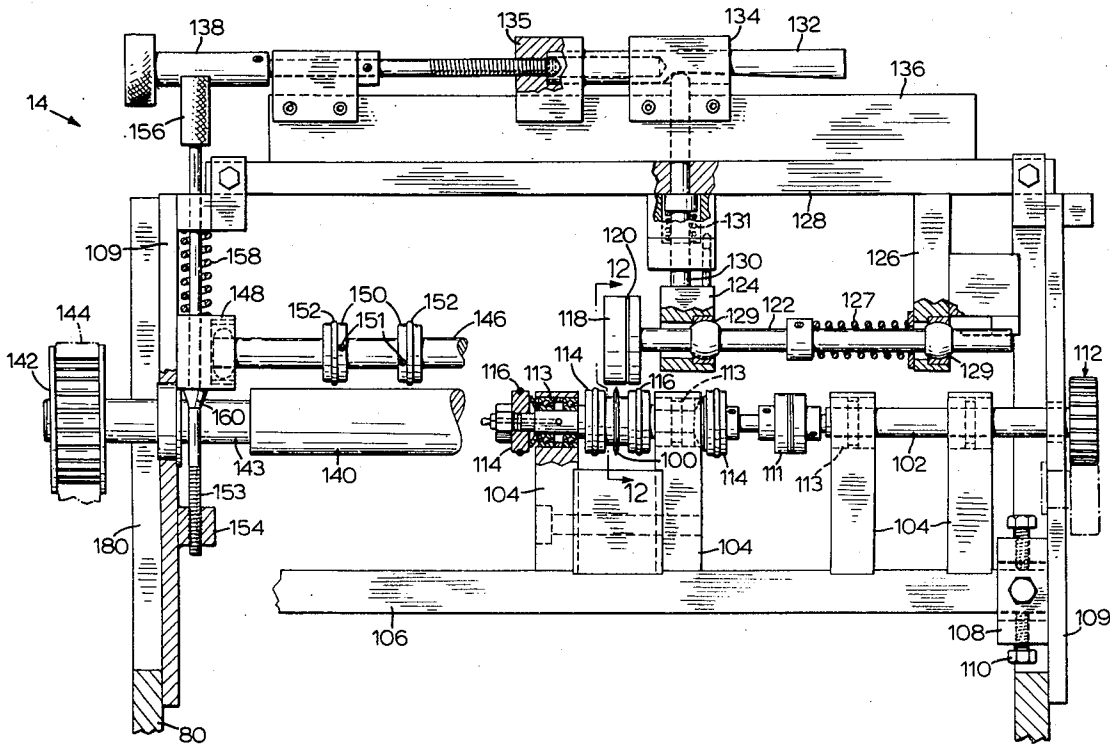
[57] **ABSTRACT**

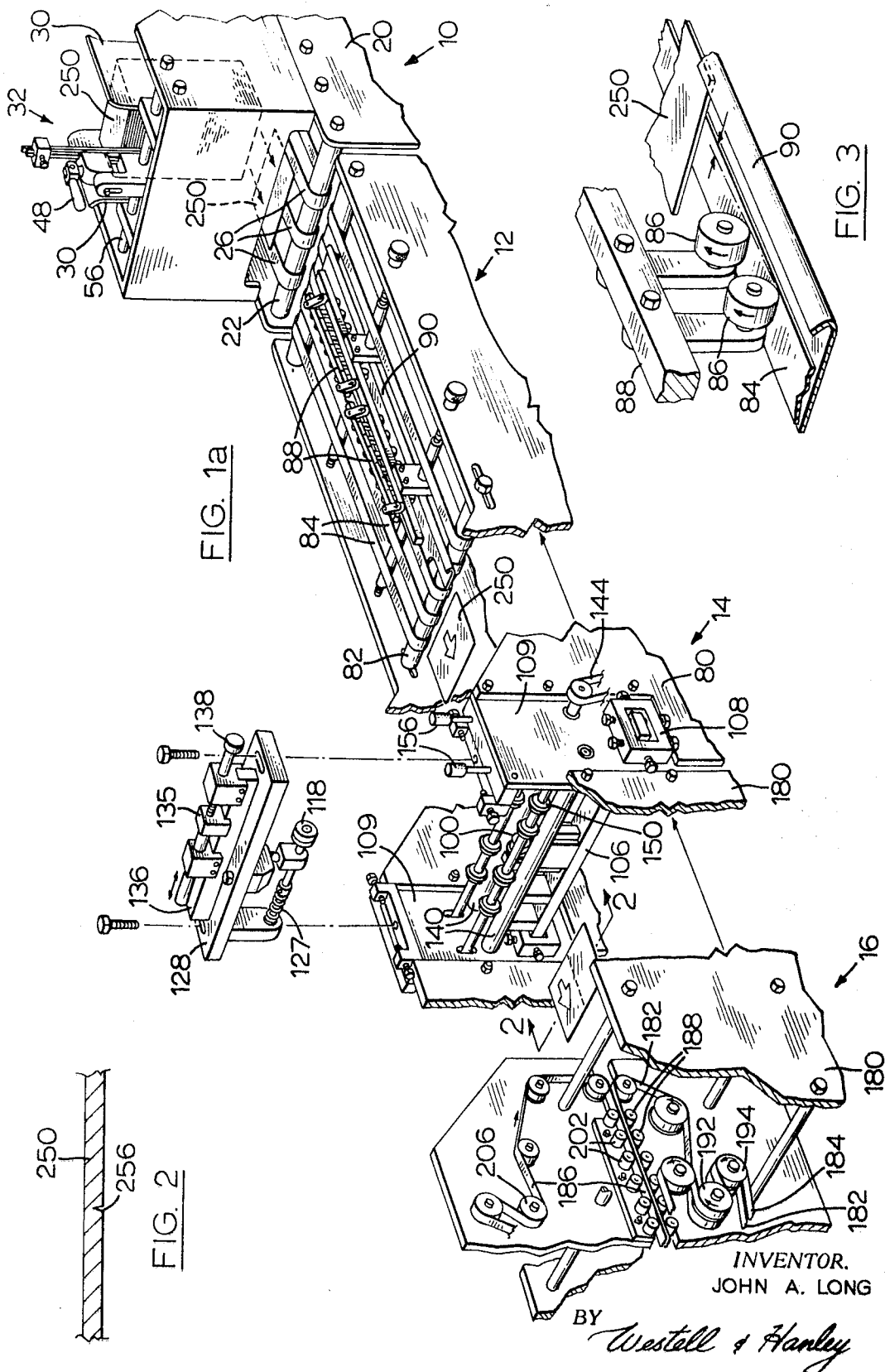
A device for feeding, scoring and stacking cards. In the feeding device each card is fed from a stack onto a moving platform, the trailing edge of the stack being shuffled by passing over a contoured vertical plate. In the scoring device the card passes between a circular blade and a cylindrical follower mounted on a base of large mass and vertically adjustable on the base. In the stacking device a photoelectric beam traverses the line of travel of the cards and when the beam is interrupted it actuates drive means for moving a conveyor which thus moves intermittently to receive the cards in overlapping relationship. In another aspect the stacking device has two conveyors receiving the cards but with opposite slopes, and a pair of opposed nozzles selectively directing an air stream across the line of travel of the cards causes them to be directed onto either one of the two conveyors.

