

[54] **APPARATUS FOR CUTTING AND CREASING SHEETS**[72] Inventor: **Franz Lenoir**, Marcinelle, Belgium[73] Assignee: **Miller Printing Machinery Co.**, Pittsburgh, Pa.[22] Filed: **Oct. 23, 1970**[21] Appl. No.: **83,335**[52] U.S. Cl. **93/58.3, 29/419, 83/92, 83/325, 93/36 A, 113/120 XY, 93/58 P**[51] Int. Cl. **B31b 1/16, B26d 7/18, B31b 1/86**[58] Field of Search **93/1 G, 36 A, 58 H, 58 ST, 93/58 P, 58.2, 58.3; 83/9, 11, 12, 92, 325; 113/116 V, 120 XY; 29/419**[56] **References Cited****UNITED STATES PATENTS**

2,240,765	5/1941	Dryer.....	83/11 X
2,418,066	3/1947	Bruker.....	83/9
3,203,288	8/1965	Blumer.....	83/92
3,257,882	6/1966	Lulie.....	83/9
3,504,584	4/1970	Deslauriers.....	83/9
3,517,576	6/1970	Hilty.....	83/5
3,555,945	1/1971	Warthen.....	93/58 ST

FOREIGN PATENTS OR APPLICATIONS

1,234,088	10/1960	France.....	93/58.3
-----------	---------	-------------	---------

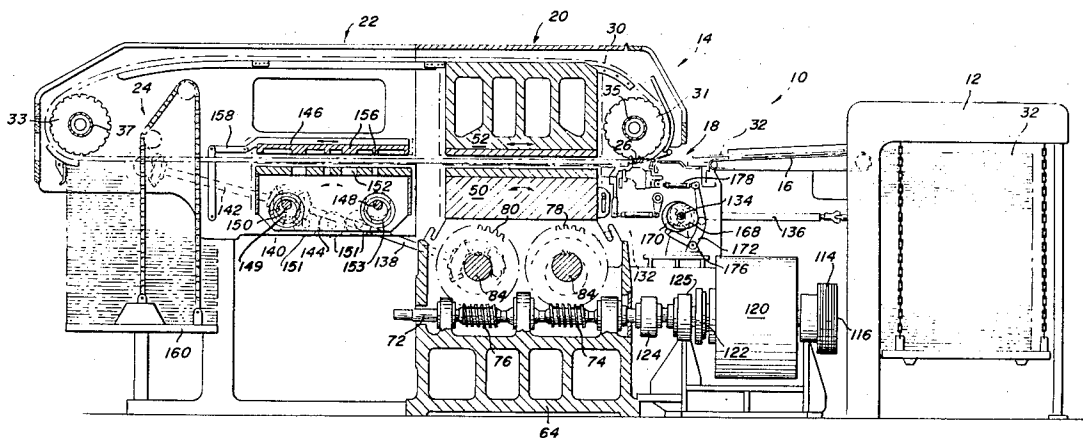
Primary Examiner—Wayne A. Morse, Jr.

Attorney—Stanley J. Price, Jr.

[57] **ABSTRACT**

The cutter and creaser includes a sheet feeder that feeds sheets down an inclined table to a sheet transfer unit. The front and side edges of the sheet are moved into register in the

transfer unit and accelerated to press speed. The front edge of the sheet is engaged by grippers on a transverse gripper bar and conveyed through the press by an endless chain conveyor device. The press unit includes a cutter and creaser section, a stripper section and a delivery section. The cutter and creaser section has a lower platen mounted on a pair of eccentric shafts that provide a non-circular oscillatory type motion for the upper horizontal surface of the lower platen. The motion imparted to the upper surface of the lower platen has both horizontal and vertical components. An upper platen is positioned in overlying relation with the lower platen and is supported for horizontal movement in the press side frames. The upper platen is connected to the lower platen so that the upper platen reciprocates horizontally with the lower platen. The sheet conveyed by the endless chain gripper mechanism is positioned between the platens as the lower platen moves upwardly into abutting relation with the upper platen so that the elements on either the upper or lower platen cut and crease the sheet between the platens. The sheet is thereafter transferred by the conveyor mechanism to a stripper section where the cutout portions are removed from the sheet by means of dies in an upper stripper platen. The lower stripper platen is also mounted on a pair of eccentric shafts and is arranged to move the upper horizontal surface in a similar non-circular oscillatory path with both horizontal and vertical components and into abutting relation with the upper platen. The upper platen is slidably supported in the press side frame members and connected to the lower platen for horizontal reciprocatory motion therewith. The grippers on the endless conveyor chains convey the sheet from the stripper section to the delivery section where the grippers open and the sheets are released and stacked on a receiver. The drive means for the various sections of the cutter and creaser includes a single motor that is drivingly connected to both of the eccentric shafts in the cutter and creaser section. Gearing and shafting connects one eccentric shaft in the cutter and creaser section with the drive mechanisms in the transfer section, the stripper section and the delivery section so that all of the components of the cutter and creaser are mechanically connected and driven in timed relation.

