Nov. 17, 1953 R. W. QUIRK 2,659,303

PUMP ACTUATING MEANS FOR ROTARY DUPLICATING MACHINES

Filed Dec. 6, 1948

8 Sheets-Sheet 1

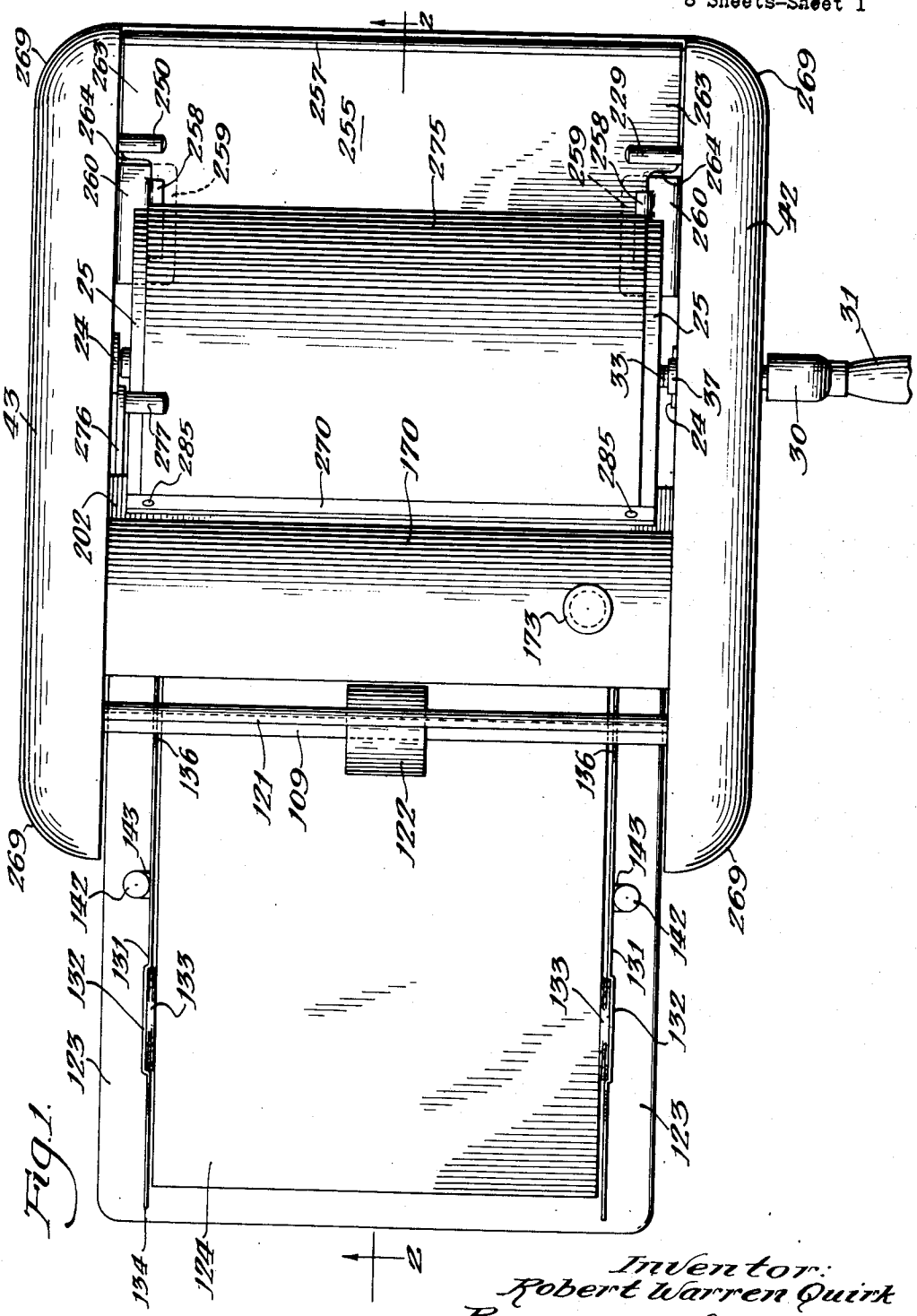



Fig. 1.

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8 Sheets-Sheet 2

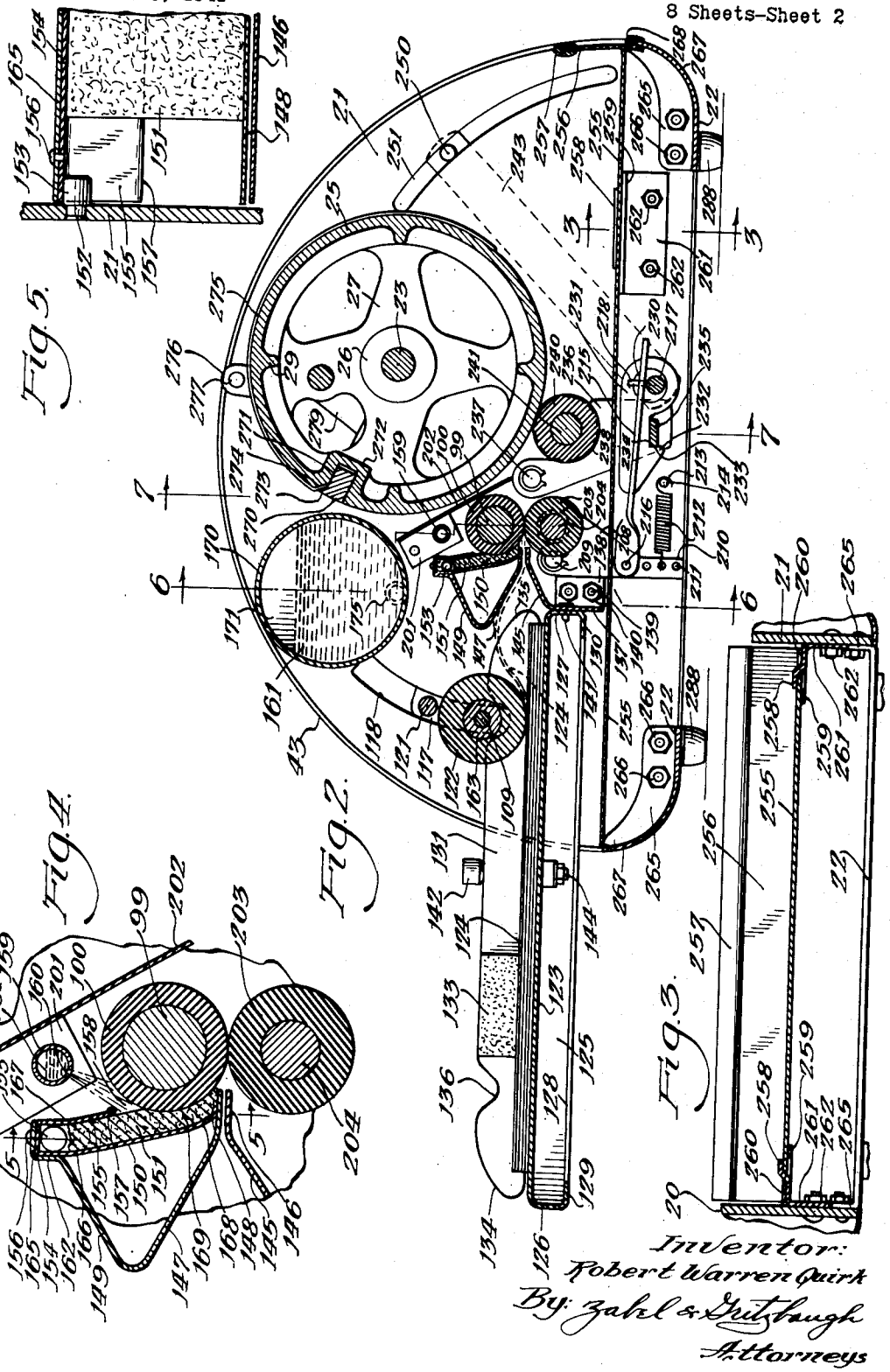


Fig. 5.

Fig. 2.

Fig. 4.

Fig. 3.

