Feb. 15, 1966 G. P. NIESEN ETAL 3,234,832

DUPLICATING MACHINE WITH SHEET SLITTER AND RECEIVING TRAYS

Filed Aug. 13, 1962 4 Sheets-Sheet 1

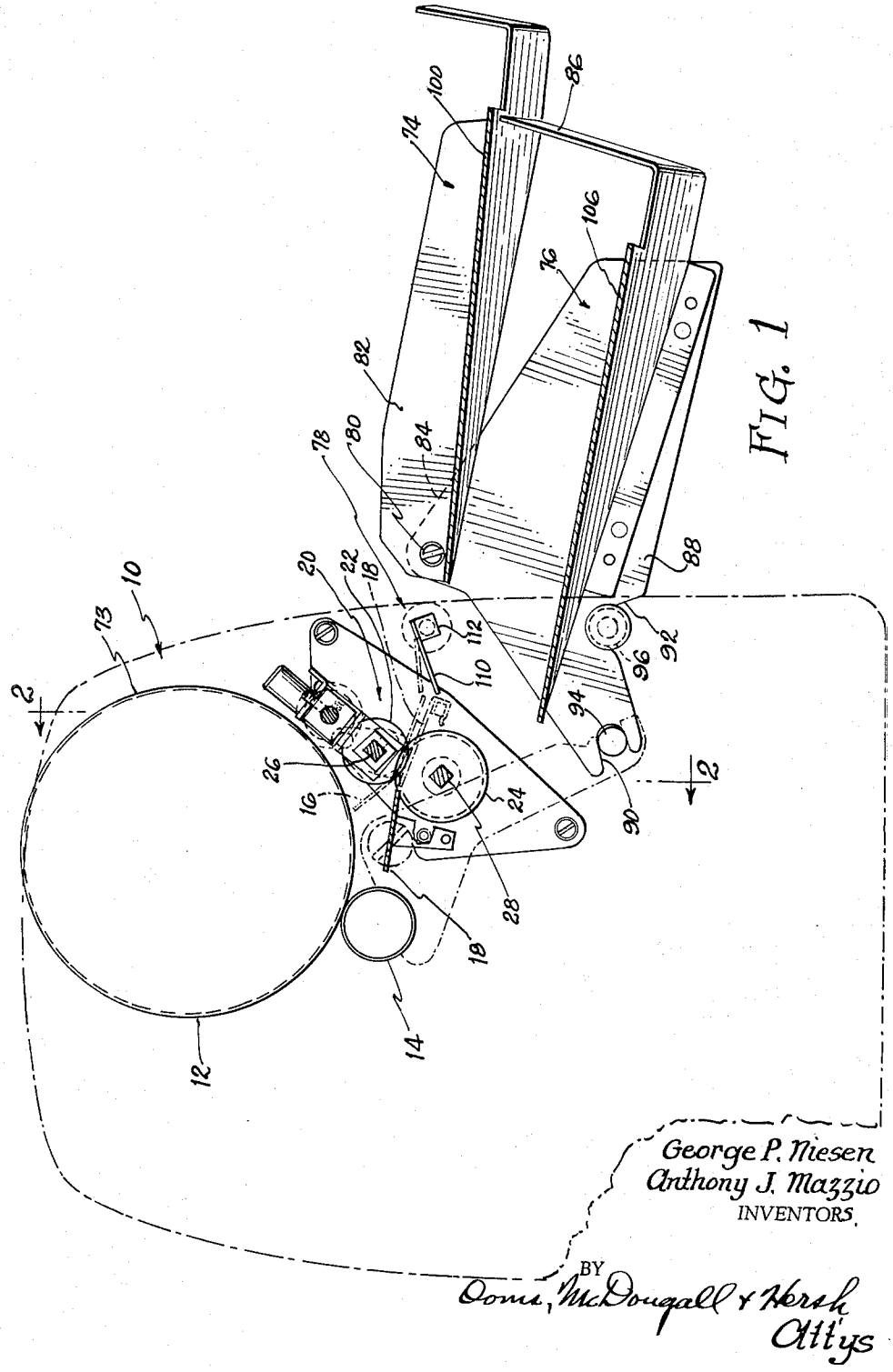


FIG. 1

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DUPLICATING MACHINE WITH SHEET SLITTER AND RECEIVING TRAYS