14 Claims, 9 Drawing Figures

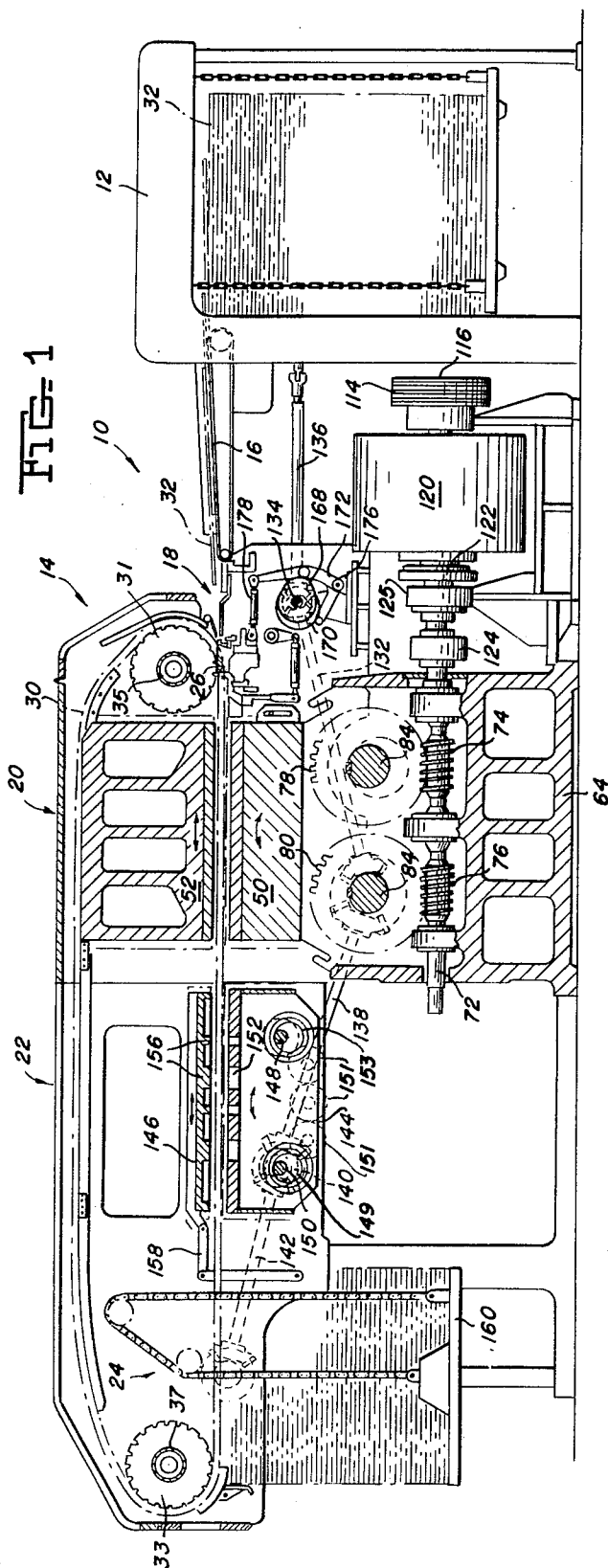


FIG. 7

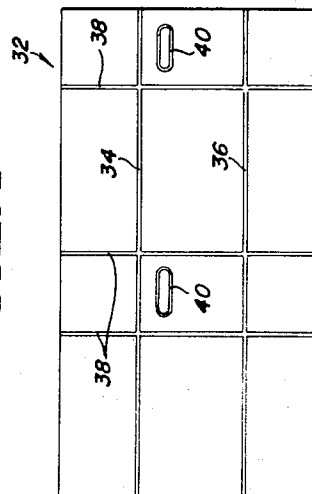
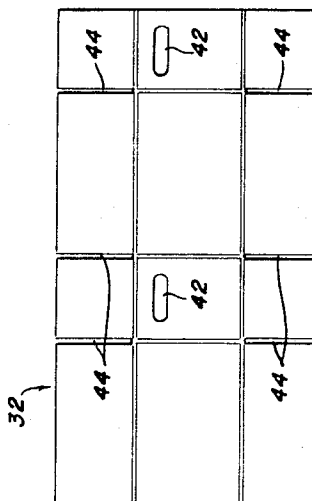


