

Jan. 20, 1970

TAMAKI KANEKO ET AL

3,490,367

ROTARY OFFSET PRINTING MACHINE

Filed Dec. 28, 1966

7 Sheets-Sheet 1

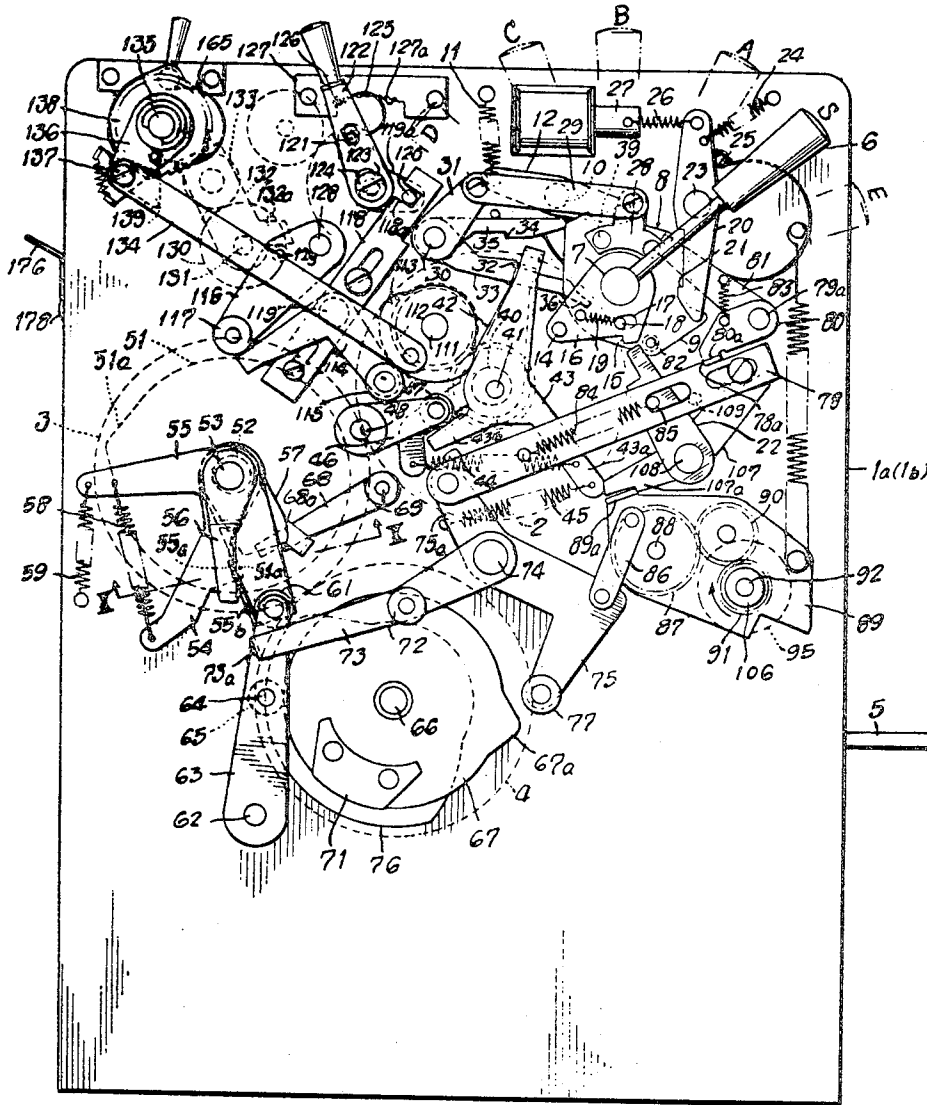


Fig. 1.

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7 Sheets-Sheet 2

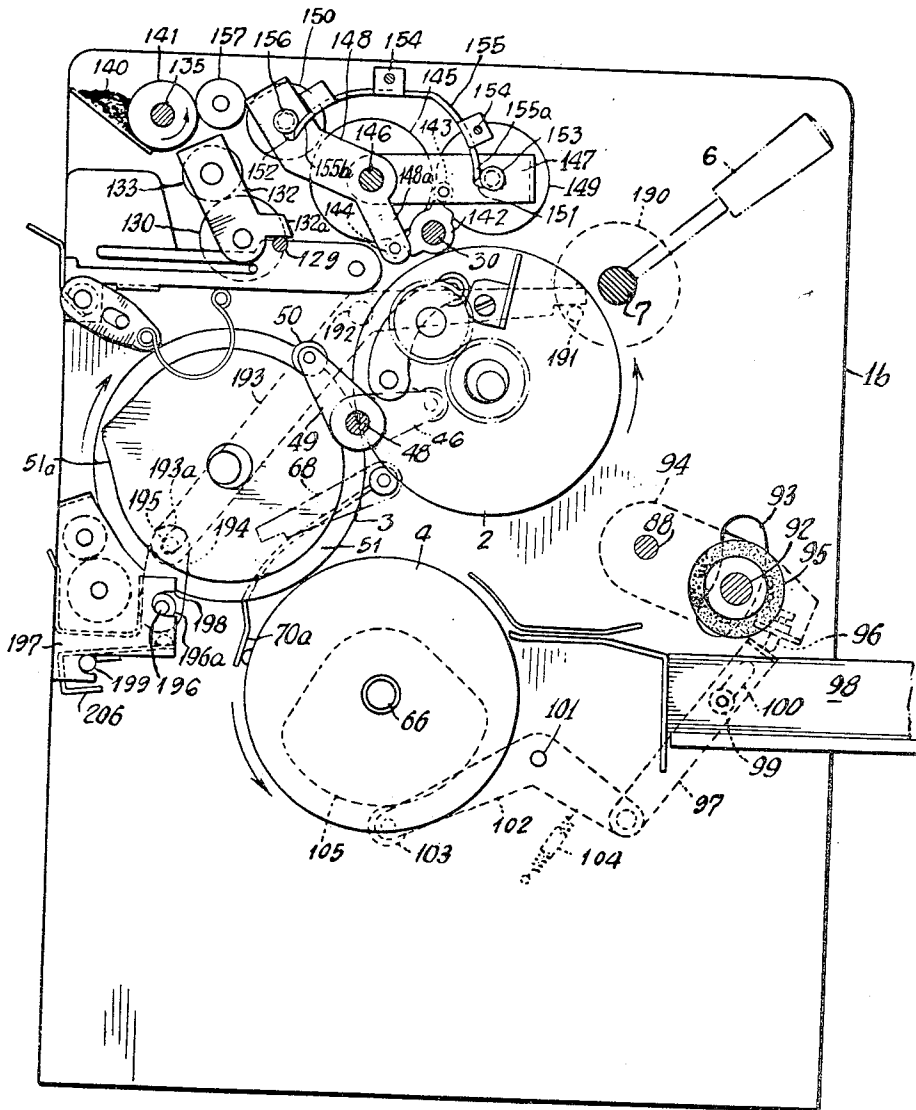


Fig. 2.

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7 Sheets-Sheet 3

Fig. 3.

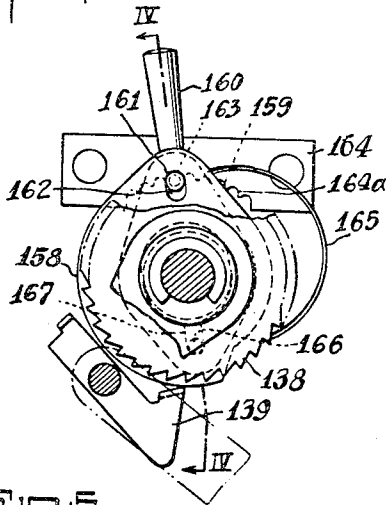


Fig. 4.

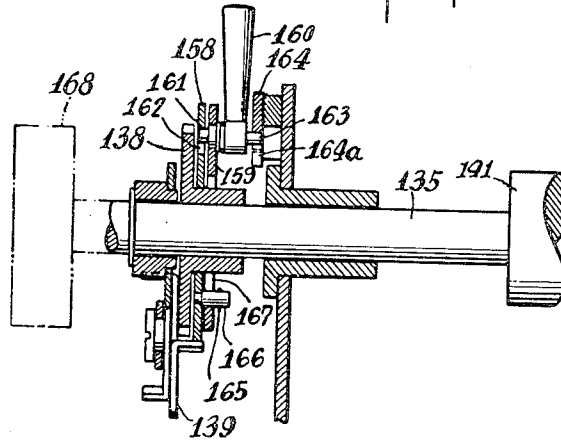


Fig. 5.