Filed Aug. 13, 1962 4 Sheets-Sheet 2

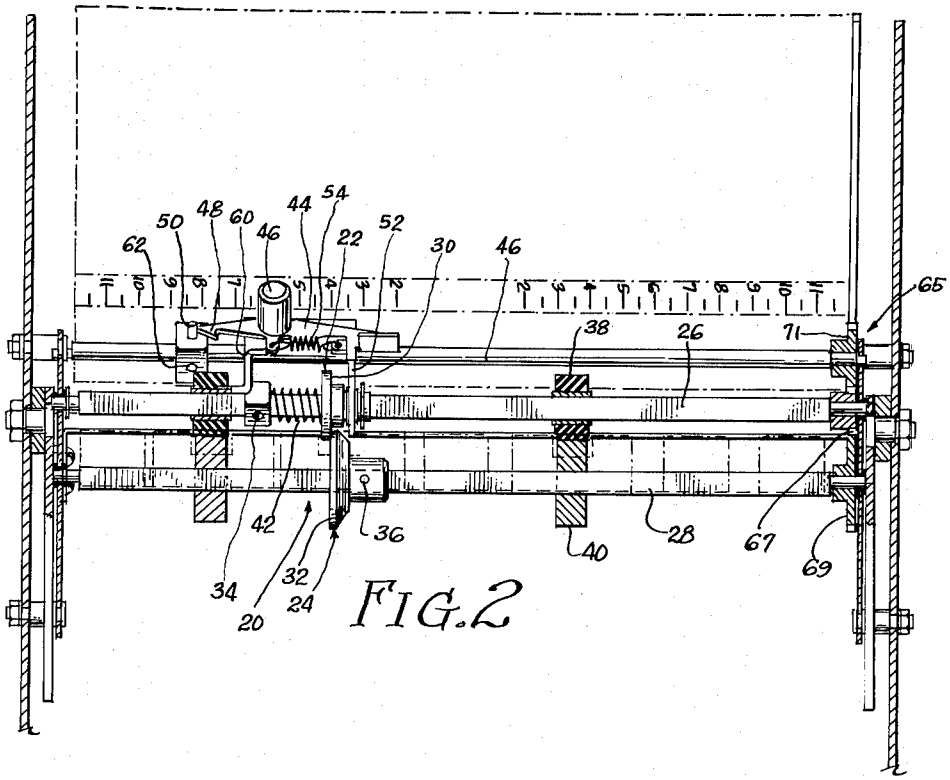


FIG. 2

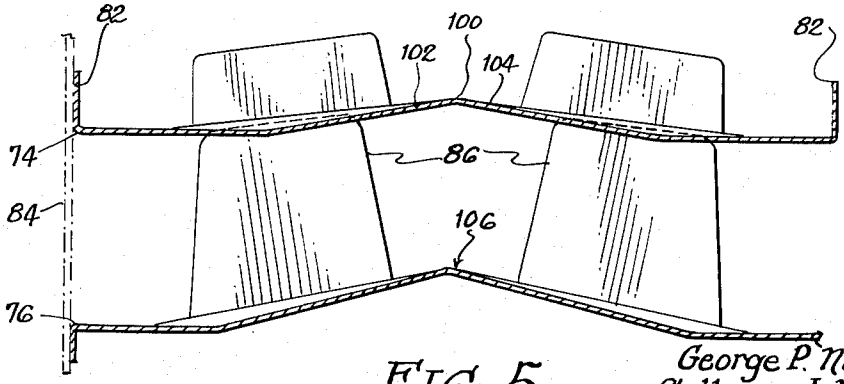


FIG. 5

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DUPLICATING MACHINE WITH SHEET SLITTER AND RECEIVING TRAYS