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4 Claims, 14 Drawing Figures





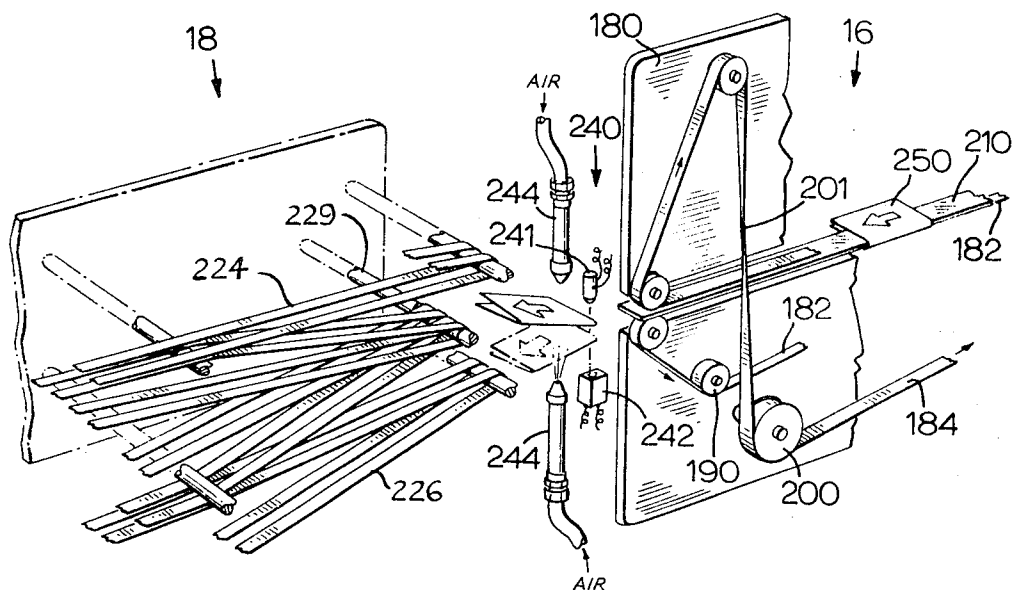


FIG. 1b

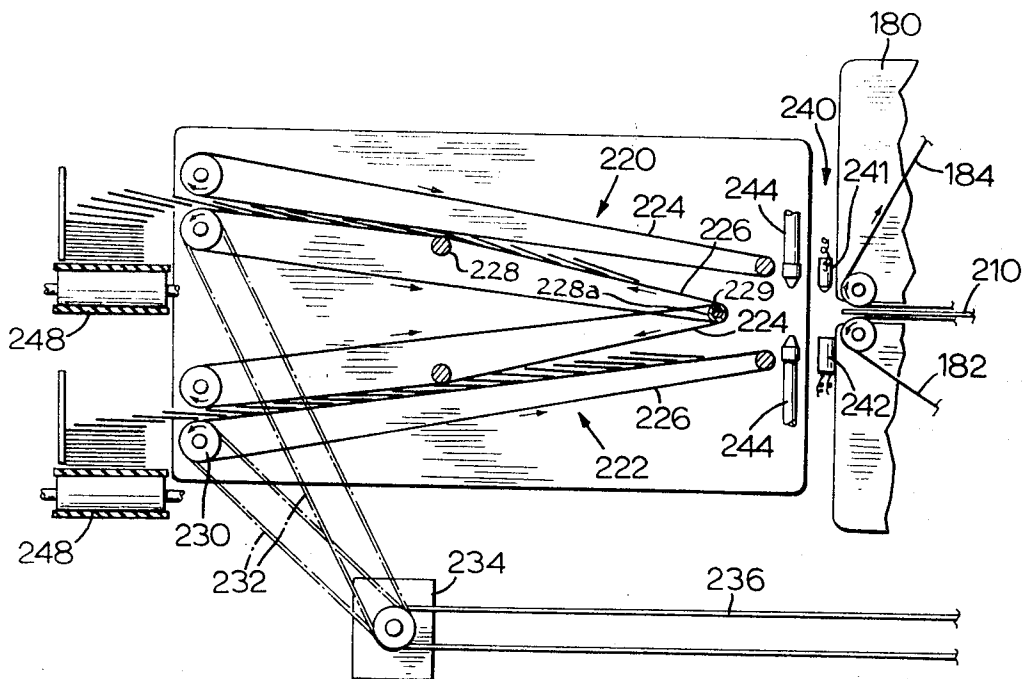


FIG. 4b

INVENTOR.
JOHN A. LONG

BY

Westell & Hanley