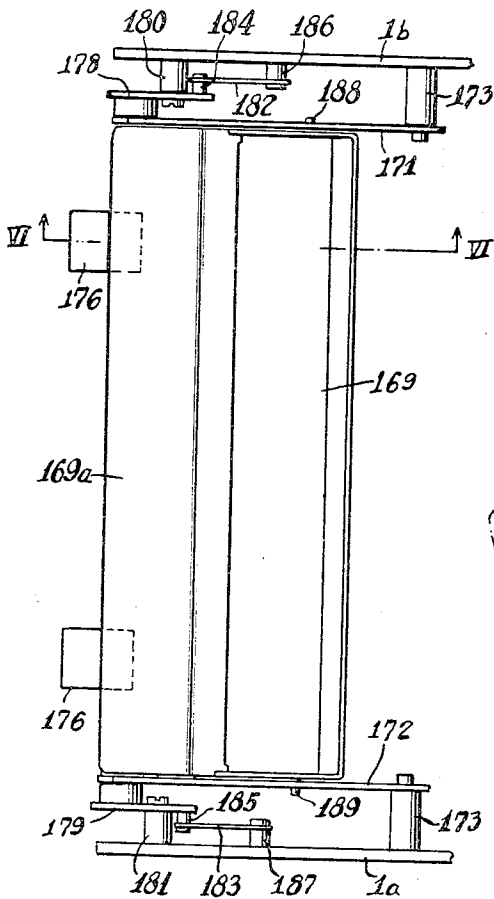


Fig. 6.

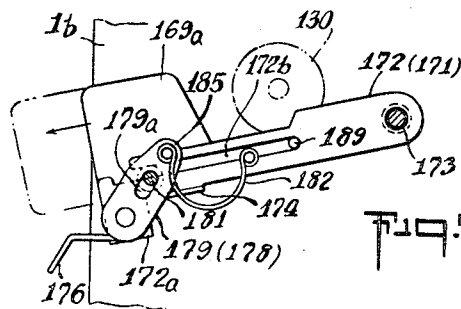
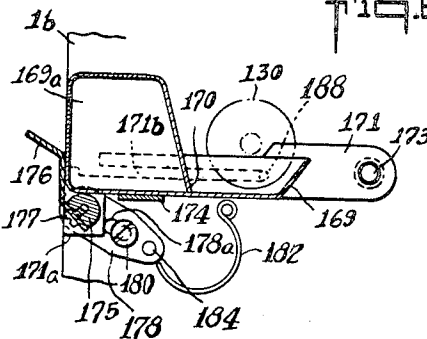


Fig. 7.

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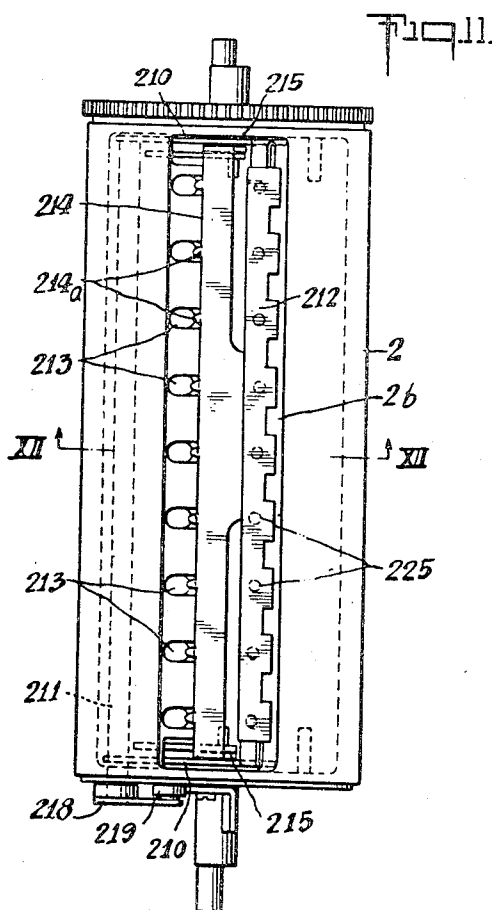
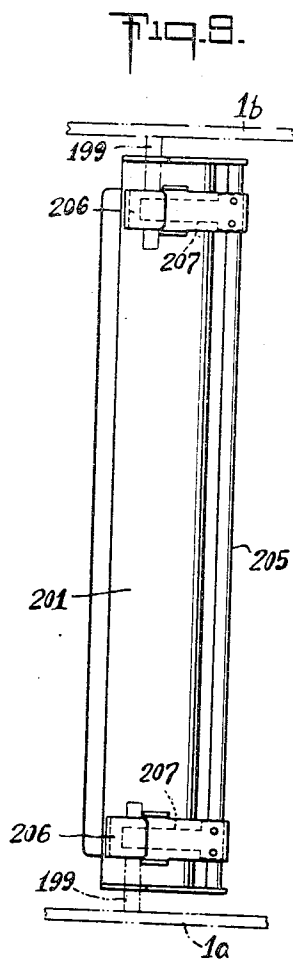
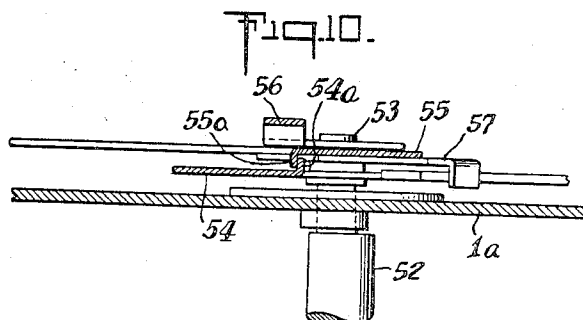
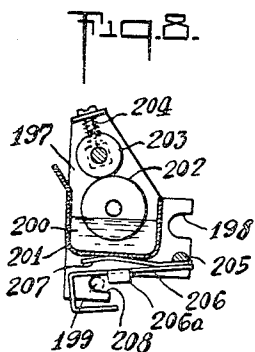
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7 Sheets-Sheet 5

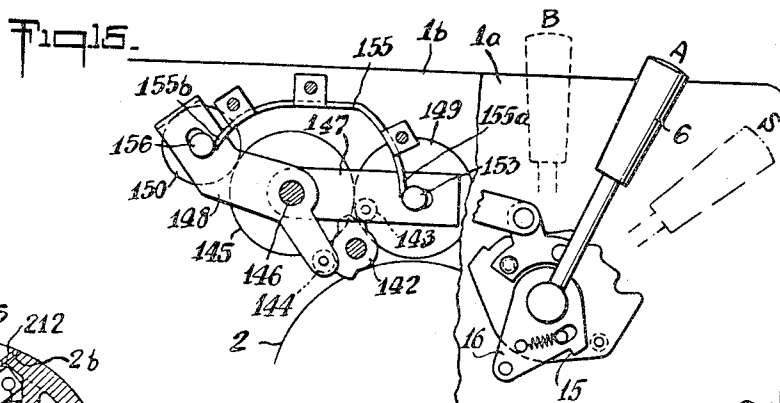


Fig. 12.

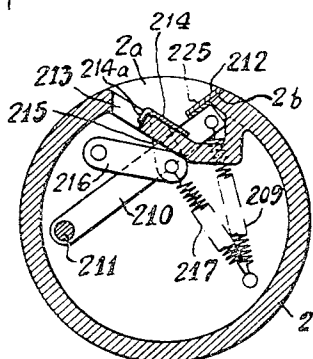


Fig. 13.

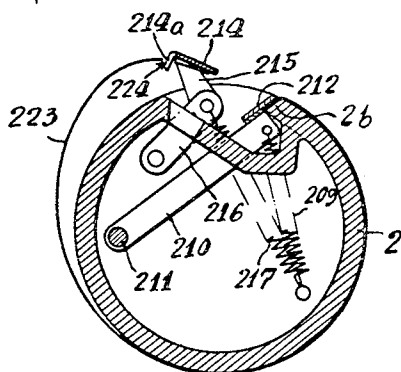
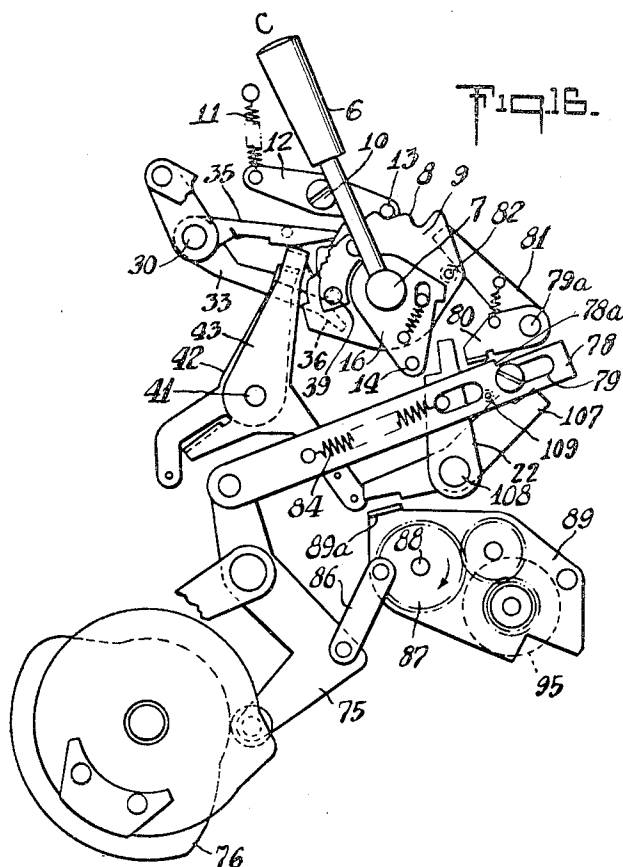
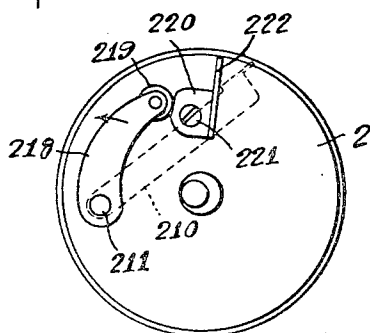


Fig. 14.



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Fig. 17

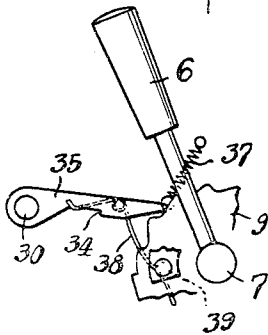


Fig. 18

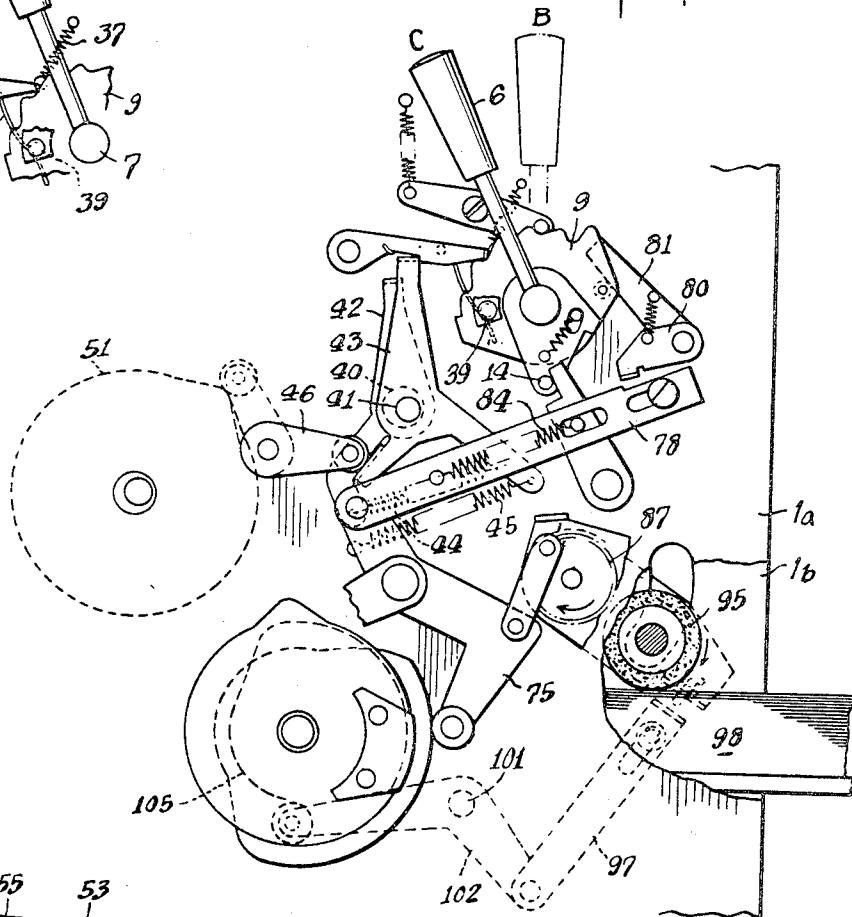
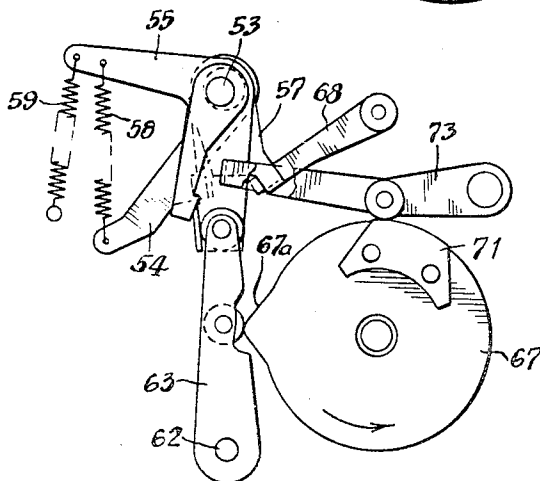


Fig. 19



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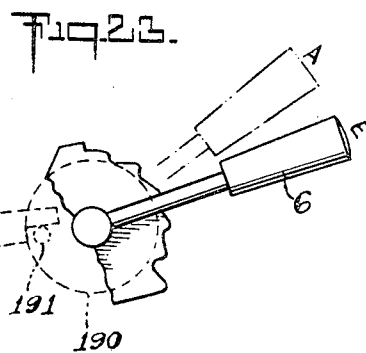
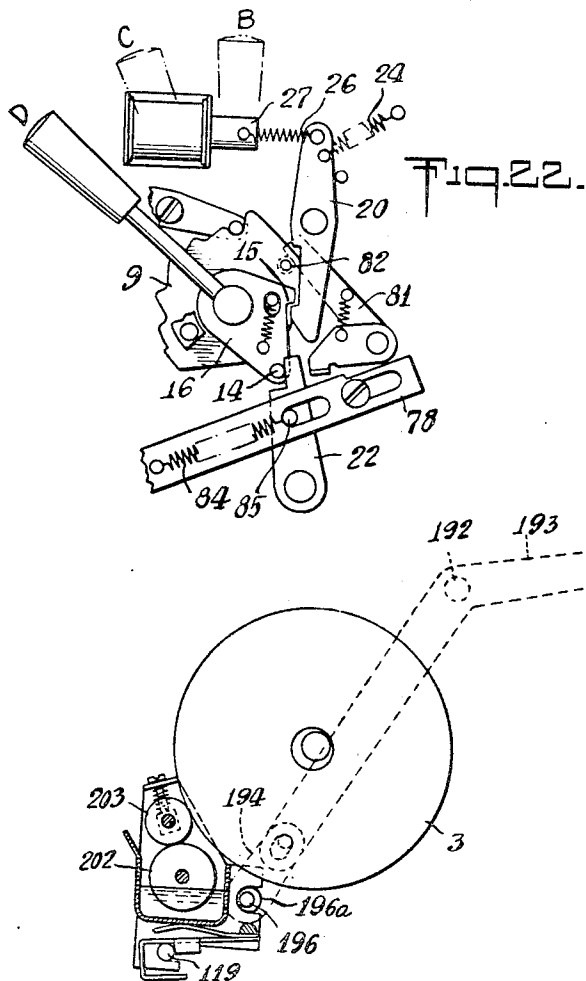
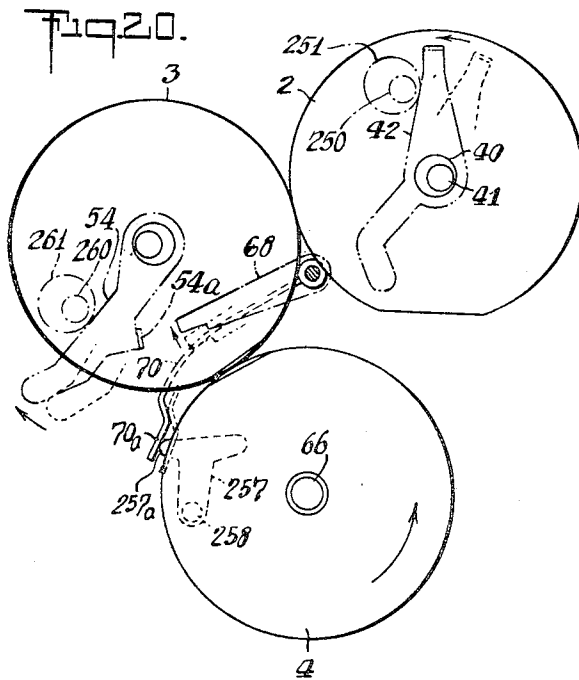
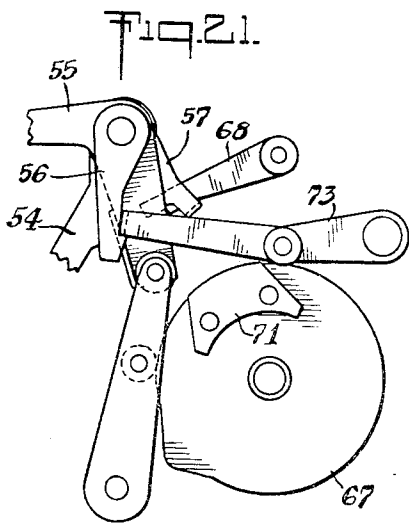
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7 Sheets-Sheet 7



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ROTARY OFFSET PRINTING MACHINE

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Claims priority, application Japan, Dec. 30, 1965,

41/39,331, 40/81,895

Int. Cl. B41f 9/00

U.S. Cl. 101-144

4 Claims

ABSTRACT OF THE DISCLOSURE

A unitary control mechanism for a rotary offset printing machine wherein said mechanism includes an operating handle with six positions for cleaning, stopping, consecutive printing, test printing, inking, and ink distribution. Any one of these operations can be chosen by the operator merely by putting the handle in the appropriate position.