Filed Aug. 13, 1962 4 Sheets-Sheet 3

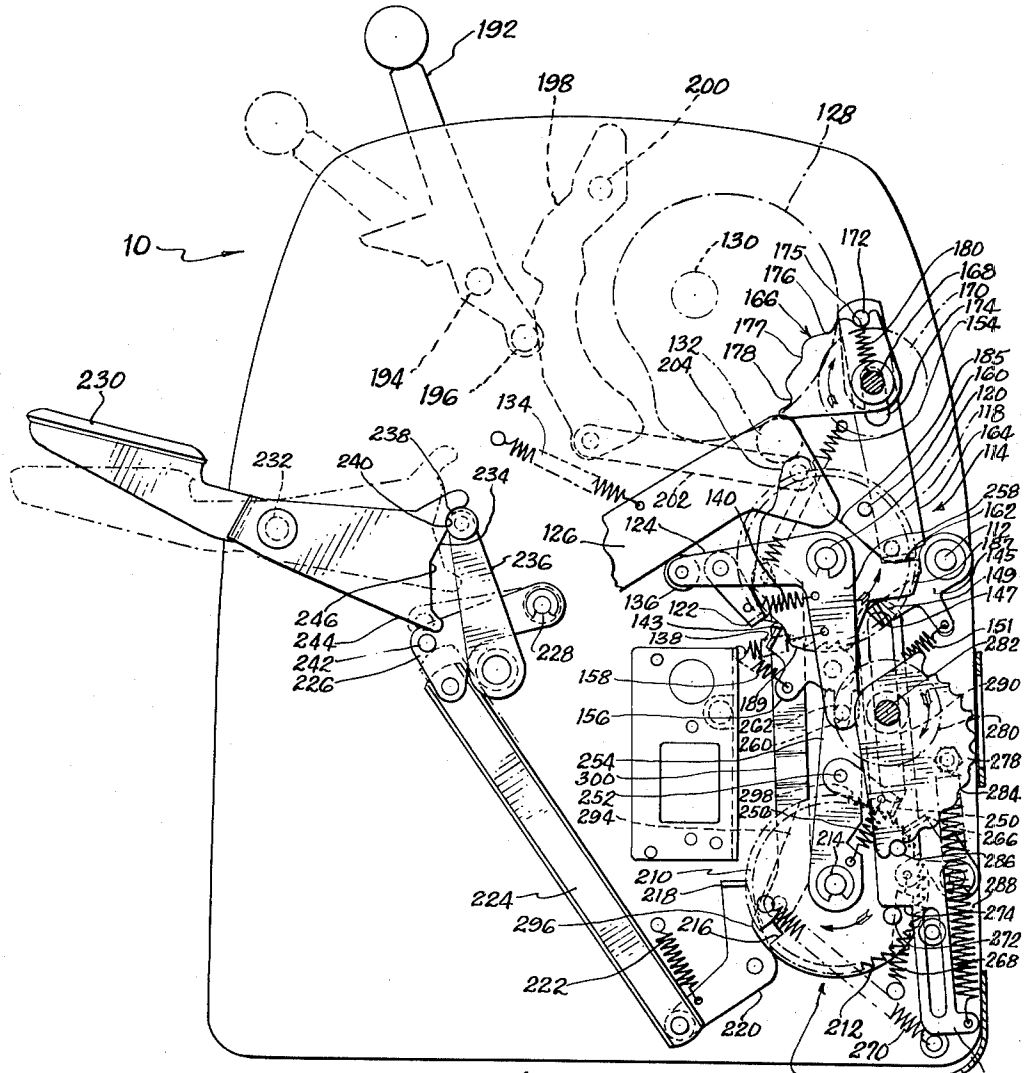


FIG. 3

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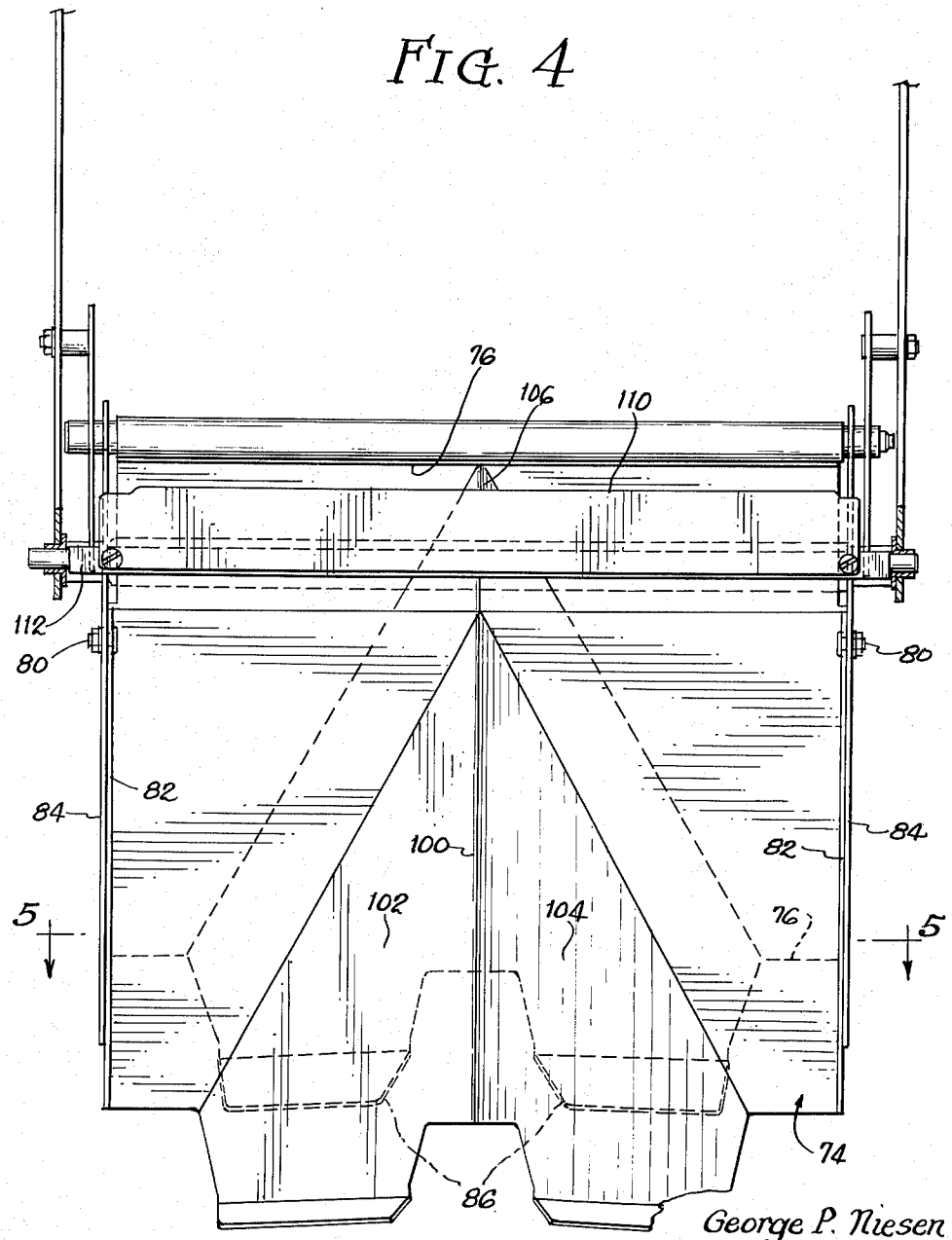
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DUPLICATING MACHINE WITH SHEET SLITTER AND RECEIVING TRAYS