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8 Sheets-Sheet 3

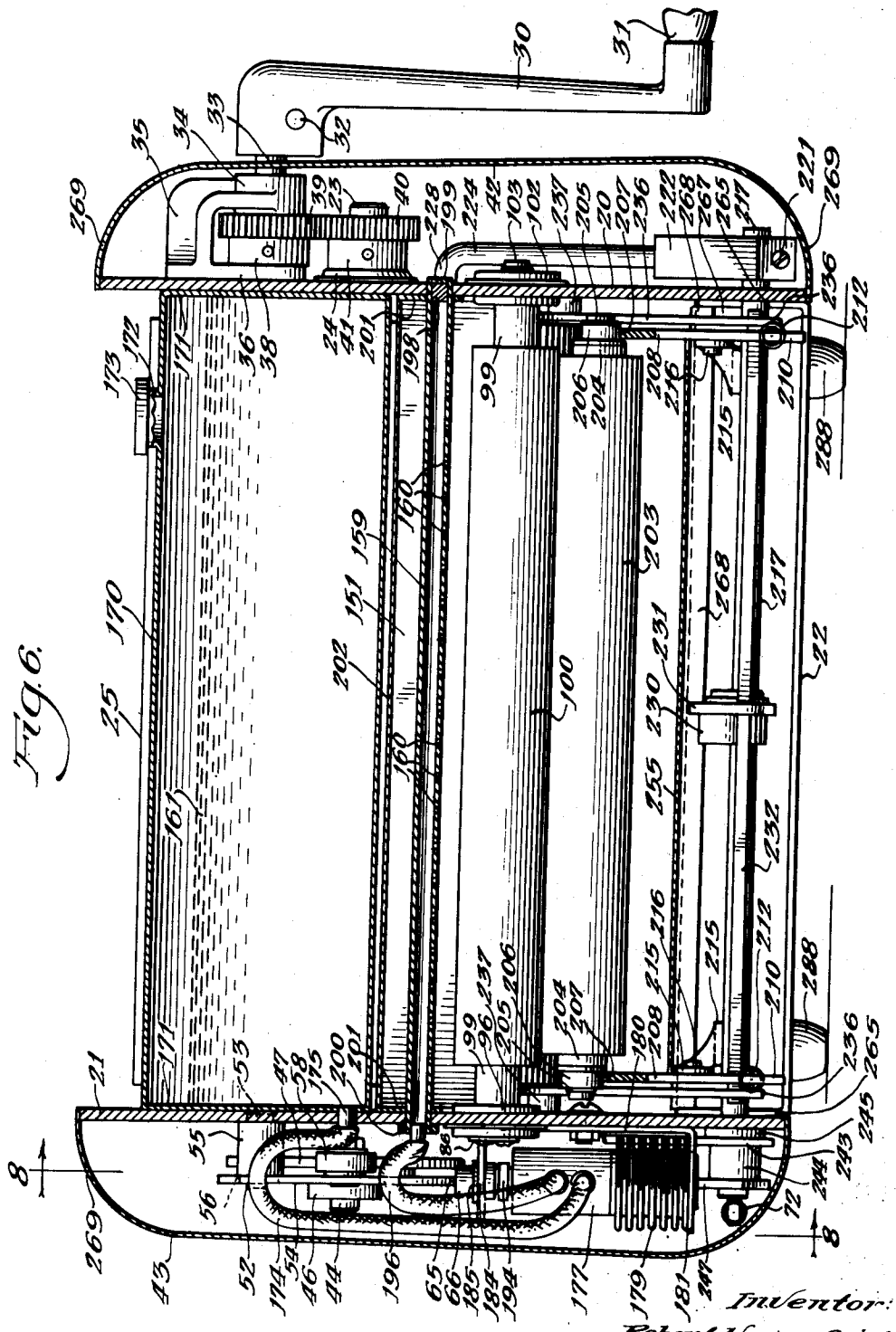


Fig. 6.

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PUMP ACTUATING MEANS FOR ROTARY DUPLICATING MACHINES

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8 Sheets-Sheet 4

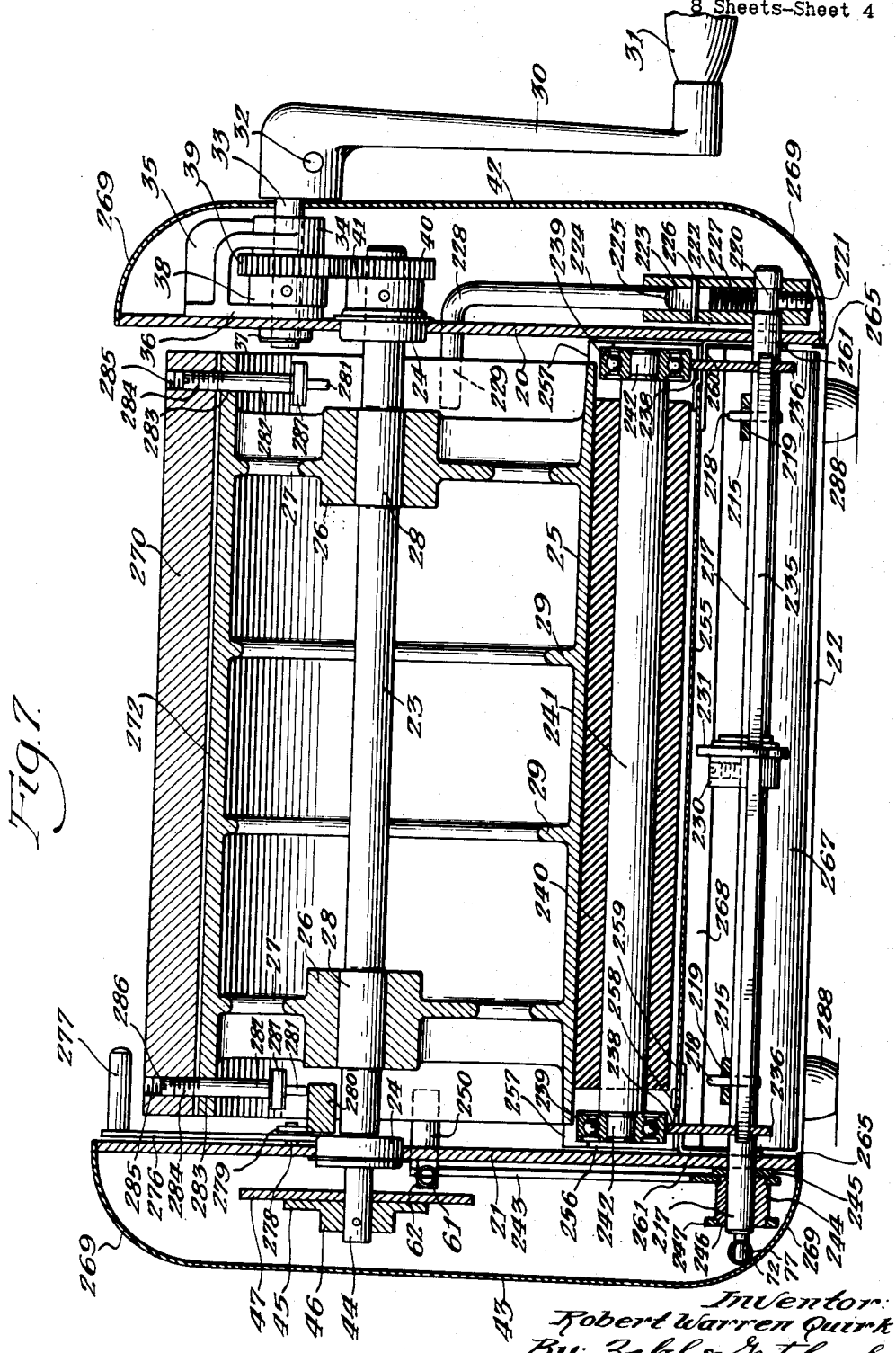


Fig. 7.

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PUMP ACTUATING MEANS FOR ROTARY DUPLICATING MACHINES

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8 Sheets-Sheet 5

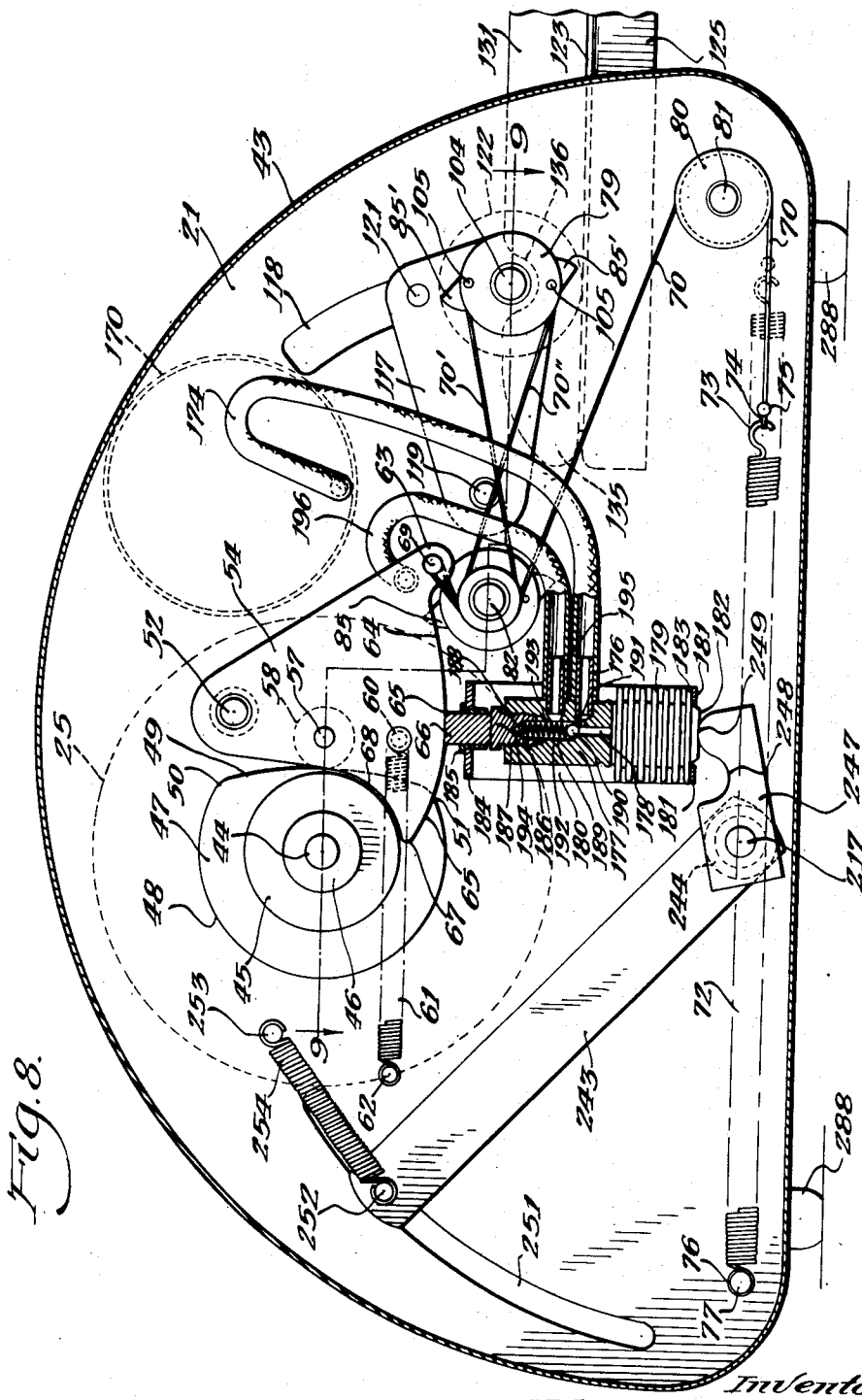


Fig. 8.