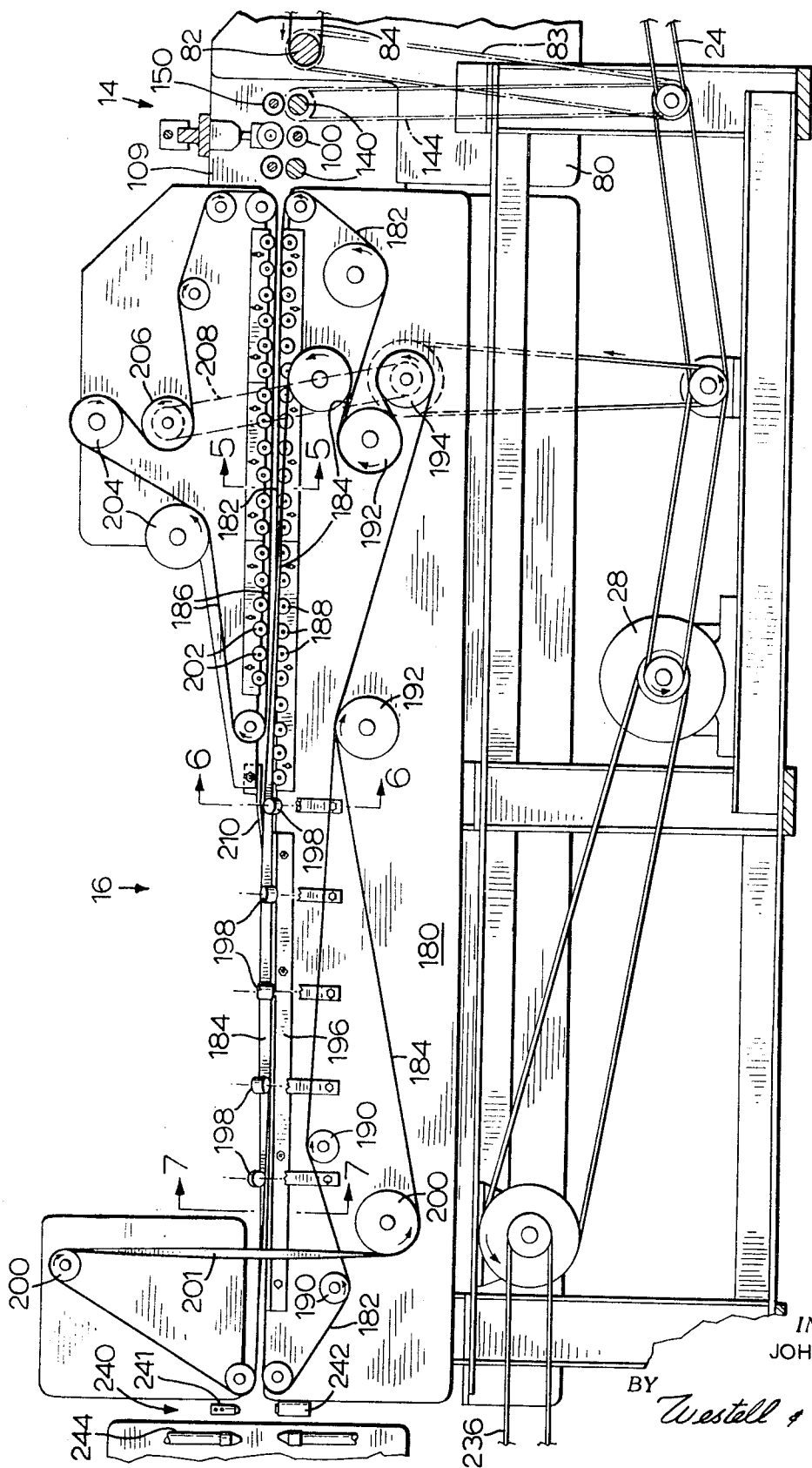


FIG. 4a

INVENTOR.
JOHN A. LONG

BY
Westell & Hanley

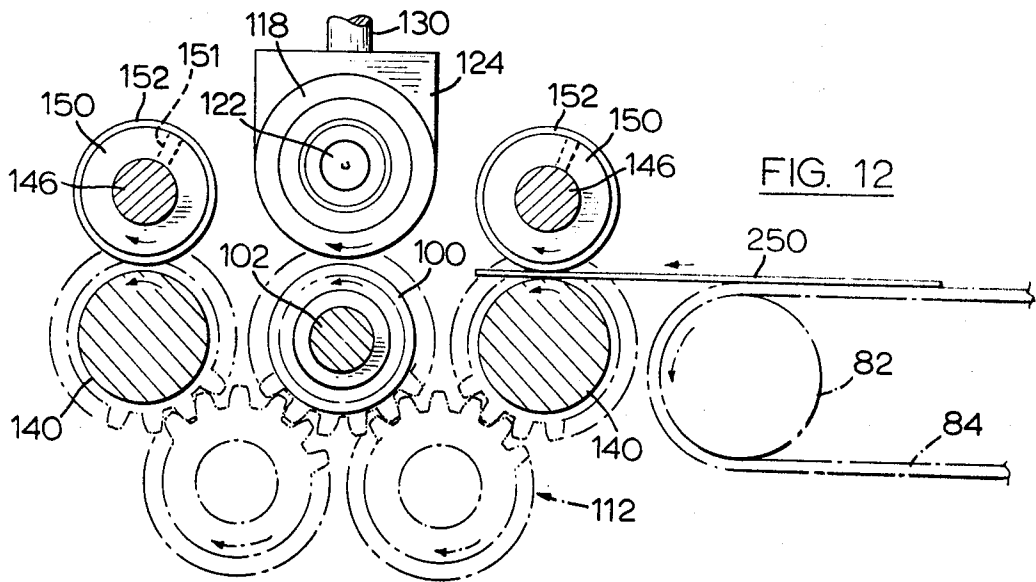


FIG. 12

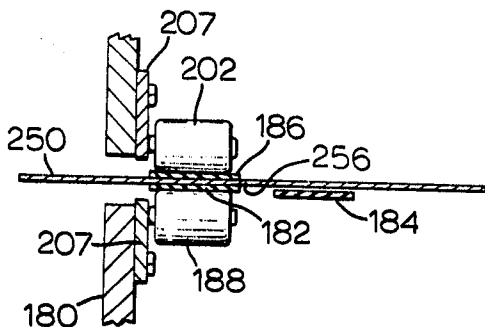


FIG. 5

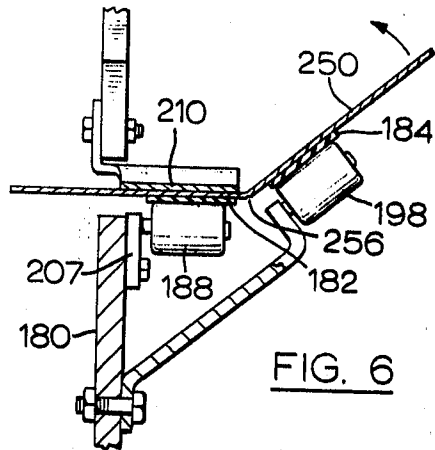