BACKGROUND OF THE INVENTION

The invention deals with control of the various functions of a rotary offset printing machine so that by the operation of one handle or control member, the machine may be caused to perform certain functions such as ink distribution, ink positioning, test printing, consecutive printing, and cleaning.

While rotary offset printing machines are well known in the art, it is supposed that a single member control for the adjustment of such machines so that they will perform various functions as outlined above, is new in the art. Heretofore various controls have been used for the above purpose and in most instances it is possible to cause operations in improper sequence.

SUMMARY OF THE INVENTION

FIG. 1 is a side view of a rotary offset printing machine according to one embodiment of this invention.

FIG. 2 is a side view of the above embodiment, with one of the side walls omitted.

FIG. 3 is a side view of a printing ink supply control device.

FIG. 4 is a cross sectional view taken on dotted line IV-IV in FIG. 3.

FIG. 5 is a plan view showing only a water tray and its supporting device.

FIG. 6 is a sectional view taken on dotted line VI-VI in FIG. 5.

FIG. 7 is a side view illustrating the water fountain supporting device in a tilted position.

FIG. 8 is a sectional view showing a cleaning device of a blanket cylinder only.

FIG. 9 is a base view of the embodiment of FIG. 8.

FIG. 10 is a sectional view taken on dotted line X-X in FIG. 1.

FIG. 11 is a plan view illustrating a plate cylinder only.

FIG. 12 is a sectional view taken on dotted line XII-XII in FIG. 11.

FIG. 13 is a sectional view illustrating a mode of mounting a plate cylinder.

FIG. 14 is a side view of an embodiment of FIG. 11.

FIG. 15 is a side view of an inking roller, illustrating a mode of operation when distributing ink.

FIG. 16 is a side view of each variable member in operational positions when test printing is performed.

FIG. 17 is a partial side view of FIG. 16.

FIG. 18 is a side view illustrating one mode of test printing operation.

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FIG. 19 is a side view of an engagement and disengagement device with a function of pressing and detaching a blanket cylinder to and from an impression cylinder.

FIG. 20 is a side view of a plate cylinder, a blanket cylinder and an impression cylinder.

FIG. 21 is a side view of an engagement and disengagement device for a plate cylinder and a blanket cylinder.

FIG. 22 is a side view of an operation lever in its rest position during consecutive printing operation.

FIG. 23 is a side view of a blanket cylinder during cleaning operation.

This invention relates to a rotary offset printing machine. It is well known in the art that series of operations as hereinafter described are required when printing on an offset printing machine. That is, firstly, the ink must be evenly distributed with a plurality of ink distributing rollers. Then one of said rollers is pressed onto a printing form rolled on the plate cylinder to apply such evenly distributing ink thereon. Consecutive printing is made usually after correct printing performance is ascertained in a test printing using one or a few copy sheets.

This invention enables the performance of the above-mentioned series of works under the control of one single operation lever. It is characterized in that when an operation lever is set for test printing and a hand holding such lever is removed therefrom, the operation lever is adapted to return automatically to its initial position and stop such test printing operation. It is further characterized in that after the consecutive printing is done, activation of the cleaning device for the blanket cylinder can also be performed under the control of the same operation lever.

Other objects and advantages of this invention will become apparent upon reading the claims in conjunction with the following detailed description and the attached drawings, in which:

Looking at FIGS. 1 and 2, 1a and 1b represent a pair of side walls facing each other; 2 illustrates a plate cylinder; 3 a blanket cylinder; 4 an impression cylinder, and 5 a printed sheet receiving tray. Referring now to FIG. 1, an operation lever 6, shown in the upper right hand corner of the drawing, is mounted on a rotatable shaft 7 which is provided on a side wall 1a. The operation lever 6 is so designed as to be shiftable from the stationary position S in FIG. 1 to the ink distributing position A shown in dot-dash lines, inking position B whereby the ink is applied on a printing form, test printing position C, consecutive printing position D and the blanket cylinder cleaning position E, respectively.

The shaft 7 is fixed with a control plate 9 carrying a wave form periphery 8 on which is pressed a pin 13 (FIG. 16) fixed on the right end of a lever 12. The lever is urged to rotate clockwise under the force of a spring 11, with its fulcrum 10 mounted on the side wall 1a.

The aforesaid shaft 7 is loosely fitted with a stopper member 16 carrying a pin 14 and a notched portion 15 with the movable range of said stopper member 16 being limited by a slot 17 on one hand and a pin 18 (FIG. 1) fixed on the aforesaid control plate 9 on the other, said stopper member being further urged to rotate in a counterclockwise direction relative to plate 9 by the force of a spring 19.

The notched portion 15 is adapted to engage with notch 21 of hook lever 20 when the operation lever 6 is rotated to a continuous printing position D and the pin 14 is adapted to be struck by an end of return member 22 (FIG. 22) when said operation lever 6 is revolved to a printing position C. The hook lever 20, which is pivoted on the side wall 1a by a shaft 23, is urged to rotate in a clockwise direction by the force of a spring 24 and is normally limited in its rotary motion by a stopper 25 (FIG. 1). The hook lever 20 is further connected, at an upper end thereof, to a movable member

27 of an electromagnetic plunger through a spring 26. A protruding piece 28 (FIG. 1) fixed on said control plate 9 is pivoted, at one end thereof, on a connecting rod 29 which is pivoted, at the other end thereof, to an arm 31 secured on a shaft 30.

The shaft 30 has pivoted thereon a first stopper arm 33 carrying a notched portion 32 and a second stopper arm 35 carrying a notched portion 34 (FIGS. 1 and 16). An end 36 of said first stopper arm 33 is extended between the control plate 9 and the side wall 1a. The first stopper arm 33 is urged to rotate in a counterclockwise direction by the force of a spring not shown, and the second stopper arm 35 is urged to rotate in a counterclockwise direction by the force of a spring 37 as shown in FIG. 17. The lower position of an elastic piece 38 fixed on said second stopper arm 35 being extended, similarly with the end 36 of the first stopper arm 33, between the control plate 9 and the side wall 1a.

The end 36 of said first stopper arm 33 and the lower portion of said elastic piece 38 of the second stopper arm 35 are adapted to receive a colliding action of a pin 39 provided on the back surface of the control plate 9 when the said control plate 9 takes either a test printing or a continuous printing position.

The first stopper arm 33 is engaged with an upper end of a bifurcated lever 42 fixed on an eccentric shaft 41 (FIGS. 1 and 18) which is integrated with a shaft 40, said shaft 40 carrying thereon a rotatable plate cylinder 2. The second stopper arm 35 is adapted to engage with an upper end of a trifurcated arm lever 43 which is loosely fitted on said eccentric shaft 41. When the copy sheet is not delivered, only the bifurcated arm lever 42 engages with the first stopper arm 33. Under the circumstance as hereinabove described, the plate cylinder 2 and the blanket cylinder 3 do not make a contact to each other, but take positions slightly apart from each other. The said two cylinders are pressed onto each other only when the first stopper arm 33 and the bifurcated arm lever 42 are disengaged and the latter lever takes a counterclockwise rotated position by the force of a spring 44 secured on an arm 43a of said trifurcated arm lever 43 which draws an end of the bifurcated arm lever 42 (FIG. 1). The trifurcated arm lever 43 is urged to rotate in a clockwise direction around the eccentric shaft 41 by the force of a contractible spring 45 which is fixed, at one end thereof, to the side wall, acting on an arm 43a of said trifurcated arm lever 43. The rotative movement of said trifurcated arm lever 43 is limited by a roller 47 provided on an oscillating arm 46 as said roller makes contact with a short arm 43b of the trifurcated arm lever 43. A shaft 48 supporting the above-mentioned oscillating arm 46 is provided through the side wall 1a with an end thereof supporting an arm 49 carrying a roller as shown in FIG. 2.