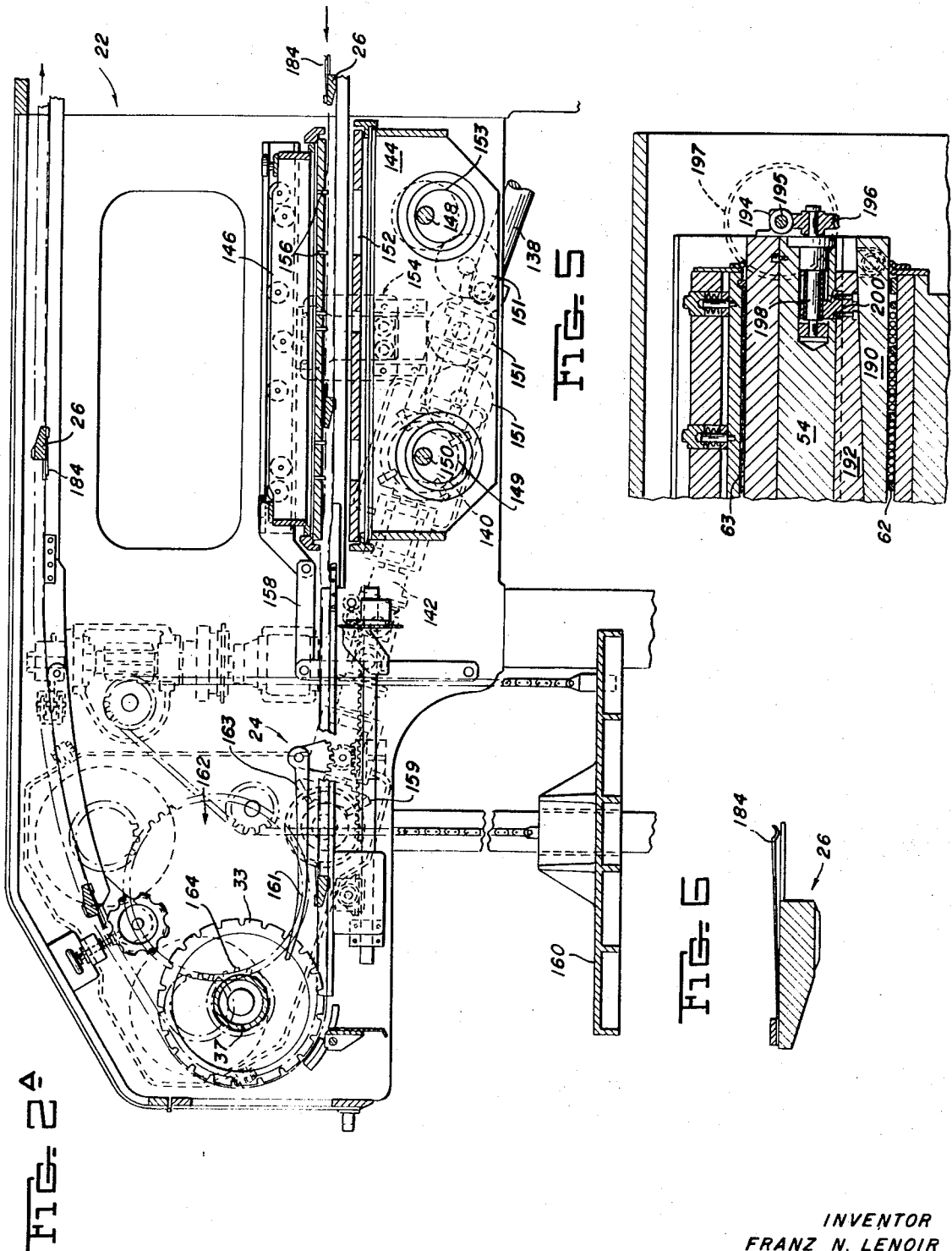
FIG. 8



INVENTOR
FRANZ N. LENOIR

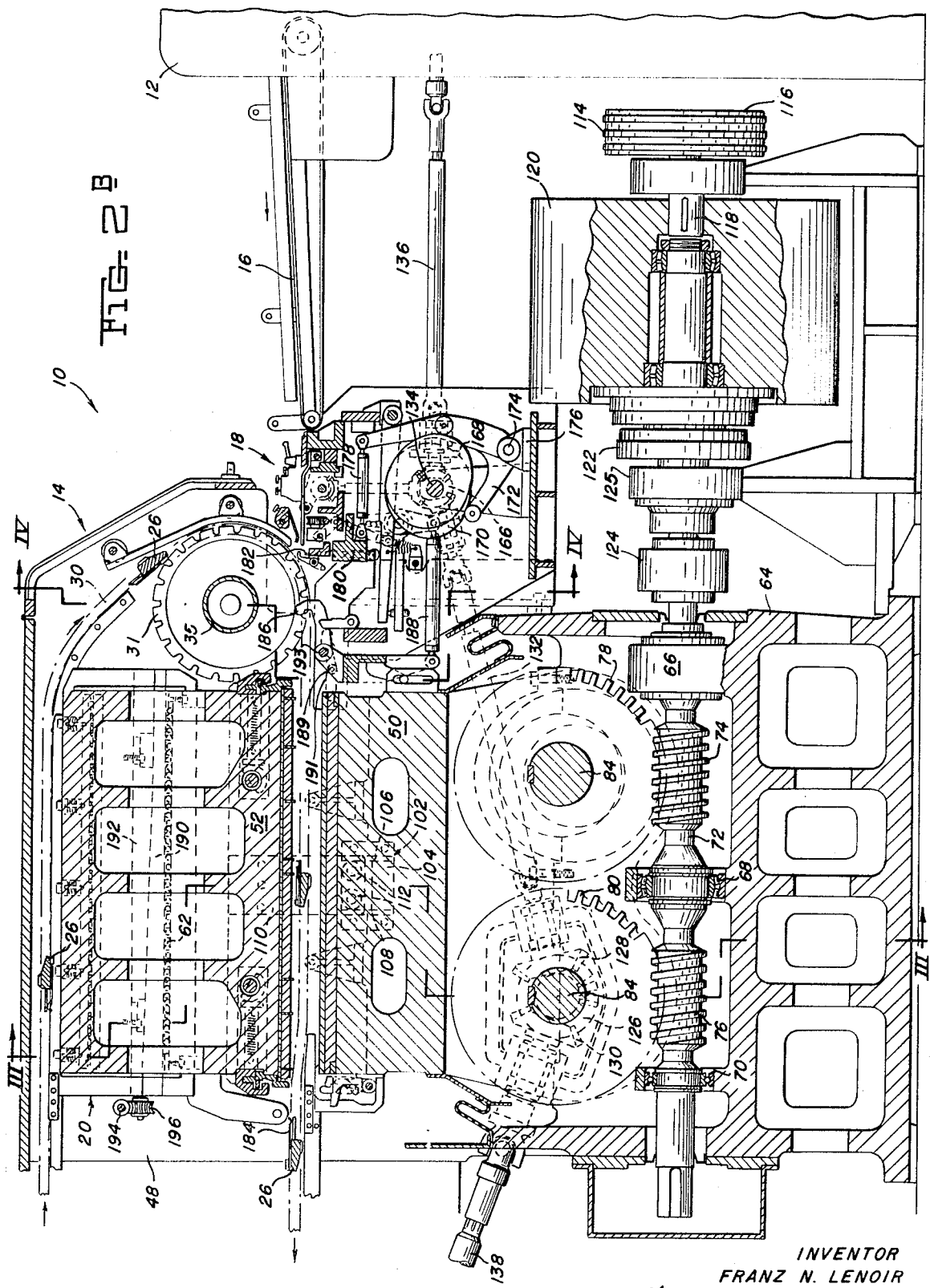
By *Stanley J. Price*

his Attorney



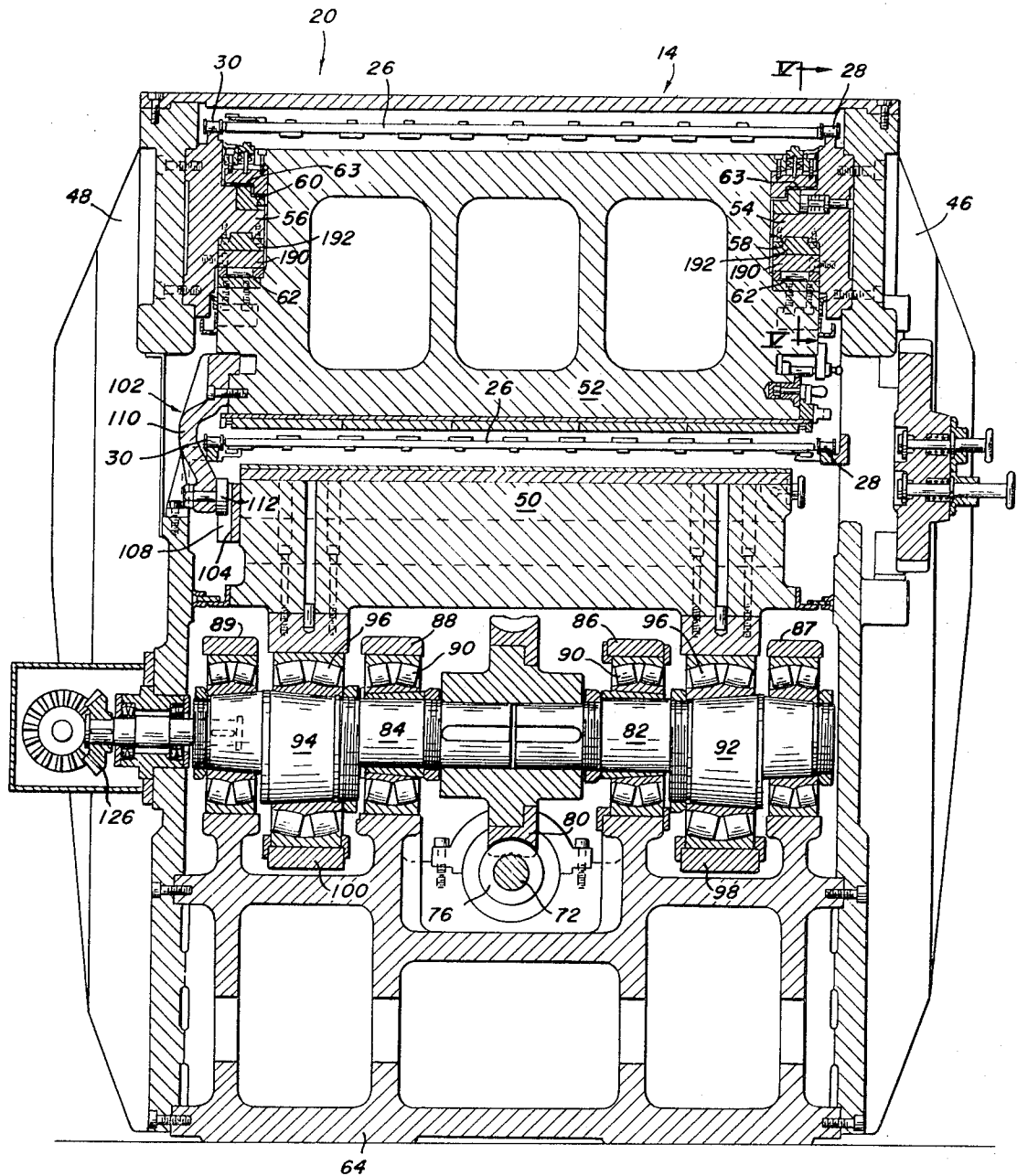
INVENTOR
FRANZ N. LENOIR

By *Stanley J. Price*
his Attorney



INVENTOR
FRANZ N. LENOIR
By *Stanley J. Pincus*
his Attorney

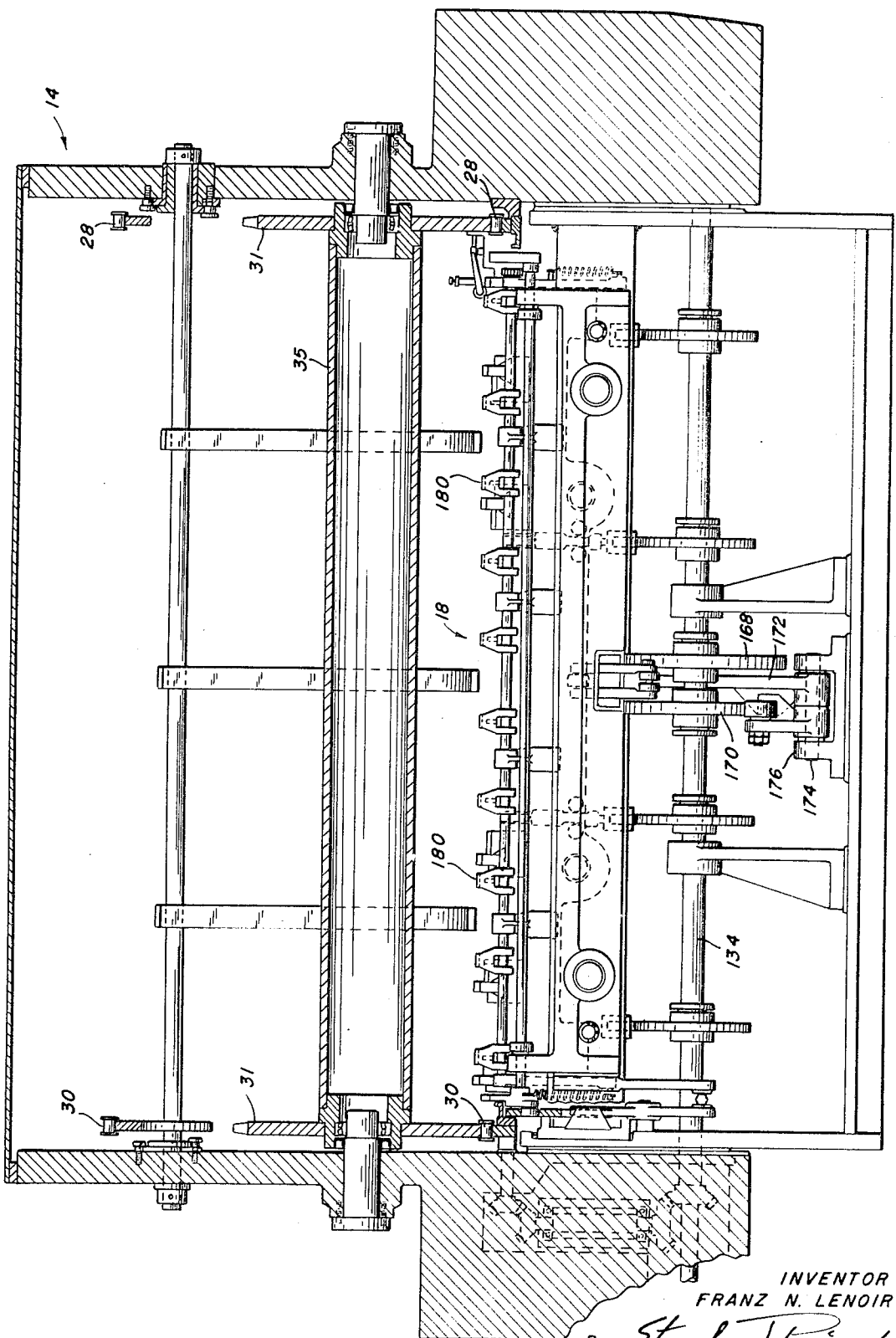
FIG. 3



INVENTOR
FRANZ N. LENOIR

By Stanley T. Price
his Attorney

FIG. 4



INVENTOR
FRANZ N. LENOIR

By *Stanley J. Pincus*
his Attorney

APPARATUS FOR CUTTING AND CREASING SHEETS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to apparatus for processing sheets and more particularly to apparatus for selectively cutting, scoring and creasing with a reciprocating die cutter while the sheet is continuously moving through the apparatus.

2. Description of the Prior Art

There are two general types of cutters and creasers used to cut, score, crease or punch sheets of paperboard for forming cartons or other types of paperboard packages. One type includes pairs of cylindrical rolls which have a die element mounted on one roll and an anvil roll against which the die element abuts during rotation. This type of machine has several disadvantages in that the rolls must be changed when the cutting and creasing configuration of the blank is altered. The dies are also subjected to wear and must be replaced frequently. These changes are expensive and time consuming. An advantage, however, of the roll type cutter and creaser is the high speed obtainable therewith.

The other type of cutter and creaser is the flat die cutter type where a pair of platens is moved into abutting relation with each other with the sheet therebetween to simultaneously cut, score and crease. This type of cutter and creaser has the advantage of rapidly and inexpensively replacing the die elements when the cutting and creasing configuration of the blank is changed. The original setup costs for a particular configuration are substantially less than the setup costs of a roll type cutter and creaser. One disadvantage of a die cutter type cutter and creaser is the intermittent, noncontinuous movement of the sheet through the cutter and creaser. Substantially all of the die cutter type cutters and creasers stop the sheet while the cutting and creasing operation is performed thereon. This intermittent operation places an upper limit on the speed of the machine.