FIG. 6

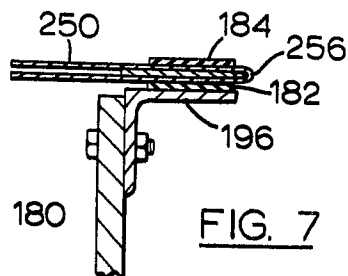


FIG. 7

INVENTOR.
JOHN A. LONG

BY *Wastell & Hanley*

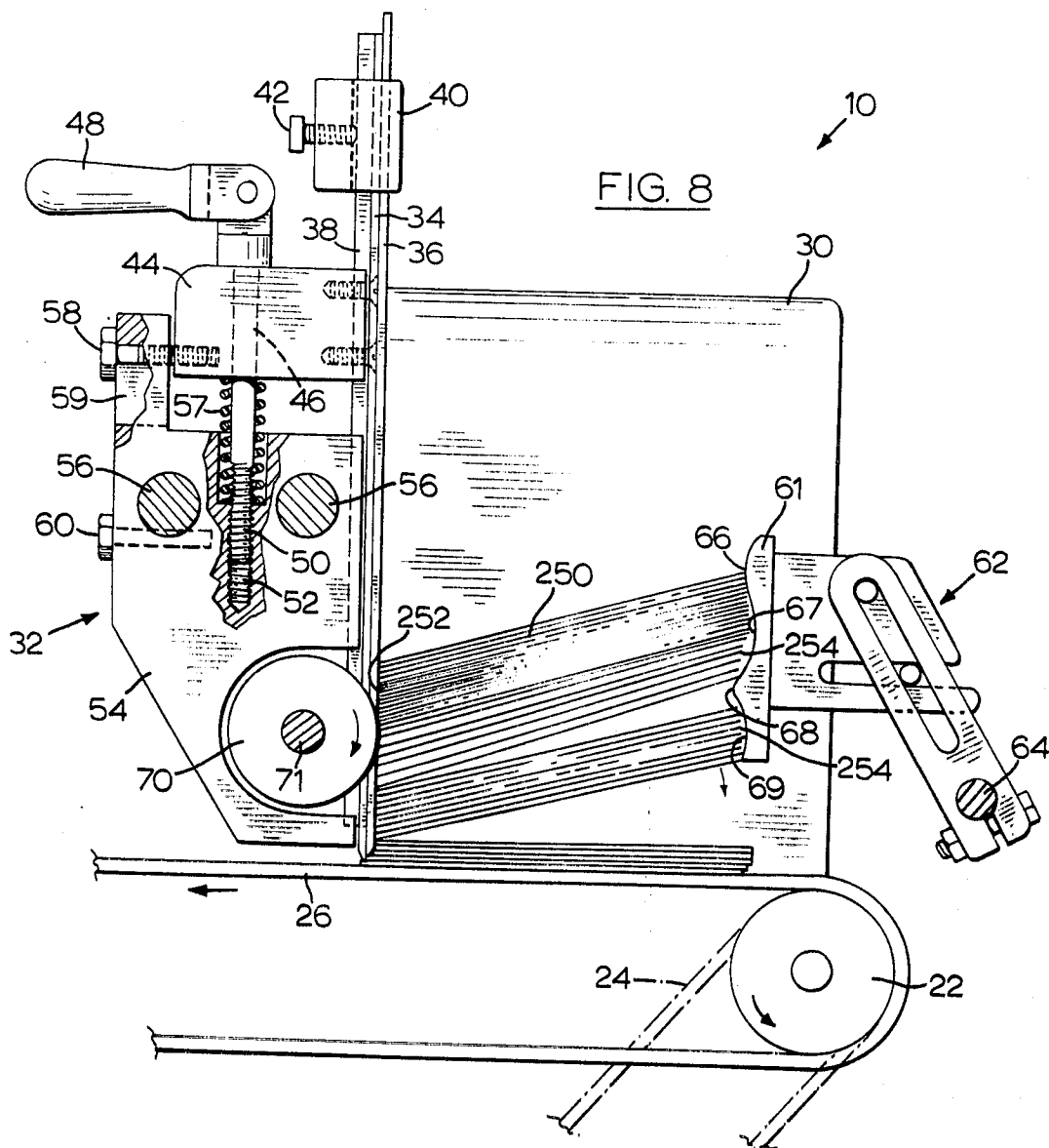


FIG. 8

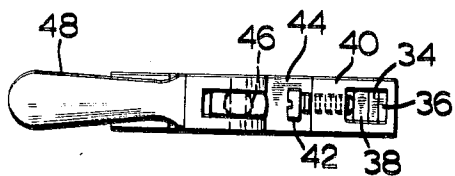


FIG. 9