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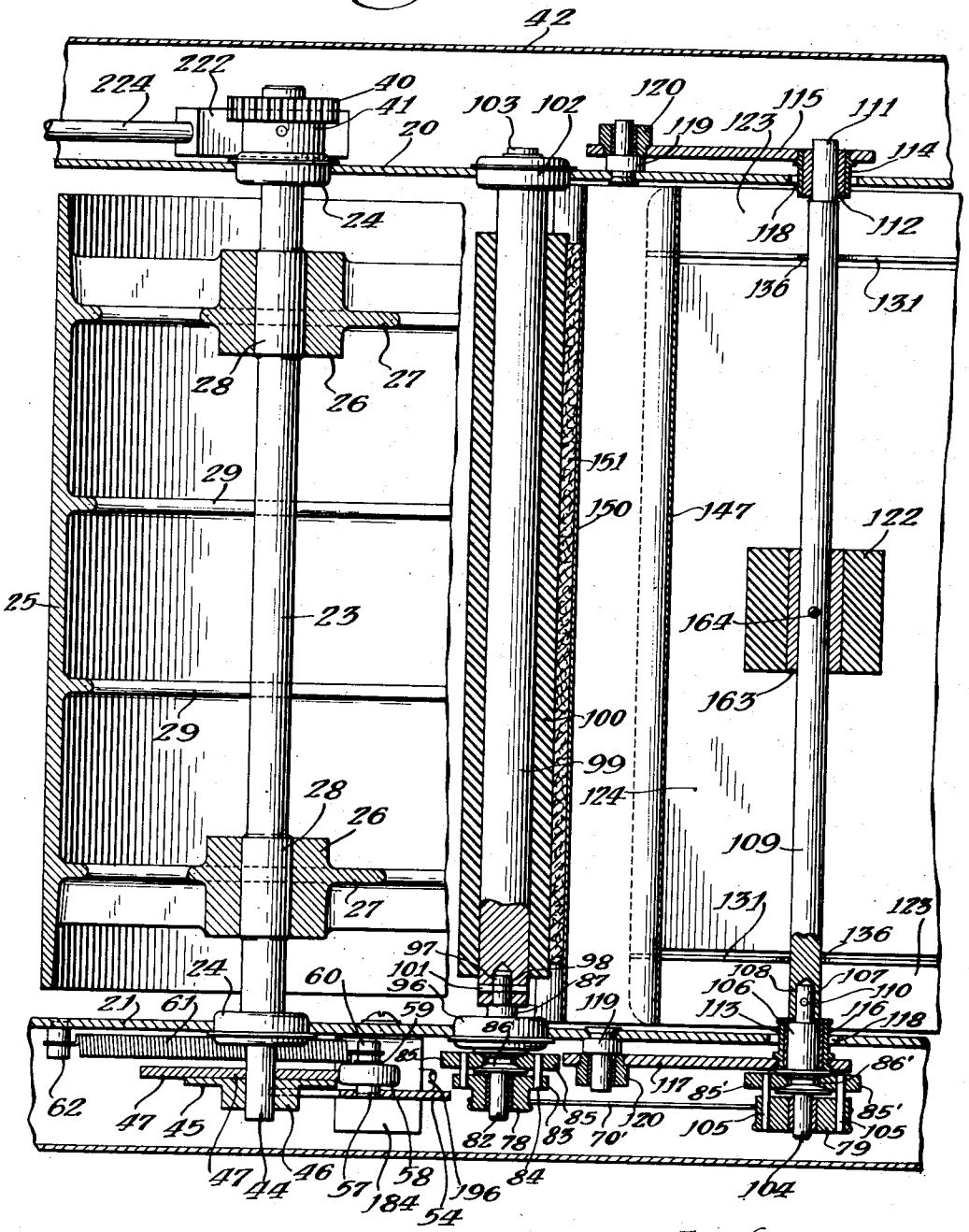
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PUMP ACTUATING MEANS FOR ROTARY DUPLICATING MACHINES

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Fig. 9.




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PUMP ACTUATING MEANS FOR ROTARY DUPLICATING MACHINES

Filed Dec. 6, 1948 8 Sheets-Sheet 7

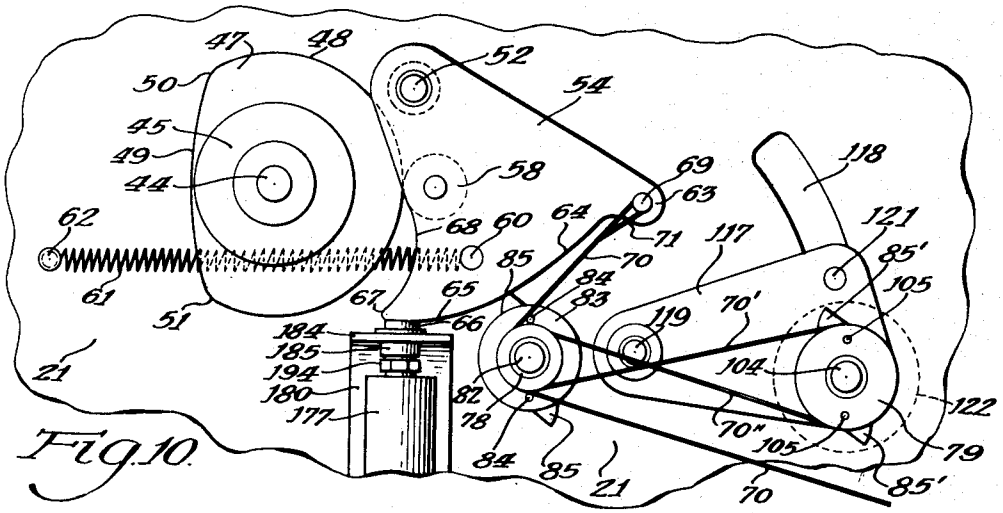



Fig. 10.

Fig. 11.

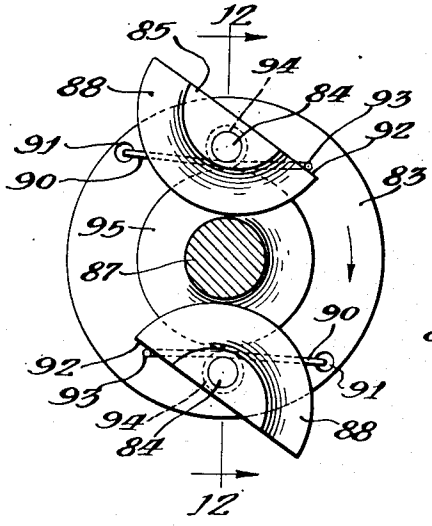
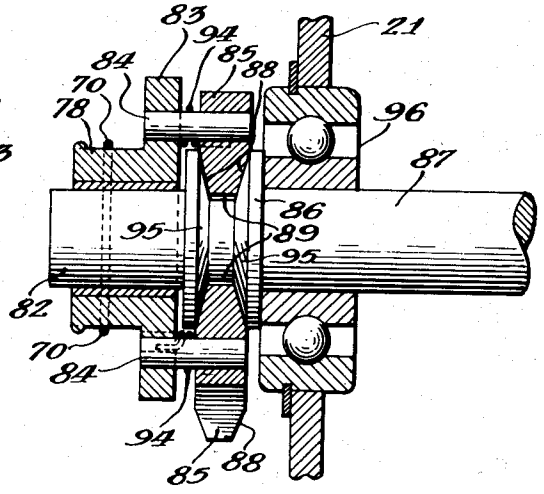



Fig. 12.




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PUMP ACTUATING MEANS FOR ROTARY DUPLICATING MACHINES

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8 Sheets-Sheet 8

Fig. 13.