U.S. Pat. No. 3,203,288 discloses a die cutter type cutter and creaser where it is stated that it is possible to maintain the sheets in motion during the cutting and/or creasing operation. The upper and lower platens of the die cutter are both mounted on pairs of eccentric shafts that are drivingly connected to each other. The platens both move toward and away from each other and one of the platens has the die element thereon that performs cutting, creasing and scoring of a sheet positioned therebetween. A conveying means is provided to maintain the sheets in motion during the cutting and creasing operation so that the sheets are cut, scored and creased on the move. The use of four eccentric shafts and the vertical movement of the pairs of platens toward and away from each other require precise timing between the upper and lower platens to move the platens into cutting relation when the sheet is positioned therebetween.

SUMMARY OF THE INVENTION

The present invention relates to apparatus for selectively processing sheets. The apparatus includes a base member with a pair of upwardly extending side frame members. An upper platen is movably supported in the side frame members for horizontal reciprocatory motion therein. A pair of eccentric shafts are rotatably supported in the base member in spaced parallel relation to each other. Both of the shafts have eccentric portions thereon. A lower platen member has depending portions with aligned shaft receiving apertures therein. The eccentric shafts have their eccentric portions journaled in the shaft receiving apertures so that rotation of said shafts moves the upper surface of the lower platen in a noncircular path, both horizontally and vertically, toward and away from the upper platen. The lower platen is mechanically connected to the upper platen so that the upper platen moves horizontally with the lower platen while the lower platen moves toward and away from the upper platen. The eccentric shafts rotate in the same direction to provide noncircular movement for the

upper surface of the lower platen with both horizontal and vertical components. The drive means for the lower platen includes a drive shaft extending longitudinally along the central axis of the cutter and creaser and has a pair of worm gears on the drive shaft. The worm gears on the drive shaft mesh with worm gears secured to the transversely extending eccentric shafts so that rotation of the drive shaft rotates the eccentric shafts in the same direction in timed relation to thereby provide a noncircular motion for the upper surface of the lower platen and horizontal reciprocatory motion to the upper platen.