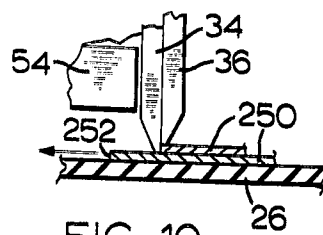
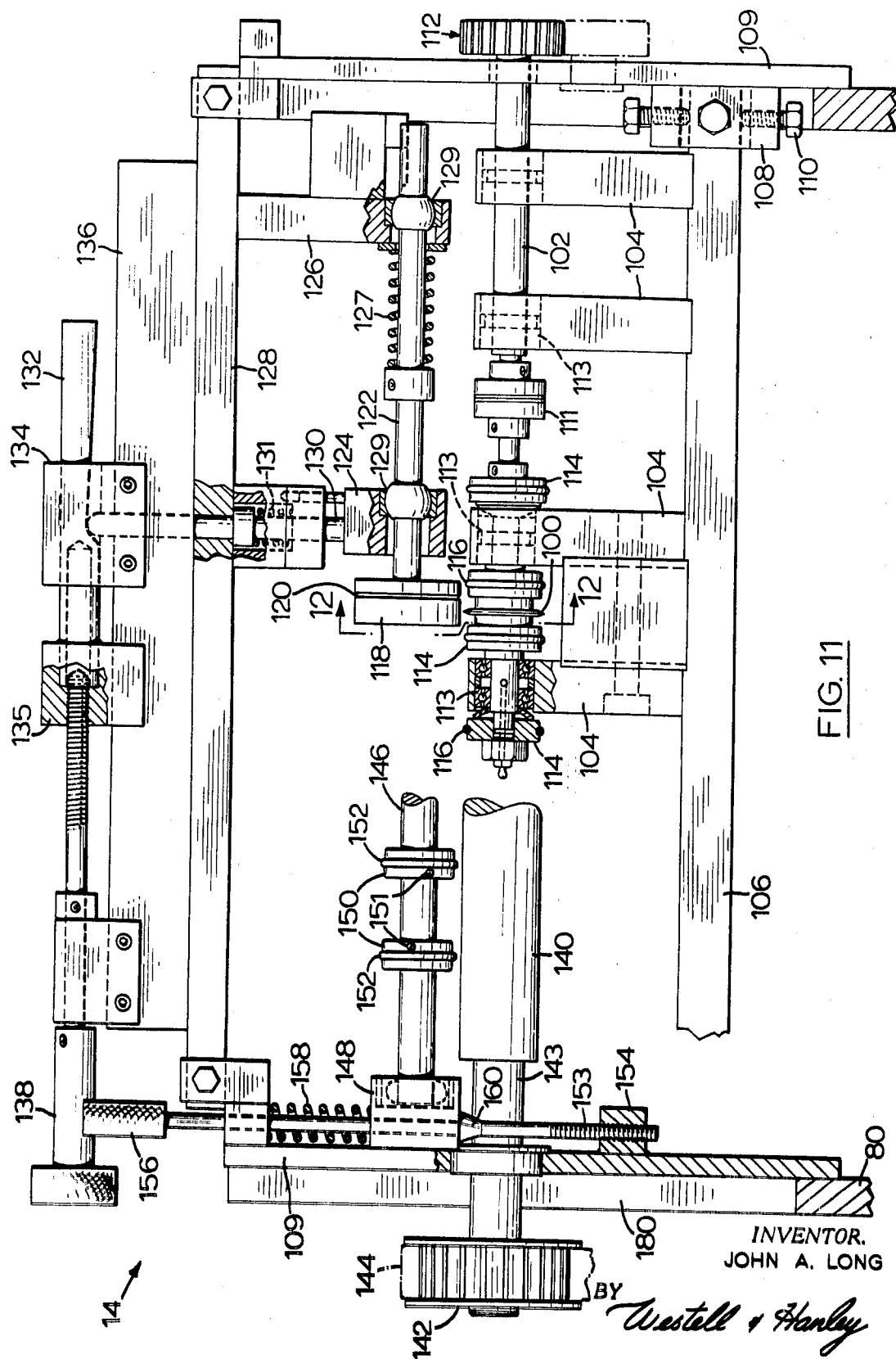


FIG. 10

INVENTOR.
JOHN A. LONG

BY
Wastell & Hanley



CARD SCORING DEVICE

The present invention relates to the feeding, scoring, and stacking of cards.