Filed Aug. 13, 1962 4 Sheets-Sheet 4

FIG. 4



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United States Patent Office 3,234,832 Patented Feb. 15, 1966

3,234,832

DUPLICATING MACHINE WITH SHEET SLITTER AND DUAL RECEIVING TRAYS

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Filed Aug. 13, 1962, Ser. No. 216,612
1 Claim. (Cl. 83—105)

This invention relates to printing machines and pertains particularly to duplicating machines for office use. The invention is applicable to duplicators of all types, such as spirit or solvent transfer, stencil, and lithographic duplicators, for example.

One object of the present invention is to provide a new and improved duplicator having a plurality of receiving trays, together with means for selectively directing the printed copies into any of the trays.

A more specific object is to provide a new and improved duplicator having upper and lower receiving trays, together with a movable deflecting member for directing the printed copies produced by the duplicator into either of the trays.

A further object is to provide a new and improved duplicator of the foregoing character having means for automatically directing the first copy of the first few copies into the upper tray, and then directing the remaining copies of the run into the lower tray.

Another object is to provide a new and improved duplicator having first counter means for directing a predetermined number of copies into one of the receiving trays, and then directing the subsequent copies into the other receiving tray, together with second counter means for stopping the operation of the duplicator after a desired number of copies have been directed into the second receiving tray.

It is a further object to provide a new and improved duplicator having means for delivering the initial copies to one position from which they may be readily removed, while the machine continues to produce copies which are delivered to a second position.

Another object is to provide a new and improved machine having means for slitting the printed sheets into two portions together with a receiving tray having means for deflecting the two portions laterally in opposite directions so as to form two separate stacks of sheets.

Further objects and advantages of the present invention will appear from the following description, taken with the accompanying drawings, in which:

FIG. 1 is a somewhat diagrammatic elevational sectional view of a duplicating machine to be described as an illustrative embodiment of the present invention.

FIG. 2 is an elevational sectional view taken generally along a line 2—2 in FIG. 1.

FIG. 3 is a somewhat diagrammatic side elevational view of the control mechanism for the duplicator.

FIG. 4 is a fragmentary plan view showing the dual receiving trays employed on the duplicator.

FIG. 5 is a somewhat diagrammatic elevational sectional view taken generally along a line 5—5 in FIG. 4.

The drawings illustrate the present invention in connection with a duplicator **10** which may be of any conventional or desired type. Thus, the duplicator **10** comprises a printing cylinder **12** which may be adapted to hold the printing master, stencil or plate, according to the type of duplicator. An impression roller **14** is provided to press the copy sheets against the printing cylinder or drum **12**. It will be understood that the printing cylinder **12** may be driven manually, by an electric motor, or in any other desired manner. An appropriate mechanism may be provided to feed the copy sheets between the printing cylinder **12** and the impression roller **14**.

After being compressed between the printing cylinder **12** and the impression roller **14**, the copy sheets pass between upper and lower guide plates **16** and **18**. In this case, the machine **10** is provided with a slitter mechanism **20** which slits or cuts each sheet in the direction in which it is traveling, as the sheet travels between the guide plates **16** and **18**. In this case, the slitter mechanism **20** comprises upper and lower slitting or shearing wheels **22** and **24**, which are secured to parallel shafts **26** and **28**. It will be seen that the wheels **22** and **24** have side portions **30** and **32** which are in shearing engagement. The slitting wheels **22** and **24** may be adjusted to various positions along the length of the shafts **26** and **28**. Thus, the illustrated wheels **22** and **24** are secured to the shafts **26** and **28** by means of set screws **34** and **36** which may be loosened to provide for adjustment of the wheels along the shafts.

To propel the copy sheet between the slitter wheels **22** and **24**, it is preferred to provide forwarding rollers **38** and **40** on the shafts **26** and **28**. As shown to advantage in FIG. 2, two sets of the forwarding rollers **38** and **40** may be employed. The rollers **38** and **40** may be adjustable in position along the shafts **26** and **28**. Preferably, the shafts **26** and **28** are square or of some other non-circular shape for driving the slitter wheels **22** and **24** and the rollers **38** and **40**.