The apparatus includes a stripper section that has an upper platen positioned for horizontal reciprocatory motion therein and a lower platen mounted on a second pair of eccentric shafts. One of the eccentric shafts is connected to one of the eccentric shafts of the cutter and creaser so that rotation of the cutter and creaser eccentric shaft is transmitted to one of the eccentric shafts of the stripper section. The second eccentric shaft is driven by a gear train drivingly connected to the first eccentric shaft. With this arrangement, the platens in the stripper section move in timed relation to the platens in the cutter and creaser section. The upper platen is also mechanically connected to the lower platen for movement therewith. An endless chain type conveyor has spaced transverse gripping means therebetween to convey the sheets from the transfer unit to the delivery unit. A suitable drive is provided for the conveyor that is connected to an eccentric shaft associated with the cutter and creaser so that the sheets are conveyed through the apparatus in timed relation with the movement of the platens of the cutter and creaser and the stripper section of the apparatus. A transfer unit is provided to transfer sheets to the conveyor mechanism. With the above apparatus, sheets move continuously through the apparatus. While the sheet is in motion, the platens move into abutting relation with each other and cut and crease the sheet. Thereafter, while the sheet continues in motion through the apparatus, the platens of the stripper section move into abutting relation with each other while the sheet is positioned therebetween to remove the cutout portions from the sheet.

Accordingly, the principal object of this invention is to provide cutter and creaser apparatus wherein the sheet is cut and creased and the cutout portions removed therefrom while the sheet is continuously conveyed through the apparatus so that the sheet does not have to be decelerated to a stopped position and thereafter accelerated from this stopped position within each cycle of the machine.

Another object of this invention is to provide cutter and creaser apparatus wherein the upper platen is mechanically connected to the lower platen for horizontal reciprocating movement therewith.

A further object of this invention is to provide cutter and creaser apparatus in which all of the components are driven in timed relation to each other.

These and other objects and advantages of this invention will be more completely disclosed and described in the following specification, the accompanying drawings and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an overall view in side elevation partially in section of the cutter and creaser.

FIGS. 2A and 2B are enlarged views in side elevation of the cutter and creaser press unit.

FIG. 3 is a view in section and end elevation taken along the line III—III of FIG. 2B illustrating the drive mechanism for one of the eccentric shafts in the cutter and creaser section.

FIG. 4 is a view in section and end elevation taken along the line IV—IV of FIG. 2B and illustrating a portion of the transfer unit and the sprockets for the endless chain conveyor.

FIG. 5 is a fragmentary view in section taken along the line V—V of FIG. 3 illustrating the height adjustment means for the die in the upper platen.

FIG. 6 is an enlarged view in section of one of the transverse gripper bars.

FIG. 7 illustrates the manner in which a sheet of paperboard is creased and portions cut out by the die mechanism in the upper platen of the cutter and creaser unit.

FIG. 8 is a view similar to FIG. 7 illustrating the manner in which the stripper mechanism removes the cutout portions from the cut and creased sheet.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Throughout the specification, the apparatus will be referred to as apparatus for processing sheets. The apparatus may be used solely as a cutter, solely as a creaser, solely as a scorer, or solely as an embosser, or the apparatus may be used to simultaneously perform any combination of the above operations to the sheet, as for example, depending on the die configuration, the die cutter portion of the apparatus could simultaneously cut a portion of the sheet, impress score lines thereon and further, crease the sheet along predetermined lines. The cutter and creaser section will also be referred to as the die cutter section where the cutting, scoring and creasing operation is performed on the sheet. Although reference is made to performing the above operations on a paperboard sheet, it should be understood that the same operations may be performed on other materials such as metal or plastic foils or sheets of other thin material.

GENERAL DESCRIPTION

Referring to the drawings and particularly to FIG. 1, there is illustrated cutter and creaser apparatus generally designated by the numeral 10 that has a feeder unit 12 connected to the press unit 14 by a feed board 16. The sheets are fed from the feeder unit 12 down the feed board 16 into the press unit 14 in a conventional manner. The feeder unit 12 does not form a part of this invention other than as a component of the overall combination.

The press unit 14 houses a transfer unit 18, a cutter and creaser unit 20, a stripper unit 22 and a delivery unit 24. The sheets supplied to the press unit 14 along the feed board 16 are moved into side and front edge register, engaged by grippers in the transfer unit and accelerated to press speed. The front edge of the sheet is engaged by grippers on gripper bars 26 that are mounted on a pair of endless driven chains 28 and 30 (FIGS. 3 and 4). The endless chains are mounted on pairs of sprockets 31 adjacent the transfer unit 18 and pairs of sprockets 33 adjacent the delivery unit 24. The sprockets 31 are mounted on shaft 35 journaled in the side frames. The other pair of sprockets 33 are mounted on a shaft 37 suitably journaled in the side frames. The sprockets 33 are drive sprockets for the chains 28 and 30 and propel the chains and gripper bars at a variable speed through a variable speed drive mechanism. The grippers on gripper bars 26 convey the sheet into the press unit 14. As the sheet moves into the cutter and creaser unit 20, the upper and lower platens, as later described, move into abutting relation and perform the cutting, creasing and scoring operations on the sheet while the sheet is being continuously conveyed through the press unit 14. The sheet is thereafter conveyed to the stripper section 22 where the cutout portions are stripped and removed from the sheet. The scored and creased sheet, with the cutout portions cut out and removed, is then deposited on a stack in the delivery unit 24 after the grippers on gripper bar 26 release the sheet.

Referring to FIGS. 7 and 8, a sheet generally designated by the numeral 32 is fed down the feed board 16 as a blank without cutout or creased portions. Within the cutter and creaser unit 20, the dies crease the sheet 32 along the lines 34 and 36 and cut out elongated strips 38 and form rectangular blanks 40. The rectangular blanks 40 and the cut out elongated strips 38 remain with the sheet 32 as it is transferred to the stripper 22. In the stripper 22, the elongated strips 38 and blanks 40 are elongated therefrom to form rectangular aper-

tures 42 and elongated slots 44 in the sheet 32. The sheet 32 now has the desired cutout portions and creases to fold and form a carton with apertures or openings 42 therein. It should be noted that the cutting, creasing operations and the stripping operation are performed on the sheet 32 while the sheet 32 is being continuously conveyed through the press unit 14.