Apparatus presently in use for scoring cards such as greeting cards is limited in output to a maximum of approximately 30,000 cards per hour because of the need to use a platen press to die cut blocks of the cards. Also, the use of conventional feeding, aligning, folding and stacking apparatus would similarly limit the output speed even if faster scoring apparatus were to be used.

It is an object of the present invention to provide an improved device for scoring cards, using a circular blade and an adjustable circular follower to control the depth of the score, the follower being mounted on a rigid frame.

It is a further object of the invention to provide an improved device for feeding stacked cards individually to a scorer, using a vertically contoured plate to shuffle the stacked cards.

It is another object of the invention to provide a device for stacking cards whereby an overlap of all cards one with another is achieved prior to stacking.

Still another object of the invention is to provide an improved device for feeding, scoring, and stacking cards, using the above devices in combination.

An example embodiment of the invention is shown in the accompanying drawings in which:

FIG. 1a is a view in perspective, partly broken away, of feeding, aligning, scoring and folding units in combination;

FIG. 1b is a continuation of the view in FIG. 1a, showing a stacking unit in combination with the folding unit of FIG. 1a;

FIG. 2 is a cross-section taken along the line 2—2 of FIG. 1 showing a scored card.

FIG. 3 is a perspective view of a portion of the aligning unit showing FIG. 1a;

FIG. 4a is a side view showing the scoring, folding and stacking units shown in FIG. 1a;

FIG. 4b is a side view showing the stacking unit of FIG. 1a;

FIG. 5 is a cross-section taken along the line 5—5 of FIG. 4a;

FIG. 6 is a cross-section taken along the line 6—6 of FIG. 4a;

FIG. 7 is a cross-section taken along the line 7—7 of FIG. 4a;

FIG. 8 is a side view, partly in cross-section, of the feeding unit shown in FIG. 1a;

FIG. 9 is a plan view of a portion of the feeding unit showing FIG. 8;

FIG. 10 is a side view of the pair of vertical plates of the feeding unit shown in FIG. 9, showing their relationship to pass single cards;

FIG. 11 is a side view, partly broken away, showing the scoring unit of FIG. 1a; and

FIG. 12 is a view taken along the line 12—12 of FIG. 11.

The apparatus shown in the drawings consists of a feeding unit 10, an aligning unit 12, a scoring unit 14, a folding unit 16 and a stacking unit 18.

Feeding unit 10, as seen in FIGS. 1a, 8, 9 and 10, consists of a frame 20 supporting journaled rollers 22 driven by a belt 24 from a drive motor 28 (see FIG. 4a). Rollers 22 carry a plurality of horizontally disposed bands 26, adjustable in known manner for yaw and for

speed, located below a pair of upright, laterally spaced guide walls 30 and forming a movable conveyor platform. A spacer device 32, positioned between walls 30, comprises a pair of vertically disposed blades 34 and 36 placed back to back. Blade 34 is fixed to a supporting bar 38 and blade 36 bears slidably against blade 34 by means of a bracket 40 carrying an adjustment screw 42. Bar 38 is fixed on a block 44 which carries a fixed vertical shaft 46. A toggle lever 48 is attached to the upper end of shaft 46 while the lower end of the shaft carries a thread 50 and is engaged in a threaded socket 52 in a supporting block 54 which is slidable on a pair of lateral bars 56 fixed on frame 20. A compression spring 57 projecting from socket 52 urges block 44 upwardly and a lateral locking bolt 58, threaded into the side of block 44, is laterally slidable in a vertical slot 59. A further bolt 60 releasably locks support block 54 on lateral bars 56.

A vertically profiled shuffle plate 61 is mounted, facing blade 36, on an adjustable bracket assembly 62 which is fixed on a lateral supporting bar 64 fixed on frame 20. The face of plate 61 is profiled from its top edge to its bottom edge to present sequentially a shallow concave portion 66, a shallow convex portion 67, a steeper concave shoulder 68, and a shallow convex portion 69. A wheel 70 keyed on a lateral shaft 71, which is journaled on frame 20 and driven by a one-way clutch (not shown), rotates clockwise as seen in FIG. 8 and its periphery projects slightly beyond the exposed face of outer blade 36. Wheel 70 is disengageable from the clutch for free rotation.

Aligning unit 12, as seen in FIGS. 1a and 3, consists of a frame 80 supporting journaled roller 82 driven by a belt 83 (see FIG. 4a) and carrying a plurality of horizontally disposed bands 84 forming a movable conveyor platform located in the plane of the platform formed by bands 26 of feeding unit 10. As seen in FIG. 3, a row of rollers 86 is journaled on a series of bars 88 which are in turn mounted adjustably on frame 80. Rollers 86 are biased towards a flange 90 also mounted on frame 80 and in line with bands 84.

Scoring unit 14, as seen in FIGS. 1a, 4, 11 and 12 comprises a circular knife 100 keyed on a horizontal shaft 102 which is journaled in row of mounting brackets 104 each fixed on a cross bar 106. A pair of spaced brackets 108, fixed on a frame 109, carry cross-bar 106 which is vertically adjustable in the brackets by means of opposed screws 110 bearing against the cross-bar. Shaft 102 has a flexible coupling 111 and the end of the shaft remote from knife 100 is connected with gear train 112. Shaft 102 is preloaded in bearings 113 located in mounting brackets 104. A plurality of guide rollers 114 are keyed to shaft 102 and each guide roller has a centrally disposed circumferential rubber ring 116.

A follower 118 is suspended above knife 100 to provide a circumferential bearing surface which carries a dull scoring groove 120 offset from the plane of knife 100. Follower 118 is keyed on a horizontal shaft 122 which is journaled in a pair of brackets 124 and 126 suspended from a crossplate 128 bolted onto frame 109. Shaft 122 is pre-loaded by a compression spring 127, in spherical bearings 129 located in brackets 124 and 126. Bracket 124 is suspended beneath plate 128 by a vertical rod 130 having its upper end urged, by a compression spring 131, against a bevel 132 slidable horizontally in a housing 134. One end of bevel 132 is

anchored in a slide 135 which is movable along a rigid rail 136 by means of an adjustment screw 138. Rail 136, together with plate 128, are of large mass to provide rigidity. A pair of cylindrical grip rollers 140 are located on each side of shaft 102, each grip roller being driven at one end by gear train 112 synchronously with shaft 102. A pulley 142 is keyed onto one end of the shaft 143 of one of rollers 140 for connection by a belt 144 to drive motor 28. A pair of further shafts 146, located one above each grip roller 140 are each mounted in a pair of journal boxes 148 which are in turn mounted on the sides of frame 109. Shafts 146 are freely rotatable in journal boxes 148. A plurality of disc guide rollers 150 are mounted on shafts 146 and each guide roller is adjustable laterally along the shafts by means of a set screw 151. Each guide roller 150 carries a centrally disposed circumferential rubber ring 152. Each journal box 148 is mounted on a vertical rod 153 which is threaded at its lower end in a block 154 fixed on frame 109 and which carries a knurled head 156 at its upper end. Journal box 148 is urged downwardly by a compression spring 158 against a shoulder 160 on rod 153 to take up any slack in the vertical adjustment of shafts 146.

Folding unit 16 as seen in FIGS. 4 to 7 inclusive, comprises a frame 180 carrying a series of endless bands 182, 184, and 186 which are roller oriented to fold a scored card over on itself. Band 182 extends the length of frame 180 in the plane of the conveyor platform formed by bands 84 of aligning unit 12 and travels over plurality of support rollers 188, returning over a plurality of single idler rollers 190, a plurality of double idler rollers 192, and a double drive roller 194. In one portion of its travel band 182 leaves support rollers 188 and moves over a support flange 196 as seen in FIG. 7. Band 184 lies beside band 182 in the first portion of its travel adjacent scoring unit 14 as seen in FIG. 5, and then over a plurality of tilt rollers 198, returning over single idler rollers 200, double idler rollers 192, and double double drive roller 194. Since band 184 turns over during its travel, a 180 degree twist 201 is imparted to the band, on its return path between two of idler rollers 200. Band 186 is located above the initial portion of the line of travel of band 182 and travels, parallel to band 182, under a plurality of support rollers 202 returning over a plurality of idler rollers 204 and over a drive roller 206. All rollers 188, 190, 192, 194, 198, 200 and 202 are journaled on brackets 207 fixed to frame 180. Drive rollers 194 and 206 are driven by belts 208 from drive motor 28. A laterally angled fold-over guide strip 210, fixed to frame 180, overlies support rollers 188.

Stacking unit 18, as seen in FIGS. 1b and 4, consists of a set 220 of mutually facing endless bands sloping upwardly from the feedout end of folding unit 16, and a set 222 of mutually facing endless bands sloping downwardly from said line of travel. Each set 220 and 222 of bands consists of a pair of guide bands 224 located above a pair of conveyor bands 226 forming a conveyor platform. Each pair of bands 224 and 226 travel over guide rollers 228 and in addition each pair of conveyor bands 226 travel over a drive roller 230 which is driven by a belt 232 from an intermittent clutch 234 connected by a further drive belt 236 to drive motor 28. Downwardly sloping bands 224 of set 222 and upwardly sloping bands 226 of set 220 pass individually over separate cylindrical rollers 228a freely

journaled side by side on a common shaft 229. Located adjacent the feedout end of folding unit 16, and immediately beside bands 182 and 184, is a photoelectric unit 240 consisting of a light source 241 projecting a vertical beam across the plane of the path formed by bands 182 and 184 to impinge on a photocell 242 which is connected electrically with clutch 234 whereby the clutch is engaged when the light impinging on the photocell is interrupted. Succeeding photoelectric unit 240 and immediately beyond the feedout end of folding unit 16 are a pair of opposed nozzles 244 directed vertically across the feedout path from bands 182, 184. Nozzles 244 are connected by conduits 246 to an air pressure source (not shown) and are valved to operate, by a counter (not shown) alternately on a predetermined cycle. A separate lateral endless conveyor 248 is located adjacent the feedout end of each set of bands 220 and 222 remote from folding unit 16.