The slitter wheel **22** is normally biased against the slitter wheel **24** by means of a spring **42** which may be mounted around the shaft **26**. By means of a member **44**, slidably mounted on a guide rod **46**, the slitter wheel **22** may be retracted from the slitter wheel **24**, against the biasing action of the spring **42**. In this way, the slitter mechanism **20** is disabled so that the copy sheets will not be cut. The disabling member **44** may be provided with a convenient handle **46**. To retain the slitter wheel **22** in its retracted position, the member **44** may be formed with a hook **48** which may be engaged with a pin **50**. The member **44** has an arm or portion **52** which slidably engages the slitter wheel **22**. A spring **54** is connected to the member **44** so as to bias the member in such a direction as to permit the slitter wheel **22** to engage the slitter wheel **24**. Instead of the slitter wheels **22** and **24**, the machine may be provided with perforating wheels or scoring wheels, if desired. As a further alternative, the slitter wheels may be omitted from the machine.

The retracting or disabling member **44** may be slidably mounted on a bracket **60** which may be secured to the rod **46** by means of a set screw **62**. It will be understood that the set screw **62** may be loosened to adjust the position of the bracket **60** along the rod **46**. The pin **50** may be mounted on a portion of the bracket **60**. The spring **54** may be connected between the member **44** and the bracket **60**.

The shafts **26** and **28** may be driven by means of a gear train **65** comprising gears **67** and **69**, mounted on the shafts **26** and **28**, and a gear **71**, rotatably mounted on the rod **46**. The gear **67** meshes with the gear **69**, while the gear **71** meshes with the gear **67**. The gear **71** may be adapted to mesh with a gear **73** secured to the printing cylinder **12**.

The illustrated duplicator **10** is provided with a plurality of receiving trays for receiving the printed copy sheets from the slitting mechanism **20**, or directly from the printing cylinder **12** if the slitting mechanism is not operating. While more than two receiving trays may be employed, the illustrated machine **10** utilizes upper and lower receiving trays **74** and **76**, together with a mechanism **78** for selectively delivering the copy sheets to either of the trays. It is preferred to direct the first sheet or the

first few sheets of a printing run to the upper receiving tray 74, where the sheets are readily accessible and may be quickly removed, while the remainder of the sheets in the run are directed into the lower receiving tray 76. Thus, in many business operations, the first few sheets may be removed from the upper receiving tray 74 for immediate distribution, while the remaining copies may be accumulated in the lower receiving tray 76 for use as file copies or for later distribution.

To facilitate removal of the sheets from the lower receiving tray 76, the upper receiving tray 74 may be mounted for upward swinging movement. In this way, easy access is afforded to the lower receiving tray. Thus, the inner end portion of the upper receiving tray 74 is supported by a pair of pivots 80 which may extend through side flanges 82 on the upper receiving tray 74. In this case, the pivots 80 are mounted on upstanding side flanges 84 formed on the lower receiving tray 76. The outer portion of the upper receiving tray 74 is adapted to rest upon a pair of end flanges 86 which extend upwardly from the outer end of the lower receiving tray 76.

The receiving trays 74 and 76 are suitably mounted on the machine 10 so as to be easily removable therefrom. Thus, the lower receiving tray 76 has lower side flanges 88, each of which is formed with notches 90 and 92 adapted to be disengageably received over rods or pins 94 and 96 on the machine 10.

The receiving trays 74 and 76 are preferably provided with means for separating or deflecting the two portions of the sheets after they have been cut by the slitting mechanism 20. As shown to advantage in FIGS. 4 and 5, the upper receiving tray 74 is formed with a central generally triangular ridge or hump 100 having generally triangular deflector sides 102 and 104 sloping in opposite lateral directions. It will be seen from FIG. 4 that the ridge 100 tapers toward the inner end of the upper receiving tray 74. The lower receiving tray 76 has a similar ridge 106. When slit sheets are being delivered to the receiving tray 74, the separate portions of each sheet are normally deposited on the oppositely sloping sides 102 and 104 of the ridge 100. Thus, the slit portions of the sheets tend to be deflected toward opposite lateral sides of the receiving tray so as to be accumulated in separate piles. The ridge 106 of the lower receiving tray 76 produces a similar action.

The mechanism 78 for directing the sheets into either of the receiving trays 74 and 76 may comprise a deflector plate of baffle 110 movable between two positions, as shown in full and broken lines in FIG. 1. The deflector plate 110 may be secured to an operating shaft 112. When the deflector plate 110 is in its full-line position, the sheets pass from the guide plates 16 and 18 over the deflector plate 110 and into the upper receiving tray 74. When the deflector plate 110 is swung to its broken-line position, the sheets travel under the deflector plate and downwardly into the lower receiving tray 76. It will be evident that the deflector plate 110 could be operated manually, but it is preferred to employ a counter mechanism which keeps the deflector plate in its full-line position until a predetermined number of sheets have been directed into the upper receiving tray 74, and then shifts the deflector plate 110 into its broken-line position so that the remainder of the sheets in the run will be directed into the lower receiving tray 76. The mechanism may include an additional counter for stopping the operation of the machine after a preselected number of sheets have been delivered into the lower receiving tray.

Thus, the mechanism associated with the upper and lower receiving trays 74 and 76 preferably comprises an upper counter 114 and a lower counter 116. As illustrated, the upper counter employs a counter or ratchet wheel 118 which is rotatable about a shaft or pin 120. The ratchet wheel 118 is adapted to be advanced by a pawl 122 which is pivotally mounted on a rocker arm 124. Whenever the machine is running, the rocker arm 124 is oscillated back and forth about the shaft 120 by means of a power lever 126 operable by a cam 128 on the shaft 130 for the printing cylinder 12. The lever 126 carries a roller 132 which rides upon the cam 128. A suitable spring 134 is provided to bias the lever 126 in such a direction that the roller 132 will be maintained in engagement with the cam 128. In this case, the rocker arm 124 carries a roller 136 which engages one edge of the power lever 126. A spring 138 biases the rocker arm 124 in such a direction as to maintain the roller 136 against the power lever 126.

The pawl 122 may be biased toward the ratchet wheel 118 by means of a spring 140 connected between the pawl and the rocker arm 124. The pawl 122 is adapted to advance the ratchet wheel through one step for each oscillatory cycle of the rocker arm 124.

The ratchet wheel 118 has ratchet teeth 143 which extend for only a portion of the circumference of the ratchet wheel 118. The pawl 122 is adapted to advance the ratchet wheel 118 until the pawl runs out of teeth. In FIG. 3, the ratchet wheel 118 is shown in the position in which the pawl has run out of teeth. This is the zero position of the ratchet wheel, at which the deflector plate 110 is shifted so as to direct the sheets into the lower receiving tray 76.

It will be seen that the shaft 112 for the deflector plate 110 is fitted with a control arm 145 having a flange or tab 147 which is adapted to engage the counter wheel 118. At one point in its circumference, the counter wheel 118 is formed with a notch 149 adapted to receive the flange 147. A spring 151 is connected to the arm 145, so as to bias the flange 147 against the counter wheel 118. Thus, the spring 151 causes the arm 145 to swing clockwise when the flange 147 enters the notch 149. The consequent rotation of the shaft 112 causes the deflector plate 110 to swing between its full- and broken-line positions, as shown in FIG. 1. The flange 147 enters the notch 149 when the counter wheel 118 is moved to its zero position by the pawl 122.

The advancing movement of the ratchet wheel 118 by the pawl 122 is resisted by a return spring 154 which tends to rotate the ratchet wheel 118 in a clockwise direction, as seen in FIG. 3. Normally, however, such retrograde movement of the ratchet wheel 118 is prevented by a non-retrograde pawl 156, which is biased against the ratchet teeth 143 by a spring 158.

The initial position on the ratchet wheel 118 is determined by a stop pin 160, which is mounted on the ratchet wheel 118 and is engageable with a stop flange 162 on an adjustable stop member 164. The position of the stop member 164 may be changed by manually rotating a selector cam 166, which is rotatable about a shaft or pin 168. A manually rotatable nob 170 is connected to the cam 166. A pin or roller 172 is mounted on the adjustable stop member 164 for engagement with the cam 166. The stop member 164 is formed with a longitudinal slot 174, which is slidably received around the shaft 168.

To provide a detenting action, the cam 166 is formed with a plurality of notches 175, 176, 177, and 178 adapted to receive the pin 172. A biasing spring 180 may be connected to the pin 172 so as to bias the pin against the cam 166.

The ratchet wheel 118 is adapted to be reset to its initial position by means of a manually operable resetting cam 185 which is swingable about the shaft 120. It will be seen that the cam 185 is formed with lobes 187 and 189 adapted to push the flange 147, the non-retrograde pawl 156 and the advancing pawl 122 away from the ratchet or counting wheel 118, so that the wheel will be free to rotate in a clockwise direction under the biasing action of the spring 154. The return movement of the wheel 118 is limited by the engagement of the pin 160 with the flange 162 on the adjustable stop member 164. Thus, the initial position of the ratchet wheel 118 is variable, depending upon the position of the adjustable stop

member **164**. The adjustment of the initial position of the ratchet wheel **118** changes the number of steps through which the ratchet wheel will be advanced before the flange **147** enters the notch **149**. Accordingly, the number of copies deflected into the upper machining tray **74** may be varied.

The lobe **187** of the resetting cam **185** is adapted to push the flange **147** out of the notch **149** and away from the counting or ratchet wheel **118**. The lobe **189** is adapted to push the non-retrograde pawl **156** and then the main pawl **122** away from the ratchet teeth **143**.

Provision may be made for operating the resetting cam **185** by means of a manually swingable lever **192**, which may also be the lever which operates the master or plate clamp on the printing cylinder **12**. Such clamp, not shown, is adapted to secure a master sheet or printing plate to the printing cylinder **12**. Before each new run, a new master is normally mounted on the printing cylinder **12**. This necessitates the operation of the lever **192** in a counterclockwise direction to open the master clamp, so that the old master may be removed from the printing cylinder **12**, and may be replaced by a new master. In this case, the lever **192** is swingable about a pivot **194** and is provided with a pin **196** adapted to engage a lever **198**. It will be seen that counterclockwise movement of the lever **192** causes the lever **198** to be swung in a counterclockwise direction about a pivot **200**. As shown in FIG. 3, a link **202** is connected between the lever **198** and an arm **204** on the resetting cam **185**, so that the counterclockwise movement of the lever **198** will cause clockwise rotation of the cam **185**.

As already indicated, the lower counter **116** is adapted to stop the operation of the duplicating machine **10** after a predetermined number of copy sheets have been printed. Thus, the counter **116** comprises a counting or ratchet wheel **210** having ratchet teeth **212** extending around a portion of its periphery. The counting wheel **210** is rotatable about a shaft or pin **214**.

It will be seen that the wheel **210** is also formed with a peripheral notch **216** adapted to receive a flange or pawl **218** on a control lever **220**. A spring **222** is connected to the control lever **220** to bias the flange **218** against the wheel **210**. When the notch **216** reaches the flange **218**, the spring **222** causes the control lever **220** to swing in a clockwise direction. This movement of the control lever **220** is utilized to stop the feeding of copy sheets to the printing cylinder **12**. In this case, a link **224** is connected between the control lever **220** and a lever **226**. The link **224** causes the lever **226** to swing upwardly about a pivot **228** when the lever **220** swings clockwise.

As illustrated, the duplicating machine **10** has a main feed-control lever **230**, which the operator may swing in a clockwise direction to start the feeding of copy sheets to the printing cylinder **12**. The lever **230** is swingable about a pivot **232**. In FIG. 3, the lever **230** is shown in full lines in the position in which the feed mechanism is activated so as to feed sheets to the printing cylinder **12**. The inactive or "off" position of the feed lever **230** is shown in broken lines.

The lever **230** has a cam portion **234** adapted to operate a control arm **236** of the feed mechanism. The cam **234** is engaged by a roller **238** on the arm **236**. It will be seen that the cam **234** is formed with a detent notch **240** adapted to receive the roller **238** when the lever **230** is in its actuated position.

In this case, the lever **226** carries a pin or roller **242** which is adapted to engage the lower edge portion **244** of the lever **230**. Thus, when the lever **226** is swung in a clockwise direction, the pin **242** is effective to swing the main feed-control lever **230** in a counterclockwise direction to its "off" position, in which the roller **238** engages the low point **246** on the cam **234**.

The counter or ratchet wheel **210** is adapted to be advanced in a clockwise direction from its initial position by a pawl **250**, which is swingable about a pivot **252** carried by a rocker arm **254**. It will be seen that the arm **254** is swingable about the shaft **214**. A spring **256** is connected between the pawl **250** and the rocker arm **254** so as to bias the pawl against the counting wheel **210**.

In order to operate the rocker arm **254**, the rocker arm is connected to a depending arm **258** on the rocker **124**. In this case, a pin-and-slot connection is employed between the arm **258** and the rocker arm **254**. Thus, a pin **260** is mounted on the arm **258** and is received in a slot **262** formed in the upper end of the rocker arm **254**.

A non-retrograde pawl **266** normally engages the ratchet teeth **212** to prevent retrograde movement of the counting wheel **210** in a counterclockwise direction. The pawl **266** is biased against the ratchet wheel **210** by a spring **268**.

It will be seen that a return spring **270** is connected to the counter or ratchet wheel **210** to bias the ratchet wheel in a counterclockwise direction. The spring **270** affords resilient resistance to the clockwise advancing movement of the wheel **210**.

The initial position of the counter wheel **210** is established by a stop pin **272**, which is engageable with a shoulder **274** on an adjustable stop member **276**. The position of the stop member **276** may be varied by manually rotating a cam **278** which is connected to a knob or hand wheel **280**. The cam **278** is rotatable about a shaft or pin **282**.

The cam **278** is formed with a plurality of detent notches **284**, which are engageable by a follower pin **286** on the adjustable member **276**. A spring **288** is preferably connected to the adjustable stop member **276** to bias the pin **286** against the cam **278**. It will be seen that the adjustable stop member **276** is formed with a slot **290** which is slidably received around the shaft **282**.

It will be evident that rotating the cam **278** controls the position of the movable stop member **276**, and thus changes the initial position of the counter wheel **210**.

As in the case of the first counter, the second counter **116** is adapted to be reset by means of a resetting cam **294**, which is rotatable about the shaft **214**. It will be seen that the cam **294** is formed with a lobe **296** for pushing the flange **218** out of the notch **216** and away from the counter wheel **210**, and another lobe **298** for pushing the advancing pawl **250** and the non-retrograde pawl **266** away from the counter wheel **210**. Thus, clockwise movement of the cam **294** releases the counter wheel **210** for counterclockwise return movement under the biasing impetus of the spring **270**. The cam **294** is adapted to be operated by a link **300** connected between the cam **294** and the corresponding cam **185** of the upper counter **114**. Thus, the link **300** causes the cam **294** to swing clockwise in unison with the cam **185**.

It is believed that the operation of the duplicating machine will be clear from the foregoing description, but a brief review of the operation at this point may be helpful. To initiate the feeding of copy sheets, the operator raises the main feed lever **230**. Sheets are then fed between the printing cylinder **12** and the impression roller **14** by the feed mechanism, not shown. Each printed copy sheet is cut into two portions by the slitter wheels **22** and **24**.

The first few copy sheets to be printed are deflected into the upper receiving tray **74** by the movable deflecting plate **110**. The triangular deflecting ridge or hump **100** deflects the two portions of each copy sheet in opposite lateral directions, so that the slit portions are deposited in two separate stacks.

The upper counter **114** is effective to shift the deflecting plate **110** in a clockwise direction after a predetermined number of sheets have been directed into the upper receiving tray **74**. The remaining sheets of the run will then travel into the lower receiving tray **76**. For each cycle of the machine, the ratchet or counter wheel **118** of the upper counter **114** is advanced in a counterclockwise direction through one step until the flange **147** enters the

notch 149 in the counter wheel. At this point, the advancing pawl 122 runs out of ratchet teeth so that the wheel 118 is not advanced any farther. The movement of the flange 147 causes the clockwise swinging movement of the deflecting plate 110.

The lower counter 116 is effective to shut off the feed mechanism after a predetermined number of copy sheets have been printed. Thus, the counter or ratchet wheel 210 for the lower counter 116 is advanced one step in a clockwise direction for each cycle of the machine. The movement of the lower counter wheel 210 continues until the flange 218 enters the notch 216 in the counter wheel. The resulting movement of the control lever 220 causes the main feed lever 230 to be swung to its "off" position by the pin 242 on the lever 226.

To make another run, the hand lever 192 is swung in a counterclockwise direction. Such movement of the lever 192 causes the lever 198 to be swung in a counterclockwise direction. By virtue of the connecting link 202, the cam plate 185 is swung in a clockwise direction. Simultaneously, the lower resetting cam 294 is swung in a clockwise direction by virtue of the interconnecting link 300. The lobes 187 and 189 on the upper cam 185 push the flange 147 and the pawls 156 and 122 away from the counter or ratchet wheel 118, so that the ratchet wheel is released for clockwise return movement under the impetus of the spring 154. The counter wheel 118 is thus returned to its initial position in which the pin 160 engages the flange 162 on the adjustable stop member 164. The position of the stop member 164 is controlled by the manually adjustable cam 166. By rotating the cam 166, it is possible to change the number of copies that will be directed into the upper receiving tray 74 during the next printing run.

In the case of the lower counter, the lobes 296 and 298 of the resetting cam 294 push the flange 218 and the pawls 266 and 250 away from the counter wheel 210 so that the counter wheel is released for counterclockwise return movement under the impetus of the spring 270. The wheel 210 thus returns to its initial position in which the pin 272 engages the stop shoulder 274 on the movable stop member 276. The position of the stop member 276 may be varied by turning the cam 278. In this way, the total number of copies to be printed in the next run may be varied.

The copies directed into the upper receiving tray 74 may be removed immediately while the machine is still running. Thus, the initial copies are available for immediate distribution. The remaining copies are accumulated in the lower receiving tray 76 for later distribution. The upper receiving tray 74 may be swung upwardly about the pivots 80, so as to afford convenient access to the lower receiving tray 76.

Various modifications, alternative constructions, and equivalents may be employed without departing from the true spirit and scope of the present invention, as exemplified in the foregoing description and defined in the following claim.

We claim:

In a sheet-handling mechanism, the combination comprising

propelling means for propelling successive sheets,

slitting means for receiving the sheets from said propelling means and slitting the sheets in the direction in which they are travelling,

a receiving tray for receiving the sheets from said slitting means,

said receiving tray comprising two members sloping downwardly from said slitting means,

and a centrally disposed triangular ridge projecting upwardly from said receiving tray and tapering longitudinally to a point on said receiving tray adjacent said slitting means,

said ridge comprising a pair of oppositely inclined triangular deflecting surfaces sloping upwardly from said receiving tray for deflecting the slitted portions of the sheets in opposite lateral directions to accumulate the slitted portions in separate stacks on the two members of said receiving tray,

each of said triangular deflecting surfaces being tapered in width to said point on said receiving tray,

said triangular deflecting surfaces coming together to form a centrally disposed longitudinal crest,

said triangular deflecting surfaces being inclined downwardly in opposite lateral directions from said crest,

said crest sloping upwardly from said point at an acute angle relative to said receiving tray.

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