CUTTER AND CREASER UNIT

The cutter and creaser unit generally designated by the numeral 20 is illustrated in detail in FIGS. 2B and 3. Referring to FIG. 3, the press unit 14 has a pair of side frames 46 and 48 and a pair of platens 50 and 52. Rail members 54 and 56 extend inwardly from the frame members 46 and 48. The upper platen 52 has recessed portions 58 and 60 in which the rails 54 and 56 extend so that the upper platen 52 is supported on the rails for horizontal movement thereon. Ladder type roller bearings 62 (FIGS. 3 and 5) are positioned between the lower surface of rails 54 and 56 and the lower shoulder portion formed by the recessed portions 58 and 60 of upper platen 52. Ladder-type roller bearings 63 are positioned between the upper surface of rails 54 and 56 and the upper shoulder portion formed by recessed portions 58 and 60. With this arrangement, the upper platen 52 is movable horizontally along the rails 54 and 56 and the ladder bearing 63 support the dead weight of the platen 52 and the ladder bearings 62 support the pressure delivered by the lower platen 50.

A main base member 64 (FIG. 2B) is secured to the side frame members 46 and 48 and has longitudinal aligned shaft receiving portions 66, 68 and 70 which rotatably support a main drive shaft 72. The drive shaft 72 extends along the central longitudinal axis of the press unit and has a pair of worm gears 74 and 76 thereon that mesh with worm wheels 78 and 80.

Referring to FIG. 3, the worm wheel 80 has a pair of oppositely extending eccentric shafts 82 and 84 rotatably journaled in pairs of shaft receiving portions 86, 87, 88 and 89 extending upwardly on the base member 64. The shaft receiving portions 86, 87, 88 and 89 extend transversely across the press and rotatably support the eccentric shafts 82 and 84 in bearings 90. Thus, rotation of the worm wheel 80 rotates both oppositely extending eccentric shafts 82 and 84. The worm wheel 78 also has similar pairs of eccentric shafts extending oppositely therefrom and mounted in similar shaft receiving portions extending upwardly from the base member 64. With this arrangement, rotation of drive shaft 72 rotates the worm wheels 78 and 80 in timed relation to each other to provide a noncircular oscillatory motion for the upper surface of the lower platen 50 with both vertical and horizontal components, as later described.

It should be understood that when reference is made to horizontal and vertical components of the noncircular motion imparted to the upper surface of the platen, it is not intended to imply solely linear vertical and horizontal movement of the platen upper surface. The vertical component is employed to illustrate that the upper surface of the lower platen moves upwardly into abutting relation with the lower surface of the upper platen and downwardly away from the lower surface of the upper platen. The horizontal component is intended to designate that both the upper and lower platens oscillate or move toward and away from the stripper unit 22.

Again referring to FIG. 3, the oppositely extending eccentric shaft portions 82 and 84 have eccentric surfaces 92 and 94 which are mounted in bearings 96. The lower platen 50 has a pair of depending shaft receiving portions 98 and 100 on opposite sides of the worm wheel 80 and the eccentric portions 92 and 94 of shafts 82 and 84 are rotatably journaled therein. The lower platen 50 has a second similar pair of depending shaft receiving portions in which similar eccentrics 92 and 94 of similar shafts driven by worm wheel 78, are mounted. The eccentrics 92 and 94 on both sets of shafts are so arranged and interconnected that the eccentrics rotate in phase and in the

same direction, as illustrated in FIG. 1, to provide a noncircular oscillatory motion for the upper surface of the lower platen 50 upon rotation of the main shaft 72. The lower platen 50 has two pairs of depending shaft receiving portions 98 and 100, only one pair of which is illustrated in FIG. 3.

The eccentric members 92 and 94 are formed on the shaft members 82 and 84 that are in turn rotatably secured in the respective worm wheels 78 and 80. The worm gears 74 and 76 connected to the drive shaft 72 rotate the worm wheels 78 and 80 and the respective eccentric shaft members 82 and 84 to provide the noncircular oscillatory motion to the upper surface of the lower platen 50. The noncircular oscillatory motion moves the upper surface of the lower platen 50 in an endless noncircular path having a general peripheral shape of a rectangle with semicircular end portions. Stated otherwise, when viewed in side elevation, the volume swept by the upper surface of the lower platen 50 in one revolution of the eccentric shaft members 82 and 84 is a rectangular section with a pair of semicircular end portions. With this motion, the upper surface of the lower platen 50 moves upwardly to a preselected elevation in an arcuate path and then moves forwardly in a substantially horizontal path toward the stripper section 22. The upward movement of the lower platen 50 is caused by the eccentric portions 92 and 94 on the pairs of shafts 82 and 84 to thus move the lower platen into cutting and creasing relation with the die on the upper platen. The lower and upper platens then both advance in timed relation toward the stripper section 22. It should be understood that although the apparatus herein described moves the lower platen 50 in a noncircular endless path, other types of motion could be imparted to the lower platen without departing from other features of the invention.

The upper platen 52, as previously described, is reciprocally supported on the rails 54 and 56 (FIG. 3) and is mechanically connected to the lower platen 50 by a bracket member generally designated by the numeral 102 (FIGS. 2B and 3). The bracket member 102 is connected in a vertical channel member 104 on the lower platen 50. The channel member 104 has outwardly extending walls 106 and 108 and the bracket member 102 has a depending arm member 110 secured to the upper platen 52 and depending downwardly therefrom. A pair of rollers 112 are rotatably secured to the end of arm member 110 and are arranged to abut the inner surface of channel wall members 106 and 108. With this arrangement, the upper platen 52 is mechanically connected to the lower platen 50 and movable horizontally therewith. As the lower platen 50 moves in a vertical plane because of the eccentric members 92 and 94, the rollers 112 move vertically in the channel member 104 along the channel side members 106 and 108. The horizontal motion from the lower platen 50 is transmitted to the upper platen 52 through the bracket assembly 102 so that the upper platen 52 reciprocates with the lower platen 50 and, because of the rails 54 and 56, remains in the same horizontal plane. Although only one bracket 102 has been illustrated, it should be understood that additional brackets similar to bracket 102 may be provided on one or both sides of the platen 50. Also suitable stop means may be provided to limit horizontal movement of the upper platen 52.

The eccentrics 92 and 94 move the lower platen 50 upwardly into abutting cutting relation with the upper platen 52 during each revolution of the shafts 82 and 84 and thereafter, moves the lower platen 50 away from the upper platen 52 to permit the conveyor mechanism to continue to convey the sheet from the cutter and creaser unit 20 to the stripper unit 22 and to move another blank sheet between the upper and lower platens 52 and 50.

The drive mechanism for the cutter and creaser unit 20 includes a motor (not shown) connected by means of belts 114 to a drive pulley 116 that is, in turn, connected to a main shaft 118 of a flywheel 120 (FIG. 2B). The flywheel 120 is connected through suitable clutch means 122, flexible coupling 124 and brake mechanism 125 to the main drive shaft 72. The sheet feeder unit 12, transfer mechanism 18, stripper unit 22

and delivery mechanism 24 and the conveyor mechanism are driven in timed relation with the cutter and creaser unit 20 by means of mechanism connections that include a main bevel gear 126 (FIGS. 2B and 3) that meshes with a pair of bevel gears 128 and 130. A shaft 132 extends forwardly from the bevel gear 126 and has the bevel gear 128 secured to one end thereof. The shaft 132 is connected by means of a suitable bevel gear to the main shaft 134 of the transfer unit 18. Another shaft 136 is drivingly connected through suitable bevel gears to the main shaft 134 of transfer unit 18 and drives the sheet feeder 12.