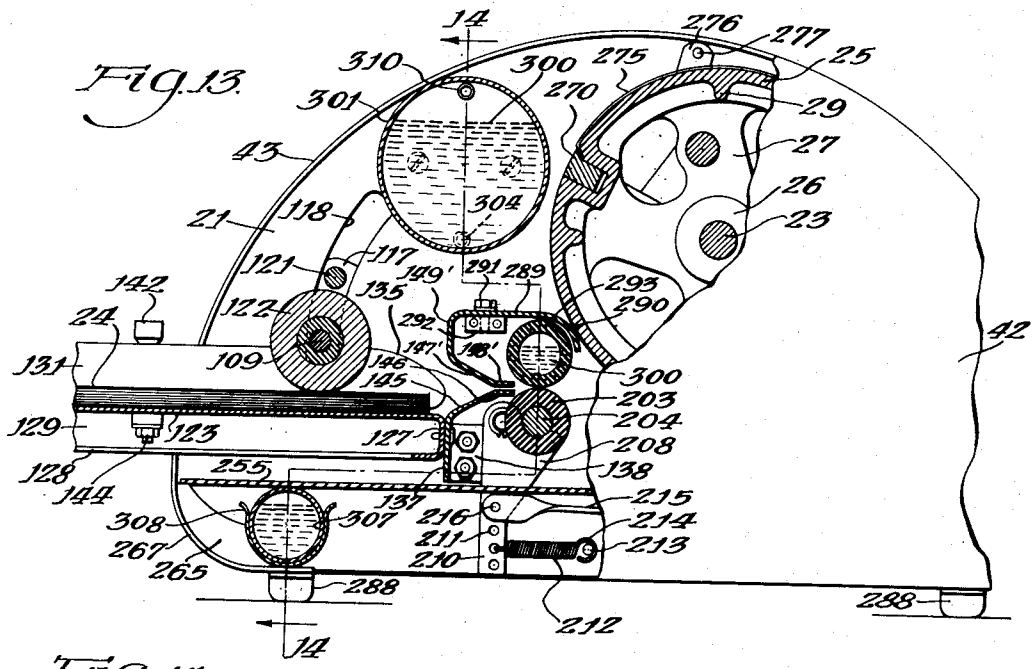
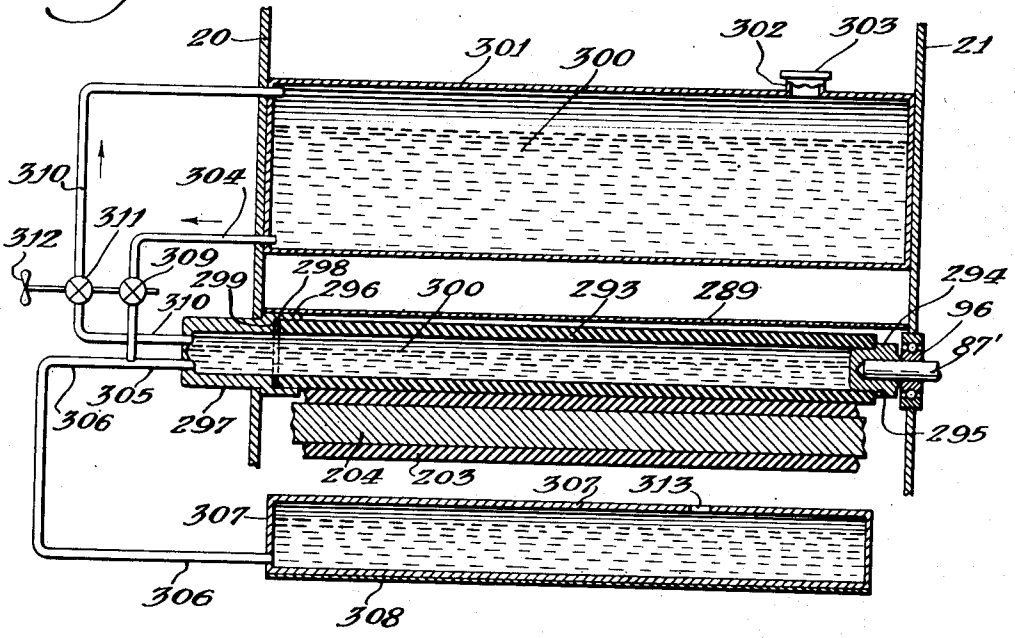



Fig. 14.




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Patented Nov. 17, 1953

2,659,303

# UNITED STATES PATENT OFFICE

2,659,303

## PUMP ACTUATING MEANS FOR ROTARY DUPLICATING MACHINES

Robert Warren Quirk, Chicago, Ill., assignor to Ditto, Incorporated, Chicago, Ill., a corporation of West Virginia

Application December 6, 1948, Serial No. 63,703

4 Claims. (Cl. 101—132.5)

1

My invention relates to duplicating machines, and more particularly to a liquid process duplicating machine.

In duplicating machines that utilize a drum for carrying the master against which sheets are engaged to imprint matter from the master on said sheets, a feed tray is provided from which sheets are fed one at a time to engage with the master on the drum, and it is an important purpose of my invention to provide new and improved driving means for the feeding apparatus for said sheets to transfer the sheets from the stack one at a time to feed rollers and into engagement with the master on said drum.

It is an important purpose of my invention to provide a driving mechanism for said feeding means that is of a simple and cheap construction, but which is reliable and which is effective to first pick up a sheet from the top of a stack and feed it into the bight of a pair of feed rollers and then rotate said feed rollers so as to feed the sheet into position between an impression roller and the drum on which the master sheet is located, at such a rate that the sheet is traveling at the same speed as the surface speed of the drum when it engages with said drum and impression roller, so as to prevent any buckling of the sheet as it comes into engagement with the master.

It is a further purpose of my invention to provide a driving means of the above mentioned character that also operates a pump for supplying the solvent liquid that is utilized for moistening the impression sheet by means of a moistening roller, which is one of the feed rollers above referred to.

It is a specific purpose of my invention to provide a driving means for the sheet feeding roller and one of the paired feed rollers utilized in a duplicating machine of this character, that comprises a lever actuated by means of a cam that is operated by rotation of the drum carrying the master sheet, said lever being connected with one end of a flexible cable that has the other end thereof connected with a tension spring and operating to rotate members forming the driven members of one-way driving means in the form of over-running clutches, connected with the feed roller that removes a sheet from the stack and with the one feed roller of the pair that feeds the sheet to the impression roller, that the roller that feeds the sheet from the stack is actuated when the lever is moving in one direction and the driven roller of the paired feed rollers is actuated when the lever moves in the opposite direction.

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It is another purpose of my invention to provide a pump for the solvent fluid that includes a metal bellows and to provide priming means for the pump that operates to compress the bellows by means of a lever that is manually operated and which operates the bellows in a similar manner to that occurring when the usual pumping action takes place, which is accomplished by the movement of the cam actuated lever.

It is another specific purpose of my invention to provide a lever actuating means for the pump that has a metallic bellows of the above mentioned character, that comprises a cam surface on a sector-shaped lever, which also actuates the driving mechanism as above set forth.

My invention is adapted for use on liquid process duplicating machines that utilize a moistening device of the wiping pad type as well as a moistening device of the porous tube type.

Other objects and advantages of my invention will appear as the description of the drawings proceeds. I desire to have it understood, however, that I do not intend to limit myself to the particular details shown or described, except as defined in the claims.

In the drawings:

Fig. 1 is a top plan view of my improved duplicating machine.

Fig. 2 is a vertical sectional view thereof taken on the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary sectional view taken on the line 3—3 of Fig. 2.

Fig. 4 is a fragmentary sectional view through the feed rollers showing one form of moistening means for the moistening roller, on an enlarged scale.

Fig. 5 is a fragmentary sectional view taken on the line 5—5 of Fig. 4.

Fig. 6 is a vertical sectional view taken on the line 6—6 of Fig. 2, on a somewhat enlarged scale.

Fig. 7 is a similar view taken on the line 7—7 of Fig. 2.

Fig. 8 is a vertical sectional view taken on the line 8—8 of Fig. 6.

Fig. 9 is a horizontal sectional view taken on the line 9—9 of Fig. 8.

Fig. 10 is a fragmentary side elevational view of a portion of the driving mechanism, showing the same in a different position than that shown in Fig. 8.

Fig. 11 is a vertical sectional view on an enlarged scale through one of the over-running clutch members.

Fig. 12 is a section thereof taken on the line 12—12 of Fig. 11.

Fig. 13 is a fragmentary vertical sectional view through the feeding and moistening means, and showing a portion of the drum and a modified form of moistening mechanism, and

Fig. 14 is a vertical sectional view taken substantially on the line 14—14 of Fig. 13.

Referring in detail to the drawings, my improved duplicating machine is provided with a frame that includes a pair of side plates 20 and 21, which are connected by means of a plurality of transverse frame members 22. A shaft 23 is journaled in suitable ball bearings 24 mounted in the side plates 20 and 21, the drum 25 being mounted on the shaft 23 to rotate therewith, the mounting on said shaft including hub portions 26 on spiders 27 on said drum, which are mounted in fixed position on enlargements 28 provided on the shaft 23. Reinforcing ribs 29 may be provided on the inner face of the cylindrical body portion 25 of the drum.

The shaft 23 may be driven in any suitable manner, but is, preferably, rotated by means of the crank 30, which may be provided with a suitable handle 31, and which is fixed by means of a pin 32 to a stub shaft 33, which is rotatably mounted in a bearing 34 provided on a bracket 35 that is mounted on the side plate 20. The stub shaft 33 is also rotatably mounted in the bearing portion 36 provided on the bracket 35 and in a suitable opening in the side plate 20, a collar 37 being fixed to the shaft 33 on the inner side of the plate 20 to hold said shaft against endwise movement. The hub portion 38 of a gear 39 is fixed on the shaft 33 and the gear 39 meshes with a gear 40 that has a hub portion 41 fixed on the shaft 23, the drum 25 thus being rotated by means of the crank 30 in the opposite direction to the movement of said crank 30. The direction of rotation of the drum is counterclockwise as viewed in Fig. 2.

The side plates 20 and 21 have removably mounted thereon sheet metal cover plates 42 and 43 providing housings for the driving means for the drum and other moving parts, as will be described below. The shaft 23 has a reduced extension 44 extending into the space between the side plate 21 and the cover plate 43. The extension 44 has a flanged collar 45 having a hub portion 46 attached thereto, a cam plate 47 being fixed to the flange 45 of said collar. The cam plate 47 has a high portion 48 and a low portion 49. The high portion 48 of the cam is concentric with the axis of rotation thereof, while the low portion 49 of the cam gradually rises from a mid-point to the curved portion 50 that connects said low portion with the high portion 48 and gradually descends from the curved portion 51 that joins the high portion 48 with the low portion 49. Thus a follower that engages with the cam surface 49 will be moved to the right as viewed in Fig. 8 as the cam plate 47 rotates in a clockwise direction with the drum 25, and will remain in its most advanced position to the right during the time that the follower engages the portion 48 of the cam, and then returns toward the left as the follower rides along the descending portion of the cam 49 from the point 51 on the cam to the center of the curved portion 49, which is curved on a very much greater radius of curvature than the portion 48.