A roller 50 is pressed against a cam disc 51 which is substantially integral with the blanket cylinder 3. An angular cam 51a of said cam disc 51 provides said arm 49 with an oscillating movement which, in turn, is transmitted to the aforesaid trifurcated arm lever 43 through shaft 48 and oscillating arm 46.

Referring now to FIG. 1, the eccentric shaft 53, which is integral with a shaft 52 loosely mounted with the aforesaid blanket cylinder 3, is provided with an arm lever 54 fixed thereon and a bell crank 55 loosely mounted, said bell crank 55 carrying, substantially integral therewith, a stopper member 56 on the surface thereof and an engagement member 57 on the back face thereof. An extreme end of said arm lever 54 and one arm end of said bell crank 55 are associated with each other through a contractible spring 58 and the abutment piece 54a provided on said arm lever 54 (FIGS. 19 and 20) and the bent piece 55a of said bell crank 55 are pressed onto each other as shown in FIGS. 1 and 10.

The bell crank 55 is urged to rotate in a counterclockwise direction around the eccentric shaft 53 by the force of a contractible spring 59 secured, at the lower end thereof, to the side wall, said bell crank being pressed against a roller 61 at an abutment 55b formed on the lateral edge of an arm end extending downward.

The roller 61 is fixed on an end of the oscillating arm 63 which is pivoted, at the lower portion thereof, on the side wall 1a by a shaft 62, said oscillating arm 63 carrying, on the reverse side thereof, another roller 65 which is secured by a shaft 64. The roller 65 is pressed on the circumference of a cam disc 67 fixed on a shaft 66 which rotates integral with an impression cylinder 4. The oscillating arm 63 is provided, by means of an angular cam 67a of said cam disc 67, with an oscillating movement which, in turn, is imparted to the aforesaid bell crank 55.

At the lower end of the stopper member 57 fixed on said bell crank 55 is formed a bent portion over which extends a stopper lever 68. A shaft 69 fixing a stopper lever 68 thereon is rotatably secured on the side walls 1a and at an end of said stopper lever 68 proximate to the side wall 1a is fixed with an upper end of a feeler arm 70 as shown in FIG. 2. The feeler arm 70 is adapted to oscillate in a clockwise direction when the copy sheet is not correctly delivered between the blanket cylinder 3 and the impression cylinder 4, so as to help engagement of the notched portion 68a of the aforesaid stopper lever 68 with the stopper member 57.

The cam armature 71 (FIGS. 1 and 19) secured on said cam disc 67 is adapted to act on the roller 72 so as to provide an oscillation movement to the oscillating member 73. The end 73a of said oscillating member is adapted to suitably engage with a hook portion of said stopper member 56 so as to prevent the oscillating motion of said oscillating member 73.

The shaft 74 of said oscillating member 73 is provided with a rotatable elbow lever 75 which is fixed, at its lower end, with a roller 77. The roller 77 is adapted to receive an action of a cam 76 which rotates integral with an impression cylinder 4. One end of an arm 75a extending in the upper direction from the shaft 74 is pivotally fixed with the left end of a movable member 78 which is supported freely shiftable, relative to the side wall 1a, by means of a slot 79 (FIG. 16) provided on the right end of said movable member 78. The elbow lever 75 is urged to rotate in a counterclockwise direction by the force of a spring not shown, and is supposed to urge the aforesaid movable member 78 to move in the direction of the left (FIG. 18). The movable member 78 is further provided, at its right upper end with a notched portion 78a (FIGS. 1 and 16) which is engaged by an end of the short arm 80 pivoted on a shaft 79a, whereby the rightward movement of said movable member 78 is prevented.

On the shaft 79a of said short arm 80 is pivoted the base portion of a release lever 81 which extends, at the upper end thereof, between the aforesaid control plate 9 and the side wall 1a. When said control plate 9 takes a test printing position (FIG. 16), the release lever 81 is adapted to be pushed towards an outer direction by the pin 82 fixedly planted on the back of said control plate 9 and is further urged to rotate clockwise around the shaft 79a, causing the short arm 80 to revolve around said shaft 79a in the likewise direction through a contractible spring 83, thereby releasing engagement between said short arm 80 and the movable member 78.

The contractible spring 84 (FIGS. 1 and 22) which is secured on said movable member 78 at one end, and on the pin 85 on the return member 22 provided through a slot of the movable member 78, urges said return member 22 to rotate in a counterclockwise direction.

The aforesaid elbow lever 75 is pivoted to an end of a connecting rod 86 (FIGS. 1 and 16) which, in turn, is pivoted, at the other end, on a gear 87. The shaft 88 of

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the gear 87, which is provided on the side wall 1a, is loosely mounted with an oscillating plate 89. The gear 87 is meshed with an idle gear 90 provided on said oscillating plate 89, said idle gear being further meshed with a gear 91. The shaft 92 of said gear 91 extends to outside of the side wall 1b through slots 93 provided on the side walls (FIG. 2) and is rotatably mounted on the oscillating plate 94 provided on shaft 88 outside of the side wall 1b. The shaft 92 is further provided, between the side walls 1a and 1b, with a plurality of friction wheels 95 fixedly secured thereon. The free end of said oscillating plate 94 is provided with a stud 96 which prevents, by pressing at its lower end against the upper end of a thrust lever 97, the said friction wheels 95 from pressing on a stack of copy sheets 98.

The thrust lever 97 is shiftable by means of a headed stud 99 and a slot 100 provided on said lever and is further pivoted on one end of the bell crank 102, the fulcrum of which is pivoted on the side wall 1b by a shaft 101 (FIGS. 2 and 18). The bell crank is provided, at an arm end thereof, with a roller 103 which is pressed against a fan cam plate 105 by the force of a spring 104 acting on said bell crank 102. The cam plate 105, which is secured on a shaft 66 integrated with the impression cylinder 4, provides upon its rotation, the oscillating plate 94 with a reciprocating movement through the bell crank 102 and the thrust lever 97 so as to press the friction wheels 95 onto the copy sheet.

Referring to FIG. 1, an irreversible rotary device 106 is provided between the aforesaid gear 91 and the shaft 92, whereby the rotary movement of the gear is imparted to said shaft 92 only when the gear 91 rotates in the direction of the arrow, whereas the shaft 92 is kept in a stationary position when the gear 11 revolves in the contrary direction. The reciprocating rotary motion of the gear 11 is provided by the same motion of the gear 87 driven by the connecting rod 86, when the elbow lever 75 makes a reciprocating movement by the action of the cam disc 76.

Over the oscillating plate 89 carrying the abovementioned gears is provided a lever 107 which is pivoted on the side wall 1a by a shaft 108 and which is urged to rotate counterclockwise around said shaft 108 by the force of a spring not shown. The notched portion 107a on the left end of said lever 107 is engaged with the abutment 89a of the aforesaid oscillating plate 89, while the right end of said lever extends in the movement path of a pin 109 fixed on the back of the aforesaid movable member 78.

The plate cylinder 2 is provided at an end face thereof, and coaxially therewith, with a gear 111a (not shown) with which is meshed a gear 112 (FIG. 1) fixed on a shaft 111. The gear 112 is fixed with a cam disc 113 which is pressed with a roller 115 secured on an arm end of a bell crank 114, the other arm of said bell crank 114 being pressed against a roller 117 provided on the free end of a connecting arm 116. The bell crank 114 is pivoted by means of a shaft 119, on a slidable member 118 which is slantly mounted on the side wall 1a with two headed studs, so that the position of the fulcrum is rendered shiftable according to the movement of said slidable member 118. A notch 118a provided on the said slidable member 118 is loosely fitted with a pin 120 secured on one end of a lever 119a which fits by a pin 121 fixed on the other end thereof, loosely in slot of a handle lever 122 mounted on the side wall 1a with a shaft 123, said handle lever 122 adapted to move within the limits of a slot 124 provided on said handle lever 122.

The above mentioned handle lever 122 is pushed up by the force of a warped spring 125, the spring being fixed with the aforesaid pin 121 at one end and with a pin 126 fixed on said handle lever 122 at the other end, the end of said pin 126 being engaged with an uneven edge 127a formed on a fixed plate 127 for click-stops.

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The connecting arm 116 (FIG. 1) which is pivotally mounted on the side wall 1a by a shaft 128, carries a pin 129 which pierces through an arc slot (not shown) on the side wall 1a. The pin 129 is pressed with an extension 132a of a supporting plate 132 supported by a shaft 131 of a damping roller 130 axially provided between the side walls. The supporting plate 132 (FIG. 2) is provided with a movable roller 133 axially mounted thereon which is pressed on the said damping roller. The aforesaid cam plate 113 is pivotally mounted with an end of a connecting link 134 extending towards the upper left direction, said link being pivotally mounted, at the other end, on a free end of an arm 136 by a shaft 137, said arm being loosely mounted on a shaft 135. The said shaft 135 is fixed with a ratchet wheel 138 (FIG. 3) which is adapted to rotate with oscillation movement of the arm 136, in the direction of the arrow (FIG. 2) by a feed finger 139 (FIG. 3) provided on the shaft 137. The shaft 135 integrated with said ratchet wheel 138 is fixed with fountain roller 141 for supplying printing ink 140 as shown in FIG. 2.

The shaft 30 extended through the side wall 1a as shown in FIG. 1, is fixed with a cam 142 thereon as shown in FIG. 2. The cam 142 is pressed by two pins 143 and 144. The pin 143 is provided on a movable supporting arm 147 which is loosely mounted, at its base portion, on a shaft 146 of an ink distribution roller 145, while the other pin 144 is provided on an extension 148a of another movable supporting arm 148 which is likewise loosely mounted on the same shaft 146. The said movable supporting arm 147 carries a slot 151 along which a foam roller 149 axially associated therewith is rendered movable, while the other movable supporting arm 148 carries a slot 152 along which an ink distribution roller 150 axially associated therewith is permitted to move. Extending between both side walls 1a and 1b and fixed thereupon by studs 154 is a spring relief member 155 which is mounted with the shaft 153 of said foam roller, at one end 155a thereof, and with the shaft 156 of said ink distribution roller 150 at the other end 155b. Thus, the foam roller 149 takes a position apart from those of the ink distribution roller 145 and the plate cylinder 2, while the ink distribution roller 150 is maintained apart from said roller 145. A roller 157 located between said ink distribution roller 150 and the aforesaid fountain roller 141 is adapted to transfer the ink from the fountain roller 141 to the ink distribution roller 150.

The ink fountain roller 141 is rotated in the direction of the arrow (FIG. 2) by the action of the ratchet wheel 138, whereby the ink 140 is supplied through an ink doctor roller 157, the amount of ink to be supplied being determinable by the revolution angle of the roller 141 rotated by said ratchet wheel. That is to say, referring now to FIGS. 1 and 3, ink supply is determined by the revolution angle corresponding to the number of teeth of the ratchet wheel 138 forwarded by the feed finger 139.

Reference should now be had to FIGS. 3 and 4. Rotatably superposed on the back of the ratchet wheel 138 is a control plate 158 which is overlaid, on the back thereof, by a slidable plate 159. The said slidable plate 159 carries a handle lever 160 fixed therewith and a slot 162 loosely fitted with a pin 161. 163 is a pin pressed on an uneven edge 164a of a stationary plate 164 by the elastic force of a spring 165. The control plate 158 carries guide pin 166 fixed thereon which is loosely fitted in a groove 167 provided on the slidable plate 159. The aforesaid spring 165 is fixed, at one end, to the base portion of the handle lever 160 and at the other end, to the guide pin 166.

The control plate 158 can be rotated by first pressing down the handle lever 160 against the force of a spring 165 to disengage the pin 163 from the uneven edge and then moving said handle lever. In this manner, by suitably rotating the control plate 158 whose circumference is pressed by the feed finger 139, the distance to be covered by the rotating ratchet wheel 138 through movement of

the feed finger 139 is adjustable. Further, a manual operation knob (FIG. 4) is provided on the outer end of the roller shaft 135.

The lower portion of the aforesaid damping roller 130 is dipped in the water of a water fountain 169, as shown in FIG. 6. Referring now to FIGS. 5 through 7, 169a represents a drum having a pedestal section which is interconnected with said water fountain 169 through a hole 170, 171 and 172 are oscillating arms which are respectively pivotally secured on the side walls 1a and 1b by shafts 173. Carrying the water fountain 169 is a receiving plate 174 which is also connected to said oscillating arms. 175 represents a rotatable shaft carried by lugs 171a and 172a at lower left ends of said oscillating arms. 176 is an operation piece which is secured, at its one end, on shaft 175 by a stud 177. Fixed to the ends of said shaft 175 are provided tiltable arms 176 and 179 which respectively carry, at slots 178a and 179a, shafts 180 and 181 secured on the side walls 1a and 1b. Further, there are provided wrapped springs 182 and 183 which are respectively secured, at one end thereof on pins 186 and 187 to the side walls 1a and 1b (FIG. 5).

The water fountain 169 is securely positioned on pins 188 and 189 provided on the lateral sides thereof loosely fit in grooves 171b and 172b formed on the aforesaid oscillating arms 171 172, while the back of said water fountain rests on the control piece 176. The water fountain 169 can be removed out of the printing machine by first pressing down the operation piece 176 with a finger tip, which rotates said shaft 175, causing oscillating arms 171 and 172 to oscillate around a shaft 173 as shown in FIG. 7 and then drawing said water fountain towards the direction of the arrow. In this case, the water does not spill from the water fountain as the water moves into the drum 169a through the connecting hole 170. Further, the horizontal position and the tilted position of the water fountain shown in FIG. 7 are held by the elastic force of springs 181 and 182.

Referring now to FIG. 2, on the end of a shaft 7 of the operation lever 6 extending out of the side wall 1b is fixed disc 190 which activates a switch when the operation lever 6 takes an ink distribution position A (FIG. 1). A pin 191 fixed on the disc 190 pushes up, when the operation lever 6 takes a cleaning position E, and end of a lever 193 which is pivotally mounted at a fulcrum thereof on the side wall 1b with a shaft 192, so as to render the cleaning device connected to the other end of the lever 193 operative. A slot 193a provided at the end of said lever 193 is loosely fitted with a pin 195 of a short arm 194 which is fixed to a rotatable shaft 196 extended between the side walls 1a and 1b.

An eccentric axis 196a formed integral with said shaft 196 fits loosely in a notch 198 provided on a frame plate 197 of the cleaning device, so that when said eccentric axis 196a is rotated by an action of said short arm 194, the frame plate 197 will slightly rotate clockwise around a shaft 199 secured in a side holder.

The frame plate 197 (FIG. 8) supports a container 201 accommodating cleaning solution 200, FIG. 8, in which is dipped to lower portion of a roller 202 axially provided on said frame plate. The roller 202 is pressed with a cleaning roller 203 by the force of springs 204 acting on both ends of the latter roller. Fixed on rotatable shaft 205 on the frame plate 197 are the base portions of two stopper levers 206 which are urged to rotate with said shaft 205 in a counterclockwise direction by the force of a platen spring 207. Downwardly bent pieces 206a provided on both ends of the stopper lever 206 help prevent the frame plate 197 from slipping off from the aforesaid shaft 199 fitting in the bearing section 208 of the frame plate. Therefore, the frame plate 197 or the cleaning device can easily be removed by drawing it to the left as shown in FIG. 8, after revolving the stopper lever 206 in a clockwise direction against elasticity of the platen spring 207, clearing bent pieces 206a from the bearing

portion. FIGS. 11 through 14 indicate plate cylinder 2 only. The inner sides of both end plates of the plate cylinder 2 are pivotally mounted on a shaft 211, with arms 210 which are urged to rotate in a clockwise direction by the force of a spring 209, the free end of said arm extending to the broken circumference 2a of the plate cylinder. An end surface 2b formed in the broken circumference 2a is pressed with a spring form clamping plate 212 extended between the arms 210. The slant face of said broken circumference 2a is provided with numerous holes 213 which are engageable with fingers 214a of a finger plate 214.

The above mentioned finger plate 214 carries, at its both ends, bent arms 215 which are respectively connected with free ends of movable short arms 216 which, in turn, are fixed with end plates of a plate cylinder 2, the aforesaid fingers 214a being attracted, by the elasticity of spring 217, in such direction as to render the fingers 214a pressed into the perforations 213.

Referring now to FIG. 14, 218 is an oscillating arm fixed on the aforesaid shaft 211 at the other side of the end plate of the plate cylinder 2. 219 represents a roller axially provided on an oscillating arm 218. 220 is a cam pivotally mounted by a stud 221 on the end plates. 222 is an operation member formed integral with a cam 220. By turning said operation member 222 in a counterclockwise direction around a stud 221, the roller 219 is pushed forward by the action of the cam 220 causing the oscillating arm 218 to rotate in the direction of the arrow, whereupon the arm 210 inside the plate cylinder 2 is oscillated against the force of a spring 209, causing the printing form clamping plate 212 provided on said arm 210 to disengage from an edge 2b of the plate cylinder 2. By inserting a printing form 223 between said disengaged clamping plate 212 and said edge 2b and restoring said cam 220 to its initial position to hold an end of the printing form 223, and by fitting the finger 214a of the finger plate 214, which had been extracted against the force of springs 217, in the perforations provided on the other end of the printing form and returning such extracted finger plate to its original positions as shown in FIG. 12, the printing form 223 is rolled tight on the plate cylinder 2.

Furthermore, the printing form can be easily mounted on a plate cylinder by fitting said protrusions 225 into the perforations of the printing form without requiring insertion work of the printing form as hereinbefore described.

Operations of an offset printing machine according to this invention can be understood in the following description. Referring now to FIG. 1, the operation lever 6 is turned from a stationary position S to ink distributing position A, the arm 31 is rotated counterclockwise by means of connecting rod 29, causing the cam 142 (FIG. 2) to revolve in the same direction. This causes pins 143 and 144 pressed to the cam 142 to disengage from the depressed portion of said cam as shown in FIG. 15, rotating, on one hand, a movable supporting arm 147 in a clockwise direction around shaft 146 and on the other hand, a supporting arm 148 moves clockwise around shaft 146. As a result, respective shaft ends 153 and 156 of rollers 149 and 150 supported by the aforesaid supporting arms are disengaged from both ends 155a and 155b of a relief member 155, pressing rollers 149 and 150 respectively on roller 145, thereby performing an ink distribution operation.

By rotating the operation lever 6 to an inking position B after distributing the ink for a while, the aforesaid cam 142 is further rotated to disengage the pin 143 from the second stage of the cam 142, causing the movable supporting arm 147 to rotate in a clockwise direction around a shaft 146, thereby pressing a roller 149 onto the plate cylinder 2 for inking performance.

By turning the operation lever 6 to the test printing position C, after inking performance, as shown in FIG. 16, a pin 82 fixed to the control plate 9 is moved against

the release lever 81 which, in turn, is caused to rotate around a shaft 79a, disengaging a short arm 80 from a movable member 78. As a result, the elbow lever 75 connected with said movable member 78 and the gear 87 connected with said elbow lever 75 are provided with a reciprocating movement, causing, on one hand, the gear 87 to rotate in the direction of the arrow shown in FIG. 18 and on the other hand, a friction wheel 95 to press on the copy sheet to deliver one sheet at a time between a blanket cylinder and an impression cylinder. The pressing operation of said friction wheel 95 is activated by the motion of a cam disc 105 (FIG. 18) through a thrust lever 97 and a bell crank 102.

When one copy sheet is thus delivered by one reciprocating movement of the elbow lever 75 and the returning movement of the removable member 78 from the position shown in FIG. 16 to its initial position shown in FIG. 18, the return member 22 connected with said movable member 78 through a spring 84 is rotated counterclockwise around shaft 108 by the contraction force of said spring 84. During the aforementioned operation, the return member 22 rotates, at the lateral edge of its extremity, a pin 14 until the control plate 9 takes a position corresponding to inking position B of the operation lever 6, preventing pin 82 from applying pressure on a release lever 81 which, thereupon, makes an oscillation movement back to its initial position by its own inertia to be engaged with a movable member 78. Oscillation of said elbow lever 75 being thus stopped, copy sheet feeding operation is accordingly prevented. Upon return of said movable member 78 to its initial position, a lever 22, which had been held in a rotated position by a pin 109 fixed on said movable member 78, returns to its original position by its inertia as shown in FIG. 1, engaging with the abutment 89a of an oscillating plate 89 and thus preventing the oscillating motion of said oscillating plate 89.

On the other hand, when the operation lever 6 is set in a test printing position C, the pin 39 of the control plate 9 rotates one end 36 of the first stopper arm 33 against the free end of the latter as shown in FIG. 16, disengaging a bifurcated lever 42 from the first stopper arm 33 for free oscillation movement of said bifurcated lever 42. Concurrently, the aforesaid pin 39 pushes the wire spring 38 of the second stopper arm 35, causing oscillation motion of the second stopper arm 35 so that, when the trifurcated lever 43 revolves around a shaft 41 in a counterclockwise direction, as shown in FIG. 16, said stopper arm 35 is so positioned as to be ready to catch the upper end of said trifurcated lever 43, as shown in FIG. 18.

Under a status as hereinabove described and in which the bifurcated lever 42 is disengaged from the first stopper arm 33 and the trifurcated lever 43 takes a position ready to be engaged by the second stopper arm 35, if, as shown in FIG. 18, the trifurcated lever 43 were rotated around a shaft 41 by the reciprocating motion of an arm 46 through the action of a cam disc 51, the upper end of the trifurcated lever 43 will engage with the second stopper arm 35 and will be prevented from return movement which would otherwise have occurred, by the force of a spring 45, whereupon the oscillating arm 46 will be rendered to make an idle motion only.

When the trifurcated lever is held in a counterclockwise rotated position as hereinbefore described, the bifurcated lever 42, which is connected with said trifurcated arm lever 43 through a spring 44, will be rotated in a counterclockwise direction by the force of said spring 44, slightly rotating an eccentric shaft 41 fixed on said bifurcated lever 42 in the same direction. Accordingly, the plate cylinder 2 rotatably mounted on a shaft 40 integrated with the aforesaid eccentric shaft 41 is pressed to the blanket cylinder 3 as shown in FIG. 20, thereby transferring the inked image of the printing form to the latter cylinder. This pressed status of the above men-

tioned two cylinders is restored to a detached status instantaneous with an automatic return of the operation lever 6 from the test printing position C to the ink distribution position B, whereby the pressure applied by pin 39 upon the first and the second stopper arms 33 and 35 is removed.

Needless to mention, however, an operator can manually hold the operation lever 6 in the test printing position C to obtain desired number of test prints although said lever would otherwise return automatically to the ink distribution position B after one copy sheet is printed, as hereinbefore described.

By turning the operation lever 6 to the continuous printing position D (FIG. 22) after test printing, the notch 15 of stopper 16 engages with a hook lever 20 and a pin 82 releases lever 81, disengaging the movable member 78, as was the case with the test printing operation, and thereby starting the paper feeding operation. The first stopper arm 33 and the second stopper arm 35 also take the same positions as in the case of the test printing operation, pressing the plate cylinder to the blanket cylinder. The difference between setting the operation lever 6 in the continuous position D and placing the same in the test printing position C is that, in the former case the notch 15 of the stopper member 16 is engaged with the hook lever 20, so that, when the movable member 78 makes a return movement from the position shown in FIG. 22 with the return member 22 trying to move pin 14 by the force of spring 84, the pin 14 remains stationary due to its engagement with stopper member 16.

In the case of the continuous printing, the desired number of prints can be preset on a print counter device. After such preset copies are printed, a movable member 27 of an electromagnetic plunger connected with the aforesaid hook lever 20 through a spring 26 moves to the left, as seen in FIG. 22, rotating said hook lever 20 against the elasticity of spring 24, thereby disengaging said hook lever from the stopper member 16. The pin 14 of said stopper member 16 is pushed by the return member 22 as was the case with the test printing operation, thereby rotating the operation lever 6 back to the ink distributing position B.

The blanket cylinder 3 is pressed on the impression cylinder 4 only when a copy sheet is fed thereto. When an oscillating arm 63 on a fulcrum 62 oscillates upon revolution of a cam disc 67, as shown in FIG. 19, a bell crank 55 rotates clockwise around an eccentric shaft 53 against the force of spring 59, causing an arm lever 54 to rotate in the same direction through spring 58 which, in turn, causes said shaft 53 fixed on said arm lever 54 to make a slight rotary movement, whereby the blanket cylinder 3, mounted on shaft 52 integral with said eccentric shaft 53, is pressed onto the cylinder 4 as shown in FIG. 20. Degree of pressure between said two cylinders 3 and 4 can be adjusted by an arm (not shown) or the arm lever 54 fixed to the above mentioned shaft 52, said arm or arm lever being pressed to an adjustable stopper (not shown) composed of an eccentric plate. The pressed status of said two cylinders is maintained, as shown in FIGS. 1 and 2, while a stopper member 57 provided substantially integral with said bell crank 55 is engaged with an end notch 58a of a stopper lever 68 (FIGS. 1 and 2) so as to prevent the returning movement of said bell crank 55.

If, however, a copy sheet were not delivered between the blanket cylinder 3 and the impression cylinder 4, an oscillating piece 257 (FIG. 20) provided on an end plate of the impression cylinder 4 is rotated counterclockwise around a shaft 258, rendering an extension 257a of said oscillating piece 257 to take a shifted position away from roller shaft 66. Under a status as hereinabove described, if the impression cylinder 4 rotates in the direction of the arrow, said extension 257a kicks the lower end 70a of a feeler arm 70, oscillating a stopper lever 68 integrated with said feeler arm 70, in the direction of the

arrow, causing thereby said stopper lever 68 to disengage from the stopper member 57 (FIG. 19) whereby the bell crank 55 and the lever 54 are returned to their initial position, detaching the blanket cylinder and the impression cylinder 4. Engagement and disengagement of the blanket cylinder and the impression cylinder takes place at each revolution of cam disc 67. That is to say, the two cylinders are attached, as shown in FIG. 19, each time an oscillating arm 63 is pushed out by an angular cam 67a of said cam disc 67 and when broken portions formed on respective cylinders are aligned as shown in FIG. 20.

Therefore, the inked image on the blanket cylinder 3 would not be transferred onto the impression cylinder if a copy sheet were not delivered therebetween.

The broken portion of said impression cylinder is provided with a copy sheet clamping device which clamps the leading edge of a copy sheet fed by the paper feeding device and drags said copy sheet between the blanket cylinder and the impression cylinder. If this clamping device failed to catch such copy sheet, head portion of a pin (not shown), shiftable in the radius direction of the impression cylinder is adapted to protrude into the circumference of said cylinder and an oscillating piece 257 is adapted to act though being coupled with said protruding movement on a feeler arm 70. If the clamping device caught the copy sheet, the aforesaid pin is prevented by the copy sheet from protruding out to the circumference of the cylinder, thereby causing the aforesaid oscillating piece 257 to take inner position of the cylinder than as shown, which prevents said oscillating piece 257 from acting on said feeler arm 70.

While the oscillating member 73 (FIGS. 1, 19 and 21) cooperating with a cam 71 makes a reciprocating movement at each revolution of a cam 71 when a bell crank 55 is held in a position as shifted by a stopper lever 68, as shown in FIG. 19, or when a copy sheet is normally delivered between the blanket cylinder 3 and the impression cylinder 4, if the aforesaid stopper lever 68 and the stopper member 57 were disengaged, as shown in FIG. 21, by the action of a feeler arm 70 shown in FIG. 20, or if the printing operation were not performed, a stopper member 56 integrated with said bell crank 55 engages with the left end of the oscillating member 73, preventing the oscillation motion of the latter.

The oscillating member 73 is thus adapted to oscillate only when the printing operation is performed. Accordingly, correct number of prints made will always be obtained if, said oscillating member 73 were used as a driving element for a print member indicator.

If conventional accumulating calculator were employed in said print number indicator, the driving axis of the accumulating calculator may be provided with a ratchet wheel which will be rendered rotatable by a reciprocating movement of the aforesaid oscillating member 73. The indicator may be so designed as to enable presetting of the desired number of prints and may be adapted to activate the aforesaid electromagnetic plunger so as to automatically stop the printing operation as hereinbefore described.

By turning the operation lever 6, after the hereinabove described printing operation, from the ink distributing position B to a cleaning position E following the return movement of said operation lever from the continuous printing position D to said position B, the lever 193 (FIG. 23) is rotated counterclockwise around a shaft 192 by a pin 191 and a shaft 196 integrated with a short arm 194 revolved clockwise, whereby an eccentric axis 196a formed integral with said shaft 196 is rotated, causing a frame plate 197 to make a slight revolution around a shaft 119, thereby pressing a cleaner roller 203 onto the circumference of the blanket cylinder 3 so that inked image adhered on the rotating blanket cylinder can be removed therefrom. Returning the operation lever 6 thereafter to its stop position causes all of the printing machine operations to stop.

As evident from the heretofore explained description, a rotary printing machine according to this invention is not only enabled to perform the ink distribution, inking and continuous printing operations with one single operation lever, but also enabled to perform a test printing operation prior to continuous printing operation, and a blanket cleaning operation with the same single lever, whereby continuous operation of various functions and ease and efficiency of operation are ensured.

An additional control for the engagement of the plate cylinder with the blanket cylinder is illustrated in dashed lines in FIG. 20. This is a manual control which limits the counterclockwise movement of arm 42 as viewed in FIG. 20, and thus controls movement of plate cylinder 2 in the direction of cylinder 3. This control may consist of a shaft 250 upon which is mounted a cam 251 in the same plane as arm 42. The shaft 250 is mounted on the side plate of the machine and may extend through it to support a control handle on the outside of the machine. When the shaft 250 is turned the cam 251 will act as an adjustable stop for the counterclockwise movement of the arm 42. Inasmuch as arm 42 through the axial shaft 41 and the offset axle 40 moves the plate cylinder 2 toward and away from blanket cylinder 3, the stop cam 251 will serve to limit the approach of cylinder 2 to cylinder 3. This is an alternative arrangement which may or may not be used on the machine described herein.

Similarly, the degree of pressure between cylinders 3 and 4 may be adjusted by the action of eccentric 261 (FIG. 20) on arm 54. Eccentric 261 is mounted on a rotatable shaft 260 which in turn may be supported in an end plate of the machine.

The invention claimed is:

1. In a rotary offset printing machine having a plate cylinder, a blanket cylinder, an impression cylinder, inking means and cylinder cleaning means, the combination of a control handle, means operable by said handle to stop the machine, means operable by said handle upon moving it one notch from the handle stop position for actuating a cleaning roller to operate upon said blanket cylinder to clean the surface of the cylinder, means operable by said handle upon moving it one notch from the handle stop position on the opposite side of said stop position from the position for putting the cleaning means into operation for actuating means to cause the machine to operate for automatic consecutive printing of one sheet after another, means operable by said handle upon moving it one more notch in the same direction as the last mentioned movement for actuating a test printing cycle for the production of only a very few copies of the sheet to be reproduced, means operable by said handle upon moving it one more notch in the same direction as the last mentioned movement for inking said plate cylinder, and means operable by said handle upon moving it one more notch in the same direction as the last mentioned movement for distributing ink on ink feed rollers adapted to carry the ink to said plate cylinder.

2. An engagement and disengagement device for a plate cylinder and a blanket cylinder in an offset printing machine characterized in that it comprises an operation lever which by gradual rotation within a certain rotating angle, serves to activate ink distributing means, inking operation means, and paper feeding means respectively; an operation arm loosely fitted on an eccentric axis of said plate cylinder, said operation arm being adapted to make a reciprocating oscillation movement; a movable arm fixed on said eccentric axis and connected with said operation arm by a spring; a first stopper member engageable with said operation arm; a second stopper member engageable with said movable arm; means adapted to disengage said movable arm from said first stopper member when said operation lever is in a position of activating said paper feeding device, means for said operation of arm and said stopper to engage with each other in a position where said operation arm makes an oscillation movement in such di-

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rection as to press said plate cylinder to said blanket cylinder.

3. An engagement and disengagement device for a plate cylinder and a blanket cylinder in an offset printing machine as in claim 2, in which an operation arm is urged to rotate by the force of a spring for driving said arm in such direction as to detach a plate cylinder from a blanket cylinder, said blanket cylinder being provided with a cam which oscillates said operation arm against the bias of said spring, said cam being so shaped as to act on said operation arm only when a broken circumference formed on the plate cylinder is rotated to face against the blanket cylinder, means providing engagement between said operation arm and said second stopper member, spring means providing said operating arm with rotative bias until the aforesaid cam acts on said operation arm after an operation lever is rotated back in such direction as to disengage said operation arm from said second stopper member.

4. An engagement and disengagement device for a plate cylinder and a blanket cylinder in an offset printing machine as set forth in claim 2 in which there is an eccentric shaft, a movable arm fixed on said shaft, said movable arm connected with said operating arm through

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a spring; a second eccentric shaft adapted to adjust the pressure between said two cylinders upon rotation thereof; an arm on said second eccentric shaft; a cam adapted to contact said arm and limit its movement to regulate pressure between the two cylinders.

References Cited

UNITED STATES PATENTS

2,306,044	12/1942	Davidson	101—144
3,056,346	10/1962	Gammeter et al.	101—144
3,264,981	8/1966	Burger et al.	101—144
3,286,622	11/1966	Mestre	101—144 XR
3,294,019	12/1966	Taylor	101—144
3,303,778	2/1967	Tonkin et al.	101—144

FOREIGN PATENTS

870,815	6/1961	Great Britain.
923,376	4/1963	Great Britain.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,490,367 Dated January 20, 1970

Inventor(s) Tamaki Kaneko and Yoshiharu Kagari

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

Column 7, line 26, after "171" insert --and--; line 60, change "to" to --the--. Column 10, line 63, change "58a" to -- 68a --. Column 11, line 7, change "its" to -- is --; line 24, change "though" to -- through --.

SIGNED AND
SEALED
JUL 14 1970

(SEAL)

Attest:

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