Extending in the opposite direction from eccentric shaft 84 is a shaft 138, portions of which are illustrated in FIGS. 2A and 2B. The shaft 138 has the bevel gear 130 meshing with the bevel gear 126 on eccentric shaft 84. The other end of shaft 138 is suitably connected through bevel gearing to a transverse drive shaft 150 of the stripper unit 22, as later explained. Another shaft 142 is, in turn, connected through bevel gearing to the stripper unit main drive shaft 150 and is connected to gearing for driving the chain conveyor sprockets as later explained. With this arrangement, all of the components of the cutter and creaser apparatus 10 are interconnected mechanically for timed movement of the various components to permit the sheet to be continuously conveyed through the cutter and creaser apparatus while the cutting, creasing, stripping and stacking operations are performed thereon.

STRIPPER MECHANISM

The stripper mechanism 22 illustrated in FIGS. 1 and 2A includes a lower platen 144 and an upper platen 146. The lower platen 144 has depending shaft receiving portions similar to the cutter and creaser lower platen 50 in which similar eccentric portions of shafts 148 and 150 are journaled. The shafts 148 and 150 are journaled for rotation in the side frames of the stripper unit 22. Rotation of the eccentric shaft 150 is provided through the shaft 138 connected to the main shaft 84 of the cutter and creaser unit 20. The shaft 150 is drivingly connected to shaft 148 by means of a spur gear 149 secured to shaft 150 and spur gear 153 secured to shaft 148. Meshing spur gears 151 connect the spur gears 149 and 153. Rotation of shaft 150 rotates shaft 148 and both shafts move the upper surface of the lower platen member 144 in a noncircular oscillatory path substantially the same as the noncircular oscillatory path of the cutter and creaser lower platen 50. The stripper lower platen 144 has a plurality of apertures 152 in its upper surface through which cutout portions of the sheet are moved downwardly from the upper surface of the lower platen 144.

The upper platen 146 is suitably supported on the side frame members for horizontal reciprocatory motion in a manner similar to the cutter and creaser upper platen 52. The upper platen 146 is connected to the lower platen 144 by a bracket device generally designated by the numeral 154 that is similar to the bracket device 102 connecting the upper and lower platens 50 and 52 and has similar components that will not be further described. The upper platen 146 has depending protuberances 156 that are in overlying relation with the openings 152 in the lower platen 144. With this arrangement, upward movement of the lower platen 144 and downward movement of the upper platen 146 with the cut sheet therebetween moves the platen into abutting relation with the protuberances 156 to remove the cutout portions from the sheet by displacing the cutout portions downwardly through the apertures 152 in the lower platen 144. The downward motion of the upper platen 146 while the upper platen is moving horizontally assures that the protuberances 156 push and displace the cutout portions 40 downwardly through apertures 152 to prevent the cutout portions 40 from remaining on the upper surface of the lower platen 144.

It should be noted that the stripper device 22 is mechanically connected to the cutter and creaser device 20 so that both of the lower platens 50 and 144 of the cutter and creaser and the stripper move in timed relationship to each other.

Thus, a sheet that has been cut and creased in the cutter and creaser unit 20 will advance to the stripper unit 22 so that during the next cycle while a second sheet is being cut and creased in the cutter and creaser unit 20, the previously cut sheet will be stripped in the stripper unit 22. Both the cutting and creasing operation and the stripping operation are performed on the sheets while the sheets are continuously moving through the press unit 14.

The stripper unit upper platen 146 has a lever mechanism 158 secured thereto that drives a bar 159 in a horizontal reciprocatory motion with each machine cycle. The bar 159 actuates the front, rear and side joggers and sheet lowering arms 161 of the delivery unit 24. The delivery unit 24 stacks the cut and creased sheets on the sheet receiver 160 and lowers the sheet receiver as the height of the stack increases on the receiver 160. In the delivery unit 24, built-in devices are also provided to actuate automatically a nonstop mechanism to remove the finished pile of sheets as well as to return the receiver to its upper position ready to start a new pile without operator action and without stopping the machine.

The shaft 142 is connected by bevel gear 163 to a differential drive mechanism generally designated by numeral 162 that includes gear 164 secured to the drive shaft 37 for the drive sprockets 33. The differential drive mechanism 162 is arranged to rotate the drive sprockets 33 at a preselected variable angular velocity and drive the endless chains 28 and 30 with the transverse gripper bars 26 thereon at preselected speeds so that the sheets are in register between the upper and lower platens 50 and 52 of the cutter and creaser unit 20 and between the upper and lower platens 144 and 146 of the stripper unit 22 when the lower platens are in cutting or stripping relationship with the respective upper platen. Thus, the cutting, creasing and stripping operations are performed on the sheet while the sheet is continuously moving through the press.

Sheets are fed from the feed mechanism 12 along the feed board 16 to the transfer mechanism 18. The transfer mechanism 18 has a main drive shaft 134 with a cam 168 and a counter cam 170 mounted thereon for rotation therewith. An L-shaped lever 172 is pivotally secured at 174 to an upstanding bracket 176. The lever has a forwardly extending rod portion 178 that is secured to a slidably mounted gripper member 180 that has a series of upstanding extending pins 182. The pins 182 are spring loaded to engage the front edge of the sheet and the gripper member 180 is reciprocally driven by the lever mechanism 172 and rod 178. The gripper mechanism 180 is arranged to engage the front edge of the sheet after the sheet is in register and to move toward the cutter and creaser unit 22 and accelerate the sheet. The sheet is moved by the gripper mechanism 180 into gripping engagement with the grippers 184 on the transverse gripper bar 26, FIG. 6. After the sheet is engaged by the grippers 184, the gripper mechanism 180 on the transfer unit 18 pivots in a counterclockwise direction to provide clearance for the sheet as it is conveyed into the cutter and creaser unit 20 by the transverse gripper bars 26. The rotation of the cams 168 and 170 provides the desired reciprocal motion for the gripper 180, the tumbling motion of gripper 180 and the opening and closing of the gripper mechanism 180. Other apparatus is provided in the transfer unit 18 to move the sheet into side and front register.

Two aligning levers 186 are also provided to engage the transverse gripper bar 26 at its ends and align the transverse gripper bar so that the sheet is in register before it moves between the platens 50 and 52. The aligning levers 186 secured to shaft 193 are pivotally connected to the lower platen 50 and one of the levers 186 has a roller 189 connected to a cam 191. The profile of the cam 191 pivots the levers 186 to raise and lower the levers 186 during preselected portions of the cycle. The profile of the cam 191 is amplified by a lever 187 connected to rod 188 that slides the cam back and forth. Rotation of the main drive shaft 134 in the transfer

mechanism 18 actuates the lever 188 to move the aligning device 186. The shaft 132 extending forwardly from the eccentric shaft 84 and driven thereby through bevel gearing 126 and 128 is connected to the shaft 134 by means of bevel gearing 166 so that the components of the transfer unit 18 are driven in timed relation with the cutter and creaser unit 20 and the stripper unit 22. With this arrangement, all of the components of the cutter and creaser apparatus 10 are interconnected mechanically to be driven in timed relation to each other.