A pivot member 52 is mounted at 53 in the side plate 21 projecting outwardly therefrom and having a sector-like lever 54 pivoted thereon, a spacing sleeve 55 being provided between the sector-shaped lever 54 and the side plate 21,



which has a reduced portion 56, which is received in a suitable opening in the lever 54 so that the lever 54 is fixed to the spacing sleeve 55, fitting against the shoulder provided between the reduced portion 56 of said spacing sleeve and the main body portion thereof. The outer end of the pivot member 52 is slightly upset to hold the sleeve 55 in position on said pivot member. Thus the sector-shaped lever 54 is located at a definite spaced position from the side plate 21. A pivot pin 57 projects toward the side plate 21 from the sector-shaped lever 54 and has a roller 58 rotatably mounted thereon, said roller engaging the cam plate 47 and thus constituting the follower above referred to. The pin 57 has an annular enlargement 59 thereon to prevent the roller 58 from moving to the left as viewed in Fig. 9.

The lever 54 also has a pin 60 projecting therefrom toward the side plate 21 to which one end of a coil tension spring 61 is connected, the other end of the coil tension spring 61 being connected with a post-like member 62 fixed in the side plate 21 and projecting outwardly therefrom. The spring 61 thus serves as means for maintaining the roller 58 in engagement with the cam surface of the plate 47. The sector-shaped lever 54 also has an ear 63 projecting from the same at one end of a cam surface 64 provided on said lever 54. The cam surface 64 has a portion 65 that is engaged by the follower 66, to be described below, and which extends to the heel portion 67 of said lever 54 to the left of the follower 66 as viewed in Fig. 8. The position of the parts in Fig. 8 is one extreme position of the lever 54. The lever 54 has a curved recess 68 therein to accommodate the curved edge of the flange 45 on the flanged collar. As the cam 58 rides up on the rising surface of the cam 49 from the position shown in Fig. 8 toward the point 50 on said cam the lever 54 will be swung to the right as viewed in Fig. 8, which will cause the follower 66 to ride along on the cam surface 65, which surface gradually rises toward the heel portion 67 so as to cause the follower 66 to be moved downwardly by such movement, for a purpose to be described below. The other extreme position of the parts is shown in Fig. 10, in which the roller 58 is shown as being in engagement with the high part 48 of the cam 47.

The ear 63 has a pin 69 projecting outwardly therefrom, to which one end of the flexible member 70, such as a steel cable, is secured, the loop 71 being provided at one end of said flexible member for engagement over the pin 69, the loop being formed by welding the end of the flexible member 70 to the member 70 at a suitable point spaced from the end thereof or by securing said end to the member 70 in any other suitable manner. The other end of the member 70 has a long coil tension spring 72 connected therewith by engagement of a hook 73 on one end of said spring 62 with a suitable loop 74 in the end of the flexible member 70. The said end of the flexible member 70 may be provided with suitable clamping means 75 thereon for adjusting the size of the loop 74 to adjust the tension of the spring 72. Said spring 72 at its end remote from the hook 73 has a loop 76 thereon that engages around a pin 77 projecting from the side plate 21. When the parts are in the position shown in Fig. 8 the spring 72 is under a slight tension, which increases considerably as the parts move from the position shown in Fig. 8 to that shown in Fig. 10.

The flexible member 70 extends over a pair of pulleys 78 and 79 and a pulley 80 in a manner to be described below. The pulley 80 is mounted on a pivot pin or stub shaft 81 that projects from the side plate 21 and is an idler pulley which merely directs the flexible member 70 so as to extend in the proper direction at the end thereof that is connected with the spring 72. The pulleys 78 and 79 serve as part of the drive for the paper feed mechanism. The flexible member 70 extends over the pulley 78 from the ear 63 on the lever 54 partially around the pulley 78 and has a length 70' extending from the pulley 78 to the pulley 79 and another length 70'' extending from the pulley 79 back to the pulley 78 and again partly around the pulley 78 and then down to the idler pulley 80. The lengths 70' and 70'' of the flexible member 70 cross, as will be obvious from Fig. 8, and thus the cable or flexible member 70 extends in a clockwise direction around the pulley 79 and in a counter-clockwise direction around the pulley 78 in passing from the ear 63 to the idler pulley 80. As a result the movement of the lever 54 in a counter-clockwise direction as viewed in Fig. 8 will rotate the pulley 78 in a clockwise direction and rotate the pulley 79 in a counter-clockwise direction, while return movement of the lever 54 will rotate the pulley 78 in a counter-clockwise direction and the pulley 79 in a clockwise direction.

The pulley 78 is freely rotatably mounted on the shaft portion 82 and has a flange 83 thereon that is connected by means of pins 84 with the outer members 85 of a one-way or over-running clutch member, the details of construction of which are shown more clearly in Figs. 11 and 12. Said one-way or over-running clutch member has an inner member 86, which is fixed on the shaft 87 that has the portion 82 projecting beyond said member 86, on which the pulley 78 is freely rotatably mounted, the inner member 86 being shown as being integral with the shaft 87. The members 85 are mounted to pivot on the pins 84 and are each provided with a curved face that is tapered to provide the inclined side walls 88 thereon that engage the converging walls of the V-shaped annular groove 89 provided in the inner clutch member 86. Springs 90 are provided, which are connected at one end with the flange 83 extending into suitable openings 91 in said flange and which engage the edge portions 92 of the outer clutch members 85 having right angularly bent ends 93 that engage said edge portions. The outer clutch members 85 thus are rocker members that are being urged to swing in a clockwise direction about their pivots 84 as viewed in Fig. 11. One or more coils 94, as may be found desirable on said springs 90, may extend around the pins 84.

The outer clutch members 85 serve as cam clutch members that move into gripping engagement with the walls of the annular groove 89 when the driven member 83 moves in the direction indicated by the arrow in Fig. 11, the tapering side walls of the groove 89 being indicated by the numeral 95 in Figs. 11 and 12.

The shaft 87 is mounted in a ball bearing 96, which is mounted in the side plate 21, and has a reduced end portion 97 that extends into an opening 98 in the end of a cylindrical core member 99 of the cylindrical roller 100, preferably, made of rubber or similar compressible material, and being fixed in any suitable manner to the core member 99 so as to rotate therewith. The core 99 is fixed to the reduced portion 97 of the shaft 87 by means of a pin 101. The opposite end of the core 99 is mounted in any suitable manner in a ball bearing 102, similar to the ball bearing 96, the core being shown as having a reduced end portion 103 mounted in said bearing.



The sheet feeding and moistening roller 100 rotates in a counter-clockwise direction as viewed in Fig. 2 in its paper feeding and moistening action, which will be described below, and as the shaft 87 with which the roller rotates must be driven by the clutch device above described in a direction to obtain such rotation of the feed roller, the shaft 82 and the pulley 78 drive the roller when said shaft 82 is rotating in a clockwise direction as viewed in Figs. 8 and 10. The clutch device above described drives the shaft 87 and thus the feed roller with the pulley 78 when said pulley is rotating in a clockwise direction as viewed in Figs. 8 and 10 and also in Figs. 11 and 12, while if the pulley is rotated in the opposite direction the outer clutch members 85 release and the pulley 78 will rotate in that direction free of the shaft 87.

The pulley 79 is mounted on a shaft portion 104 in a similar manner to the mounting of the pulley 78 on the shaft 82, and has pins 105 provided thereon that have the outer clutch members 85' mounted thereon, which are the same in construction as the clutch members 85, previously described, an inner clutch member 86', which is similarly constructed to the inner clutch member 86, and cooperates with the outer clutch member 85' in the same manner as said inner clutch member 86 cooperates with the outer clutch members 85 is also provided. The inner clutch member 86' is integrally formed with a shaft 106, as is also the shaft portion 104. The shaft 106 has a reduced portion 107 that is mounted in an opening 108 in a shaft or rod 109 and fixed to said shaft by means of a cross pin 110. The shaft 109 thus rotates with the shaft 106. The shaft 109 has a reduced portion 111 thereon, which is rotatably mounted in a bearing 112, while the shaft portion 106 is rotatably mounted in a bearing 113. The bearing 112 is mounted in a tubular member 114 projecting inwardly from an arm 115, and the bearing 113 is similarly mounted in a tubular member 116 projecting inwardly from an arm 117.

Said tubular projections are mounted in arcuate slots 118 in the side plates 20 and 21, which are concentric with the axis of pivot members 119 mounted on said side plates that have shouldered bearing members 120 mounted thereon, on which the arms 115 and 117 are mounted. The arms 115 and 117 are duplicates in shape and are, preferably, of a substantially triangular character as shown in Figs. 8 and 10. A bracing rod 121 is provided between the arms 115 and 117, which also operates in the slots 118, the same being fixed at its ends to the arms 115 and 117 so as to maintain the proper spacing between said arms. A roller of compressible material 122 has a hub portion 123 that is fixed to the shaft or rod-like member 109 by means of a pin 124 or similar means for fixing said hub portion to rotate with the shaft 109, said roller 122 serving as means for removing the sheets of paper to be fed into the machine from a stack one at a time in a manner to be described below. In order to feed said sheets in the proper direction, the roller 122 must be rotated in a counter-clockwise direction as viewed in Fig. 2, or in a clockwise direction as viewed in Figs. 8 and 10, and accordingly the clutch connecting the pulley 79 with the shaft 106 operates to drive in the same direction as the

pulley 78 in driving the shaft 87, and releases to be free of the shaft when rotating in a counterclockwise direction as viewed in Figs. 8 and 10. The roller 122 has a limited swinging movement about the axis of the pivots 119 determined by the length of the arcuate slots 118.

A feed tray is provided, which has a body portion 123 providing a flat surface upon which the stack of sheets 124 rests. Said feed tray has depending side flanges 125 and depending end flanges 126 and 127, which have inturned flanges 128, 129 and 130, respectively, to stiffen the same. Said feed tray also has upstanding guide members 131, which are provided with outward offsets 132 therein to provide recesses or pockets in which pads 133 of compressible material, such as sponge rubber, are mounted. Said guide members also have tapering end portions 134 and 135, and spaced from said tapering end portions are recesses 136 to accommodate the bar or shaft 109 in the position shown for the roller 122 in Figs. 2 and 8.

A transverse member 137 connects the side plates 20 and 21 having end flanges 138 thereon that are secured to the side plates in any suitable manner, as by means of the bolts 139 and nuts 140. Said transversely extending frame member 137 has headed members 141 projecting forwardly therefrom through suitable openings in the flange 127 for detachably securing the feed tray to the member 137. The feed tray is reversible, the flange 126 being adapted to be secured to the member 137 in a similar manner to that shown for the flange 127. This reversibility is desirable because it is thus possible to place the sponge rubber pad members 133 closer to the roller 122 when this is desired, this being desirable when shorter sheets than the sheets 124 are to be fed into the duplicating machine.

The guide members 131 are adjustable toward and away from each other to accommodate different widths of the sheets 124, being mounted on brackets 142, which are transversely adjustable in a slot 143 in the feed tray 123 and are provided with suitable clamping members 144 for clamping the same in adjusted position in said slots. In Fig. 1 of the drawings the guide members 131 are shown in their most widely spaced apart relation.

The transverse member 137 has an upwardly inclined portion 145 terminating in a horizontal lip 146, the portions 145 and 146 serving as a portion of a paper guide, which also comprises an upper guide member that has a downwardly inclined portion 147 that converges toward the inclined portion 145 and has a horizontal lip portion 148 extending substantially parallel to the lip portion 146 and in closely spaced relation thereto. The inclined guide portion 147 is provided on a transverse member 149 extending between the side plates 20 and 21, said transverse member 149 also serving as mounting means for a holder 150 for a wiper element 151, which serves as part of the moistening means for the feed roller.

The member 149 is mounted on a pair of pins that are mounted on the side plates, said pins having reduced headed over portions 152 secured in openings in the side plates and enlarged head portions 153 that support the transverse member 149, and the wiper element holder 150 has a transverse flange 154 and a depending flange 155 providing a channel in which the heads 153 of the pins are received. The entire assembly comprising the member 149 and the holder 150 for the wiper 151 is thus free to swing on the pins 153, the members 149 and 150 being secured together in any suitable manner, as by means of rivets 156. The location of the pivots 153 is such that the tendency is for the wiper element 151 to swing toward the sheet moistening roller 100. The wiper element 151 is made of felt or similar material and is held in position by being forced between the flange 155 and the body portion 150 of the holder, the flange 155 having a slightly out-turned edge 157 to aid in guiding the wiper element 151 into position, and is spaced from the sheet engaging surface 108 of the roller so as to leave a slit between said out-turned edge 157 of said surface.

A trough-like recess 158 is thus provided between the surface of the moistening roller and the wiper element 151, to which the liquid that is used for moistening the sheets is supplied from a feed tube 159 through suitable feed openings 160, the liquid being indicated by the numeral 161 in Fig. 4 of the drawings. In order to fix the holder 150 in position on the member 149 and prevent any shear on the rivets 156, the member 149 is provided with an upward offset 162 and a transversely extending portion 165 which receives the adjacent portions of the member 150 face to face. The side edges of the pad 151 end short of the holder so that it will not interfere with the swinging motion of the holder and guide member about the pivots 153.

By swinging the entire assembly slightly clockwise around the pivots 153, as viewed in Fig. 2, the entire assembly comprising the members 149 and 150 can be removed from the pivot pins 153, this being accomplished by lifting upwardly on the member 149 as soon as the guide portion 148 is free of the roller 100, removal of the same being possible as soon as the pivot members 153 pass the lower edge 157 of the flange 155. The wiper pad 151 can then be easily removed and replaced with another. It will be noted that the edge portion of the guide 148 is in such a position that it can not engage the roller 100 in a manner to damage the same.

It will be noted from Fig. 4 that the holder 150 and its flange 155 are bent slightly at 166 and 167 so as to incline the flange 155 and the body portion of the holder 150 toward the roller 100, and that the lower end of the body portion 150 is curved as shown at 158 in Fig. 4 substantially concentrically with the surface of the roller 100 so that the pad 151 will conform closely to the surface of the roller 100, being compressed between the member 150 and the roller 100 as indicated at 169. It will also be noted that the wiper pad 151 has its longitudinal edges confined between the transversely extending portion 154 and the guide portion 148.

The solvent liquid 161 is supplied to the feed tube 159 from a supply tank 170, which is mounted between the side plates 20 and 21, having its end walls 171 secured face to face to said side plates in any suitable manner. Said supply tank is provided with a suitable fill opening 172 closed by means of a screw cap 173. A flexible conduit 174 extends from an outlet connection 175 in the bottom of one of the end walls 171, which outlet connection extends through an opening in the side wall 21 as shown in Fig. 6. Said flexible tubular supply conduit 174 extends to an inlet connection 176 provided in a pump body 177. Said pump body has a passage 178 therein (see Fig. 8) which extends vertically of said pump body and into a flexible metal

bellows 179 secured in liquid tight relation to the lower end of the pump body 177.

A bracket 180 is provided on the side plate 21, which has a horizontally extending portion 181 at its lower end that has an opening therein through which the lower end wall 182 of the bellows 179 extends, the bottommost flange or corrugation 183 of said bellows normally resting on the bracket portions 181. Said bracket 180 also has an upper horizontally extending portion 184, which has a flanged guide sleeve 185 mounted in an opening therein, in which the follower 66 is longitudinally slidably mounted. Said follower 66 has a threaded lower end portion 186 that is screw-threaded into a screw-threaded opening 187 in the upper end of the pump body portion 177 and has a socket or recess 188 therein, in which one end of a compression spring 189 is mounted, said spring 189 being mounted between the tapering inner end of the socket 188 and a ball check valve 190 that is held in engagement with a seat 191 provided at one end of a passage 192 extending longitudinally of the body portion 77 and opening into the lower end of the passage 193 that has the threaded portion 187 into which the threaded end 186 of the follower 66 is screwed. Said follower also is provided with a flat faced enlargement 194, by means of which the same may be engaged by a suitable wrench.

The inlet connection 176 opens into the passage 178 and an outlet connection 195 leads from the passage 192, the passage 178 leading into the passage 192 through the valve seat 191. The outlet connection 195 has a flexible tubular conduit 196 connected therewith, which has an inlet connection 197 at its other end that extends into the feed tube 159. The feed tube 159 extends through the side plates 20 and 21 and at the end remote from the inlet connection 197 has a plug 198 and a cap 199 mounted therein to close off said end of the feed tube. A flange 200 in the form of a collar mounted on the feed tube is provided for securing the feed tube in fixed position on the side plate 21.

The side plates also have flanges 201 on a guard plate 202 secured thereto by suitable securing elements, said flanges having openings therein through which said feed tube passes. The guard plate 202 extends between the drum 25 and the roller moistening apparatus, as well as the roller 100 and said drum 25, to thus prevent any solvent liquid 161 from engaging the drum above the moistening apparatus and also serving as a guard or shield to prevent any drops of said liquid from inadvertently coming in contact with the copy sheets 124 in passing from the feed rollers to the drum.

The sector-shaped lever 54, in moving in a counterclockwise direction from the position shown in Fig. 8 to that shown in Fig. 10, moves the follower 66 downwardly and along with it the body portion 177 of the flexible diaphragm pump, causing the flexible diaphragm portion 179 thereof to be compressed between the body portion 177 and the lower horizontally extending bracket portion 181. As the follower 66 moves downwardly the liquid in the diaphragm portion 179 will be put under pressure and the ball valve 190 will be raised off its seat against the compression of the spring 192 and cause a predetermined amount of solvent liquid 161 to flow through the flexible tubular member 196 and into the spray tube 159 to be discharged through the horizontally extending row of spray



openings 160, which are substantially uniformly spaced along the tube 159 onto the roller 100 and into the trough 158 provided between the roller 100 and the pad 151, the combined action of the spraying means and the wiper pad 151 causing the roller to be uniformly coated with a thin coating of the solvent liquid.

This coating of the moistening roller 100 takes place as said roller 100 is rotated in a clockwise direction by the movement of the sector-shaped lever 54 from the position shown in Fig. 8 to that shown in Fig. 10. Thus the roller 100 is continuously moistened as it is rotated and the moistening operation ceases as soon as the rotation of the roller 100 is terminated by the roller 58 reaching the point 50 of the cam and traveling from that point on along the high portion 48 of the cam.

The roller 100 has a feed roller 203 cooperating therewith, the roller 203 being mounted on a core 204, which has reduced end portions 205 that are freely rotatably mounted in ball bearings 206, the bearings 206 being mounted in suitable cradles 207 provided in the upper ends of levers 208 that are mounted on pivots 209 extending inwardly from the side plates 20 and 21. The levers 208 have downward extensions 210, which are provided each with a row of openings 211. Springs 212 have hooks thereon that are engaged in one of the openings 211, the other ends of said springs having hooks 213 thereon that engage over pins 214 extending inwardly from the side plates 20 and 21. The springs 212 are under tension and act to swing the levers 208 about the pivots 209 in a counterclockwise direction as viewed in Fig. 2, causing the roller 203 to yieldingly engage the roller 100.

Means is provided for moving the roller 203 away from the roller 100, which is desirable when the machine is not in operation, in order to prevent any solvent liquid that might be on the roller 100 from being transferred to the roller 203. Said means comprises links 215, which are connected with the extensions 210 of the levers 208 by means of pins 216, each pin 216 passing through one of the openings 211 and an opening in the end of the link 215, the connection being adjustable, so as to vary the throw of the lever and thus the spacing of the roller 203 from the roller 100 when the links are actuated, by the choice of openings 211, with which the links 215 are connected.

The links 215 are connected with a rotatable shaft 217 by means of posts 218 extending upwardly from the shaft 217. Thus if the shaft 217 is rocked so as to move the post-like members 218 in a counter-clockwise direction as viewed in Fig. 2, the roller 203 will be moved away from the roller 100 against the action of the spring 212, while if the shaft is rocked in the opposite direction the roller 203 will be moved toward the roller 100. The posts 218 are mounted in slots 219 in the links 215 so that there will be a slight amount of lost motion between the posts 218 and the links 215 so as to permit the springs to hold the roller 203 yieldingly in engagement with the roller 100.

The shaft 217 is rotatably mounted in openings in the side plates 20 and 21 as shown in Fig. 7, and has a reduced portion 220 with which a set screw 221 engages that is mounted in a tubular arm 222 to fix said arm on said shaft 217 against both endwise movement and rotational movement relative thereto. The arm 222 has a bore 223 therein, into which the end of a lever 224 extends.

The lever 224 is slotted as at 225, at the end thereof that is within the bore 223, and a pin 226 extends crosswise of the bore 223 through the slot 225, thus preventing any rotation of the lever 224 relative to the arm 222. A compression spring 227 is mounted between the lower end of the lever 224 and the reduced portion 220 of the shaft so as to exert an upward pressure on the lever 224. The lever 224 is bent at 228 to provide a horizontally extending portion 229 that extends through a suitable arcuate slot in the side plate 20 and provides a handle by means of which the lever 224 is rocked, thus rocking the shaft 217. Due to the provision of the spring 227 the handle portion 229 will frictionally engage the wall of the slot in the side plate 20 so as to hold the lever 224 in adjusted position.

The shaft 217 has an eccentric 230 fixed thereon, which is rotatably mounted in an opening in a hook-like lever 231 that has a hook-like end portion 232 thereon providing a shoulder 233 and a flat face 234 on said hook-like member 215 engaged by corresponding faces of a bar 235 that is rectangular in cross section. The bar 235 is fixed to a pair of levers 236 that are pivotally mounted on pins 237 that project from the side plates 20 and 21, and which have curved recesses 238 therein providing cradles in which the ball bearings 239 are mounted.

The ball bearings 239 rotatably support a roller 240, which has a core portion 241 that has reduced end portions 242 that are rotatably mounted in the ball bearings 239. Thus the roller 240 is freely rotatable in its bearings, and as the springs 212 tend to move the members 215 to the right as viewed in Fig. 2 endwise of themselves, and thus to rotate the shaft 217 in a clockwise direction, the rotation of the eccentric 230 will cause the hook-like member 231 to have a tendency to move toward the right, as viewed in Fig. 2, and thus swing the levers 236 about the pivots 237 in a counter-clockwise direction as viewed in Fig. 2, yieldingly pressing the roller 240 into engagement with the surface of the drum 25.

When the lever 224 is moved by means of the handle 229 to rock the shaft 217 in a counter-clockwise direction from that shown for the position of the parts in Fig. 2, the hook-like member 231 will move toward the left in Fig. 2 due to the action of the eccentric 230 and also downwardly, which will permit the roller 240 to drop downwardly away from the drum 25 by the action of gravity.

The lever 243 has a bearing member 244 secured thereto at one end thereof, and is spaced from the side plate 21 by means of a washer 245. The bearing member 244 is mounted on the shaft 217 so as to be freely rotatable on said shaft 217. Said bearing member 244 also has a reduced end portion 246, upon which is mounted to rotate with the member 244 a lever 247. The lever 247 is cut away on a curve, as at 248, and terminates in an enlargement forming a curved finger 249 which engages with the bottom 182 of the metal bellows 179, forming the lower portion of the pump.

The end of the lever 243 opposite that having the lever 247 connected therewith has a handle 250 thereon that extends through an arcuate slot 251 in the side plate 21. A pin 252 extends toward the cover plate 43 from the lever 243 and a pin 253 projects outwardly from the side plate 21, a tension coil spring 254 being connected with the pin 253 and the pin 252 and tending to swing the lever 243 in a clockwise direction as viewed in Fig. 8, thus tending to hold the finger 249 away from the bottom wall 182 of the bellows 179. By moving the handle 250 downwardly toward the lower end of the slot 251 the lever 243 will be moved in a counter-clockwise direction about the shaft 217, moving the finger 243 on the lever 247 into engagement with the bottom wall 182 and compressing the bellows 179 so as to unseat the valve 190, forcing solvent liquid through the flexible feed conduit 196 to the feedtube 159, thus priming the roller moistening mechanism.

A receiving tray 255 has a flat sheet metal body portion and is provided with an up-turned wall or flange 256 at its outer extremity, which is provided with a suitable protective strip 257 of rubber or similar material along its upper edge portion. The receiving tray is shown in retracted position in Fig. 2. It is adapted to be moved outwardly to a desired extent to accommodate the copy sheets after they are discharged from the drum, the side edges of the body portion 255 being slidably mounted on the upper guide flanges 258 and lower guide fingers 259 formed from the laterally extending flanges 260 provided on the brackets 261 that are secured to the side plates 20 and 21 by suitable securing elements 262 (see Figs. 1, 2 and 3). The guide flanges 259 are merely extensions of the flange 260, while the fingers 258 are struck upwardly from the material of the flanges 260. The body portion of the member 255 has a slightly wider portion 263 adjacent the end that has the flange 256 thereon, providing an offset or shoulder 264 between said wider portion 263 and the narrower main body portion of the member 255, which is adapted to be engaged by the fingers 258 to limit inward movement of the member 255, as it will be obvious that the upwardly extending members 258 will engage with the edges of the offset 264 upon a small additional inward movement of the receiving tray 255 beyond the position shown in Figs. 1 and 2.

The transversely extending frame members 22 have upwardly directed flanges 265, which are secured to the side plates 20 and 21 by means of fastening elements 266. Said transverse frame members have upwardly curved portions 267, which follow the contour of the side plates 20 and 21, one of said upwardly turned portions 267 having a channeled strip 268 of rubber or similar material provided along its top edge for protection purposes, the receiving tray 255 engaging with said member 268 whereby said receiving tray is additionally supported. It will be noted that the cover plates 42 and 43 have inwardly curved marginal edges 269 that extend over the marginal edges of the side plates 20 and 21, this curvature of the cover plates stiffening the same and causing the same to firmly frictionally grip the marginal edge portions of the side plates.

The drum 25 has a clamping bar 270 mounted in a transverse slot 271 therein, the drum being provided with an inwardly offset rib portion 272 to provide for the slot 271. The clamping bar has an outwardly inclined marginal portion 273, which cooperates with a beveled corner 274 of the slot 271 to clamp the edge portion of a master sheet 275 in the beveled portion of the slot. Means is provided for moving the clamping means out of clamping position, comprising a lever 276, which has an operating handle 277 thereon for swinging the lever about its pivot and move the cam 280 provided on the end thereof into the path of the reduced portion 281 on one of the pins 282. A pair of said pins 282 is provided, which are longitudinally slidably mounted in openings 283 in the

inwardly offset portion 272 of the drum 25, and which are screw-threaded at 284 to engage in the screw-threaded openings 285 in the clamping bar 270. A suitable tool can be engaged with the slot 286 in the end of each of the members 284 to adjust the position thereof and thus the position of the ends 281 of said pins 282. Said pins are provided with enlargements 287 thereon, which act as stop means to limit outward movement of the clamp 270 away from the drum. Suitable feet of cushioning material 288 for supporting the machine on any suitable support are provided on the transverse members 22.

Instead of using the moistening and feed roller 100 shown in the form of the invention disclosed in Figs. 1 to 12, inclusive, a modified form of moistening device may be utilized in my duplicating machine, which is shown in Figs. 13 and 14. The construction of the machine is the same as in the form shown in Figs. 1 to 12, inclusive, except for the moistening means, and the same reference numerals are applied to the parts in Figs. 13 and 14 that correspond to the parts and are duplicates of the parts shown in Figs. 1 to 12, inclusive. Instead of providing the guide member 149 a guide member 149' is provided, which has the inclined portion 147' corresponding to the portion 147 of the guide member 149 and the portion 148', which corresponds to the portion 148 of said guide member 149. The member 149', however, is provided with an upper transverse portion 289, which terminates in a guard lip 290 extending between the drum and the moistening and feed roller, and is secured by means of suitable securing elements 291 to brackets 292 mounted on the side plates 20 and 21. The moistening roller 293 is made with a porous wall portion that is made of sintered metallic particles and is fixed on a collar 294, which in turn is fixed on the shaft 87' corresponding to the shaft 87, previously described, and driven in the same manner. The porous member 293 fits against a shoulder 295 on the sleeve 294 which is fitted within a flange 296 of a tubular bearing member 297 in which the roller 293 is rotatable, a suitable compressible gasket 298 being provided between the end of the roller 293 and a shoulder 299 provided in the bearing 297 to provide a liquid tight joint between the bearing 297 and the roller 293.

The solvent liquid, which is indicated by the numeral 300, is supplied to the roller 293 from a supply tank 301 mounted between the side plates 20 and 21 and having a fill opening 302 closed by means of a suitable cap 303. A supply pipe 304 extends through the one side plate 20 from the tank 301 to a pipe 305 that leads into the bearing 297. The pipe 305 also has a branch 306 that extends to a tank 307 mounted in suitable clips 308 provided on the side plates 20 and 21. A valve 309 is provided in the pipe 304 to control the supply of solvent liquid 300 to the porous roller 293. An overflow pipe 310 is also provided, which extends from the upper portion of the bearing member 297 to the upper portion of the tank 301, a valve 311 controlling communication through the pipe 310. Common operating means 312 is provided for the valves 309 and 311.

When it is desired to start the machine utilizing the porous roller 293, the valve 309 is opened and at the same time the valve 311 is opened by means of the operating member 312. As a result, the porous roller 293 and the bearing 297 are vented so that the solvent liquid 300 will flow by gravity from the supply tank 301 into the porous roller 293 up to a level at which the pipe 310 connects with the bearing member 297. Additional solvent liquid will not flow into the porous roller 293 because the vent will be closed off by the liquid, until the level of the liquid is again lowered, whereupon more solvent liquid will be supplied from the tank 301.

The tank 307 is provided as a drain tank to prevent the solvent liquid from oozing out of the pores of the porous wall of the roller 293 when the machine is not in use. When operation of the machine is stopped, the operating member 312 is turned to close the valves 309 and 311. As a very small vent opening 313 is provided in the tank 307, the solvent liquid 300 in the roller 293 will gradually drain off through the pipes 305 and 306 into the tank 307, the pipe 305 being connected with the bottom portion of the bearing 297 and with the tank 307 near its bottom.

In operation, the master 275 is clamped in position on the drum 25, this being accomplished by raising the clamping member 270 by means of the lever 276, by operating the handle 277 and placing the one edge of the master 275 in position under the clamping member 270, and then after said master is properly arranged on the drum, releasing the clamping means by operation of the handle 277. The moistening mechanism is then primed by operation of the lever 243 by means of the handle 251 thereon to cause the finger 249 to compress the bellows 179 upwardly, thus causing solvent liquid to be supplied to the feed tube 159.

The impression roller 240, which is out of engagement with the drum 25 when the machine has not been in operation for a considerable period of time, and the roller 203, which is out of engagement with the roller 100 or the roller 293, as the case may be, are then brought into engagement with the drum 25 and the roller 100, respectively, by moving the lever 224 by means of the handle 229 downwardly and the feed roller 122 is moved into engagement with the stack of sheets 124 mounted on the feed tray 123.

It will be noted that the spring 72 exerts a pull on the cable 70 and thus on the lengths 70' and 70'' of said cable connecting the pulleys 78 and 79, exerting a force in a direction tending to move the pulley 79 toward the pulley 78. It will also be noted that when the shaft 109 is in its uppermost position in the slots 118 this force will be acting along a line that is above the pivots 119, while when the roller 122 is in paper feeding position as shown in Fig. 8 this force will be acting along a line below the axis of the pivots 119. Accordingly the spring 72 acts to yieldingly hold the feed roller 122 both in its retracted and in its paper engaging position.

The machine is now ready to commence duplicating operation by rotation of the crank 30 by means of the handle 31. When such rotation takes place, the cam 47 is rotated, as well as the drum 25. The leading edge of the master is that which is held by the clamp 270 and the cam 47 is so positioned on the shaft 44 that if we assume the parts to be in the position shown in Fig. 10 the roller 58, upon reaching the point 51 on the cam 47, will commence to travel down the descending portion of the low portion 49 of the cam. When the parts are in the position shown in Fig. 10 the spring 72 will be tensioned and as a result the movement of the lever 54 in a clockwise direction will cause the cable 70 to be pulled by means of the spring 72 so as to cause a clockwise rotation of the pulley 79, which will cause the pick-up feed roller 122 to move the uppermost

sheet 124 rapidly to the right as shown in Fig. 2, the pads 133 preventing the sheets below the uppermost sheet 124 from moving with said uppermost sheet 124, and cause said sheet to be fed between the guides 146 and 148 and into the bight of the rollers 100 and 203.

The rollers 100 and 203 will at this time be stationary and no movement of said rollers commences until the roller 122 has ceased its rotation, as the over-running or one-way clutch device connecting the pulley 78 with the roller 100 will not grip until rotation thereof is reversed, inasmuch as the pulley 78 will at this time be rotating in a counter-clockwise direction. However, as soon as the roller 58 commences to travel up the ascending part of the low portion 49 of the cam, the lever 54 will be moved in a counter-clockwise direction as viewed in Figs. 10 and 8 and will move from the position shown in Fig. 8 to that shown in Fig. 10. This will cause the pump to be actuated by means of the follower 66 traveling along the cam portion 65 to feed solvent liquid to the moistening roller 100 and the wiper pad 151 and at the same time the roller 100 will be rotated in a counter-clockwise direction as viewed in Fig. 2, which corresponds to clockwise rotation of the pulley 78 in Figs. 8 and 10, the one-way or over-running clutch device, connecting the pulley 78 with the shaft 67 on which the roller 100 is mounted, gripping during such movement of the lever 54 to drive the roller 100 with the pulley 78.

The roller 203 will be frictionally driven by the roller 100 through the medium of the sheet 124 passing between said rollers, and the pin 69 is so spaced from the pivot 52 of the lever, and the cam 47 has such a rise that with the size of the pulley 78 provided, the surface speed of the roller 100 will be the same as that of the drum 25 and of the pressure roller 240. Thus the sheet will be fed to the drum 25 at the exact surface speed of the drum at the periphery thereof and there will be no buckling of the copy sheet as it engages with the master on the drum. The positioning of the cam is such that the copy sheet reaches a position between the pressure roller 240 and the surface of the drum when the leading edge of the master 275 also reaches this point. The high portion 48 of the cam 47 engages the roller 58 after the copy sheet passes from between the rollers 100, and engagement of the roller 58 with said high portion 48 continues through approximately half a turn of the drum 25, during which lever 54, pulleys 78 and 79 and rollers 122, 100 and 203 are stationary.

The same successive steps in the operation of the duplicating machine take place each time that the drum 25 is rotated by means of the crank 30 and the successive copy sheets on which a copy has been duplicated are deposited in the receiving tray 255, which will have been pulled out by the operator to a proper position to flatly receive the sheets between the portion thereof underlying the drum 25 and the stop flange 256 thereon.

When operation of the machine is to be halted for a long period, as over-night or for several hours, the lever 229 is actuated to release the rollers 240 and 203 from the drum 25 and the roller 100.

The operation of the machine utilizing the moistening apparatus shown in Figs. 13 and 14 is the same as above described, except that instead of utilizing a pump and a follower, such as the follower 66, to supply the solvent liquid, it is supplied by gravity, and instead of utilizing a priming lever, such as the lever 243, the valve 312 is provided and is opened before the duplicating operations are commenced in order to have the moistening roller 203 provided with the solvent liquid before such operation is commenced.

What I claim is:

1. In a duplicating machine having a drum, means for rotating said drum, and a sheet feeding and moistening roller, the combination of a cam rotating with said drum, means for moistening said roller including a pump supplying solvent fluid to said roller, said pump comprising a bellows forming part of the pump chamber, means for varying the capacity of said bellows to feed fluid to said roller, comprising a lever oscillated between two alternative positions by rotation of said cam, said pump being disposed adjacent said lever, and said lever having a cam surface thereon, an abutment with which said bellows engages, and means on said pump engaging said lever cam surface and connected with said bellows to compress said bellows between said means and said abutment, and priming means for priming said pump comprising a member mounted for engagement with said bellows to compress the same between said last mentioned member and the cam surface engaging means and additional means for moving said last mentioned member into compressing engagement with said bellows.

2. In a duplicating machine having a drum, means for rotating said drum, and a sheet feeding and moistening roller, the combination of a cam rotating with said drum, means for moistening said roller including a pump supplying solvent fluid to said roller, said pump comprising a bellows forming part of the pump chamber, means for varying the capacity of said bellows to feed fluid to said roller, comprising a lever oscillated between two alternative positions by rotation of said cam, said pump being disposed adjacent said lever, and said lever having a cam surface thereon, an abutment with which said bellows engages, and means on said pump engaging said lever cam surface and connected with said bellows to compress said bellows between said means and said abutment, and priming means for priming said pump comprising a member mounted for engagement with said bellows to compress the same between said last mentioned member and the cam surface engaging means and a second lever connected with said last mentioned member to move said last mentioned member into and out of compressing engagement with said bellows.

3. In a duplicating machine having a drum, means for rotating said drum, and a sheet feeding and moistening roller, the combination of a cam rotating with said drum, means for moistening said roller including a pump supplying solvent fluid to said roller, said pump comprising a body portion having a bellows at one end thereof forming part of the pump chamber, means for varying the capacity of said bellows to feed fluid to said roller, comprising a lever oscillated between two alternative positions by rotation of said cam, said lever having a cam surface thereon, an abutment with which said bellows engages, and a follower fixed on the body portion of said pump at the other end thereof engaging said lever cam surface, and priming means for priming said pump comprising a member mounted for engagement with said bellows to compress the same between said last mentioned member and said follower and a second lever connected with said last mentioned member to move said last mentioned

member into and out of compressing engagement with said bellows.

4. In a duplicating machine having a drum, and means for rotating said drum, the combination of a sheet feeding and moistening roller, means for moistening said roller with solvent liquid comprising a liquid feed tube mounted above said roller, a wiper pad cooperating with said roller, a combined copy sheet guide and wiper pad mounting member, and means for detachably mounting said combined guide and mounting member to swing toward said roller by the action of gravity, and means for intermittently rotating said roller upon rotation of said drum.

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