In the operation of the device a stack of flat, unfolded cards 250 is maintained in the well of feeding unit 10, formed by lateral guide walls 30, blade 36 and shuffle plate 61, as seen in FIG. 8. FIG. 10 shows the lower end of blade 34 set in relation to bands 26 to allow a single sheet to pass between that blade and the bands. The gap between the bottom edge of blade 34 and the upper surface of bands 26 is adjustable by rotating shaft 46 by means of toggle lever 48 and clamping block 44 in its adjusted position by means of bolt 58. In the case of lighter cards 250 the leading edges 252 of the cards are worked downwardly by the clockwise rotation of wheel 70 while for heavier cards the wheel is disengageable from its one-way clutch to rotate freely. Contoured plate 61 facilitates the lateral separation of cards 250 in the stack by shuffling their trailing edges 254. Brackets 62 enables shuffle plate 60 to be adjusted for correct orientation to allow the trailing edges of sheets 250 to be shuffled. The lower edge of blade 36 is tapered towards blade 34 and is offset upwardly from the lower edge of blade 34 to allow the next succeeding card 250 to move forward and bear against blade 34, which facilitates the lateral separation of the cards, especially where embossed cards are being fed through the assembly. Blade 36 is adjusted by screw 42. The gap between the bottom edge of blade 34 and the upper surface of bands 26 is adjustable by rotating shaft 46 by means of toggle lever 48 and clamping block 44 in its adjusted position by means of bolt 58. Bracket 62 enables shuffle plate 61 to be adjusted for correct orientation to allow the trailing edges of sheets 250 to be shuffled. Support 54 is adjustable laterally on bars 49 and is secured in adjusted position by bolt 60.

Each card 250 is fed by bands 26 onto bands 84 of aligning unit 12 where it is aligned by rollers 86, as seen in FIG. 3. Rollers 86 are biased sufficiently to urge one side edge of each card 250 against flange 90 as the card is advanced by bands 84 towards scoring unit 14, thus orienting leading edge 252 of card 250 to advance squarely onto scoring unit 14.

Aligned card 250 is fed from bands 84 of aligning unit 12 onto the nip between the nearest grip roller 140 and the nearest guide rollers 150 of scoring unit 14 to advance the card through the space between knife 100 and follower 118 which cuts a score 256 in the card as shown in FIG. 2. To vary the depth of score 256, preferably over a range of one-fourth inch follower 118 is adjusted by rotating shaft 138 which moves bevel 132 laterally across the upper end of rod 130. Thus follower

118 pivots about that spherical bearing 129 remote from the follower. Guide rollers 150 are adjusted laterally to grip card 250 at all times as it passes through scoring unit 14. Guide rollers 150 are also adjustable as a set by rod 153 to vary the grip pressure which varies the diameter of rubber rings 152 on the guide rollers to compensate for increased thickness of the card resulting from embossing and/or from the ink on the card. The various elements in scoring unit 14 combine to impart a maximum rigidity against movement of knife 112 or 118 while in operation; thus flexible coupling 111 removes vibrations on shaft 102 generated by gear train 112, bearings 113 and 129 are preloaded to eliminate play in shafts 102 and 122 respectively, and the unit on each shaft 130 is mounted, namely cross bar 128 and rail 136, is of heavy weight to provide a maximum amount of inertia to the assembly which carries follower 118. Groove 120 on follower 118 is an auxiliary feature allowing for dull scoring of cards (at a reduced rate of output) which is achieved by moving the knife and groove into coplaner relationship.

After each score card 250 passes through scoring unit 14 it enters folding unit 16 shown in FIGS. 1 and 4 to 7. As seen in FIG. 5, card 250 is gripped between bands 184 and 186 and it also lies across band 182 which is travelling with band 184. When card 250 passes under flange 210, band 182 folds the card about score 252 as seen in FIGS. 6 and 7.

Upon leaving folding unit 16, folded card 250 passes through the beam of photoelectric unit 240 and interrupts the current through photocell 242 which actuates clutch 234 to drive belts 224 and 226 of stacking unit 18. Card 250 also passes nozzles 244 as it leaves folding unit 16 and these nozzles are operated cyclically to direct, by an air stream, a group of a predetermined number of the cards alternately onto bands 224 of either set 220 on pair 222 of the bands. A counter (not shown) associated with photoelectric unit 240 controls the cyclical operation of nozzles 244. When each card 250 passes onto either of bands 226 it is carried forward to drop onto a lateral conveyer 248 which is operated in-

termittently, in conjunction with the counter associated with photoelectric unit 240, to transfer stacks of the cards away from the outlet of stacking unit 218. To prevent scratching of glazed cards it is most important to obtain an overlap of all the cards passing onto bands 226. Photoelectric unit 240 accomplishes this by actuating bands 226 only when a card 250 is approaching the bands; consequently the bands move only intermittently and compensate for varying gaps between successive cards being fed onto the bands. It will be appreciated that the apparatus may be operated with a single set of bands 220 horizontally disposed, and for such an embodiment nozzles 244 are unnecessary.

I claim:

1. A device for scoring a card, comprising:
a circular knife mounted on a first rotatable shaft;
a cylindrical follower mounted on a second rotatable shaft and located adjacent the knife, the axis of the follower being parallel to the axis of the knife, the second shaft being mounted on a base of large mass and being adjustable on the base to vary the gap between the knife and the follower; and
roller means rotatable to move the card through the gap between the knife and the follower; said first and second shafts being preloaded in journal bearings.
2. A device as claimed in claim 1 in which the first shaft and the roller means are synchronously rotatable and the second shaft is freely rotatable.
3. A device as claimed in claim 1 in which the first shaft includes a flexible coupling.
4. A device as claimed in claim 1 in which the rollers comprise a pair of cylindrical grip rollers located one on each side of the first shaft and parallel therewith, and a plurality of disc guide rollers mounted on a pair of further shafts located one above each shaft roller, the guide rollers being adjustable laterally along the further shafts and the further shafts being adjustable vertically with respect to the grip rollers to vary the gap between the disc rollers and the grip rollers.

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