Referring to FIGS. 2B, 3 and 5, there is illustrated apparatus for adjusting the pressure between the platens when the lower platen moves into abutting cutting and creasing relation therewith. The upper platen 52 is adjusted relative to the rails 54 and 56. The rails 54 and 56 have pairs of elongated wedge members 190 and 192. The wedge members 190 are fixed on the rails and the wedge members 192 are movable by means of transverse adjusting worm gears 194 secured on shaft 195. The shaft 195 is rotated by hand wheel 197 mounted on the side frame. A worm wheel 196 is rotatably supported in the rail 54 and is connected to a screw member 198. The wedge 192 has a nut 200 secured thereto and positioned on the screw 198. Thus, rotation of worm wheel 196 rotates screw 198 to move the wedge member 192 to either raise or lower the upper platen. Maximum down position of the upper platen creates the maximum pressure between the mating surfaces of the two platens when the upper surface of the lower platen is at the top of the noncircular path or in the closed position. When the upper platen is raised by the movable wedges 192, the pressure between the platens is reduced.

It is believed that the cutting pressure is provided by the elasticity of the apparatus side frames. The lower platen as it moves into abutting position with the upper platen pushes the upper platen upwards. The upper platen in turn pulls on its supports which include the side frames. The side frames are then forced to stretch while the two platens are in contact and return to normal when the platens part or separate by the downward movement of the lower platen. For a zero pressure setting, the lower platen touches the upper platen only at top dead center of the cycle where the lower platen reaches its maximum height. With this adjustment, no pressure is generated between the platens.

Although the above apparatus has been described for use in cutting, scoring and creasing sheets, it should be understood that with suitable dies on the upper and lower platens, the apparatus may be used in embossing surfaces of the sheets.

According to the provisions of the patent statutes, the principle, preferred construction and mode of operation of the invention have been explained and what is considered to represent its best embodiment has been illustrated and described. However, it should be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. Apparatus for selectively treating sheets comprising, a base member having shaft receiving apertures therein, a pair of side frame members extending upwardly from said base member, an upper platen movably supported in said side frame members for horizontal reciprocatory motion relative to said frame members, a pair of eccentric shafts journaled in said base member shaft receiving apertures in spaced parallel relation to each other, said shafts having eccentric portions thereon, a lower platen member positioned below said upper platen member and having depending shaft receiving portions, said shaft eccentric portions journaled in said lower platen member shaft receiving depending portions, drive means to rotate said eccentric shafts in said base member shaft receiving apertures and said lower platen shaft receiving depending portions to move said lower platen both horizontally and vertically toward and away from said upper platen, and

means connecting said upper platen to said lower platen so that said lower platen moves said upper platen horizontally therewith while said lower platen moves toward and away from said upper platen.

2. Apparatus for selectively processing sheets as set forth in claim 1 in which,

said pair of eccentric shafts are arranged to rotate in the same direction and provide a non-circular motion for the upper surface of the lower platen with both horizontal and vertical components.

3. Apparatus for selectively processing sheets as set forth in claim 1 which includes,

gear means on both of said eccentric shafts,
a drive shaft extending longitudinally beneath said lower platen,

gear means on said drive shaft meshing with gears on said eccentric shafts so that rotation of said drive shaft rotates said eccentric shafts in the same direction and in timed relation to each other to provide a non-circular motion to said lower platen upper surface.

4. Apparatus for selectively processing sheets as set forth in claim 1 which includes,

conveyor means to convey sheets between said upper and lower platens,

conveyor drive means to maintain said sheets in motion while said lower platen moves vertically toward said upper platen and said upper platen moves horizontally with said lower platen.

5. Apparatus for selectively processing sheets as set forth in claim 4 which includes,

pairs of sprockets positioned on opposite ends of said platens,

endless chains reeved about said sprockets,
transverse gripper bars connected to said endless chains, and

grripper means on said gripper bars to engage the front edge of said sheet and convey said sheets between said platens.

6. Apparatus for selectively processing sheets as set forth in claim 4 which includes,

means connecting said conveyor drive means and one of said first named eccentric shafts so that said conveyor drive means is driven in timed relation to the movement of said platens.

7. Apparatus for selectively processing sheets as set forth in claim 1 in which,

said platens include means to cut and crease said sheet therebetween while said platens are moving and said sheet is moving therewith.

8. Apparatus for selectively processing sheets as set forth in claim 7 which includes,

a stripper mechanism positioned adjacent to said platens, said stripper mechanism arranged to remove the cutout portions of said sheet while said sheet is moving.

9. Apparatus for selectively processing sheets as set forth in claim 8 in which,

said stripper mechanism includes,

an upper platen movably supported in said side frame members for horizontal reciprocatory motion relative to said frame members,

a pair of eccentric shafts journaled in said frame members, a lower platen positioned below said upper platen and having depending shaft receiving portions,
said eccentric shafts journaled in said lower platen shaft receiving portions,

drive means to rotate said eccentric shafts and move said lower platen both horizontally and vertically toward and away from said upper platen,

means connecting said upper platen to said lower platen so that said lower platen moves said upper platen horizontally therewith while said lower platen moves toward and away from said upper platen.

10. Apparatus for selectively processing sheets as set forth in claim 9 in which,

said drive means to rotate said eccentric shafts includes connecting means connecting said drive means to one of said first named eccentric shafts so that said stripper mechanism platens move in timed relation to said first named platens.

11. Apparatus for selectively processing sheets as set forth in claim 4 which includes,

a sheet transfer mechanism operable to engage the front edge of said sheet, accelerate said sheet to the speed of said conveyor means and transfer said sheet to said conveyor means.

12. Apparatus for selectively processing sheets as set forth in claim 11 in which said sheet transfer mechanism includes,

a drive shaft,
a gripper device operable to move reciprocally,

lever means connected to said gripper device and operable upon rotation of said drive shaft to open and close said gripper device, reciprocate said gripper device to accelerate the sheet and transfer said sheet to said conveyor means.

13. Apparatus for selectively processing sheets as set forth in claim 12 which includes,

means connecting said transfer mechanism drive shaft to one of said first named eccentric shafts so that said transfer mechanism reciprocates in timed relation to the movement of said first named platens.

14. Apparatus for selectively processing sheets as set forth in claim 1 in which,

said means connecting said upper and lower platens includes,

a bracket member connected to the side of one of said platens and extending vertically toward the other of said platens,

a channel-shaped receiver on the other of said platens, said bracket member positioned in said channel-shaped receiver and operable to move vertically therein and transmit horizontal motion from one platen to the other.

* * * * *

60

65

70

75

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,653,304

Dated April 4, 1972

Inventor(s) Franz Lenoir

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, Line 75 "blanks 40 are elongated therefrom"
should read - -
--blanks 40 are removed therefrom--

Column 6, Line 7 "is connected be means"
should read - -
--is connected by means--

Column 7, Line 61 "the bumbling motion of"
should read - -
--the tumbling motion of--

Signed and sealed this 9th day of January 1973.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents