

Nov. 18, 1958

W. R. FOWLIE

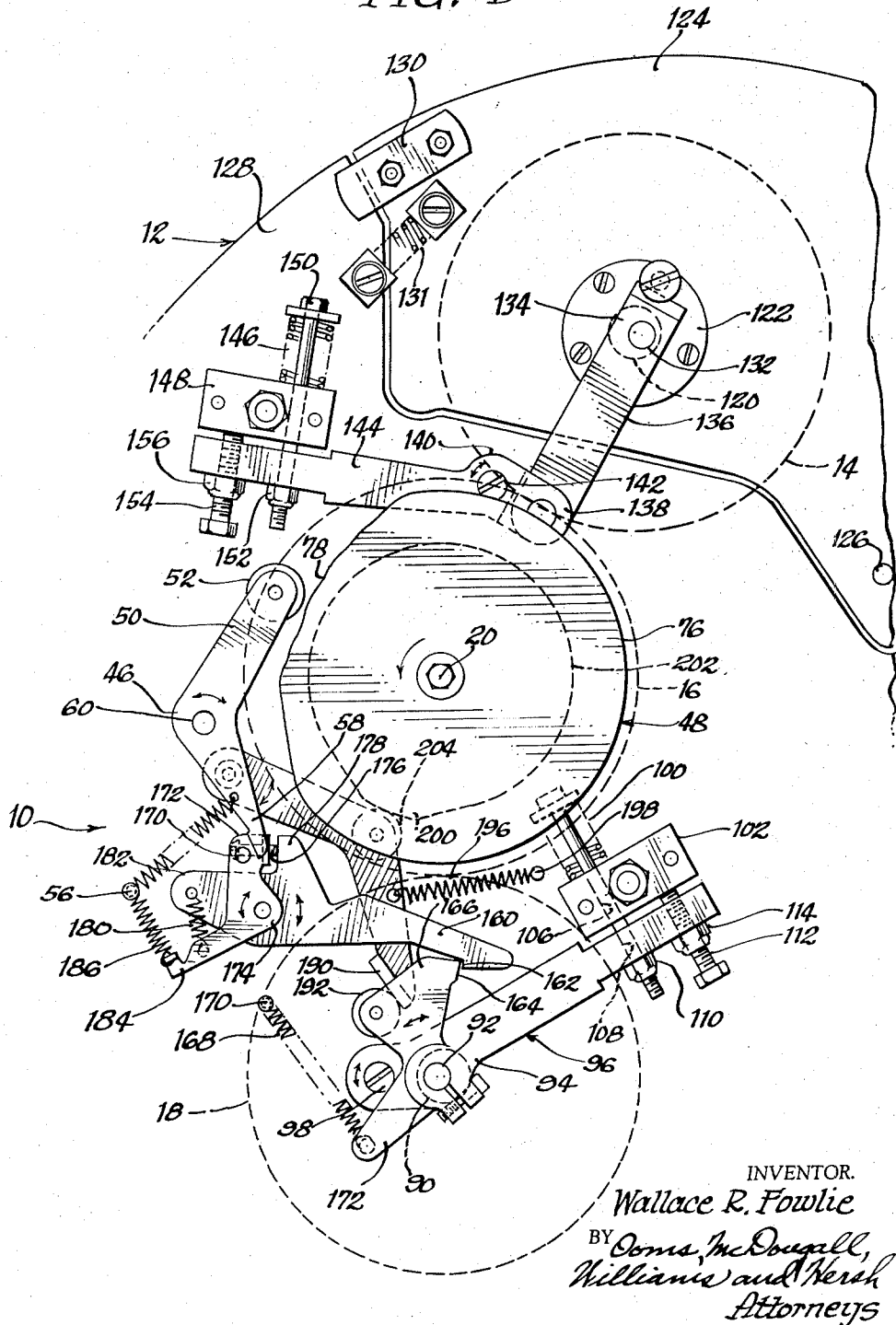
2,860,577

CYLINDER SEPARATING MECHANISM FOR DUPLICATORS

Filed Sept. 26, 1956

4 Sheets-Sheet 1

FIG. 1



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4 Sheets-Sheet 2

FIG. 2

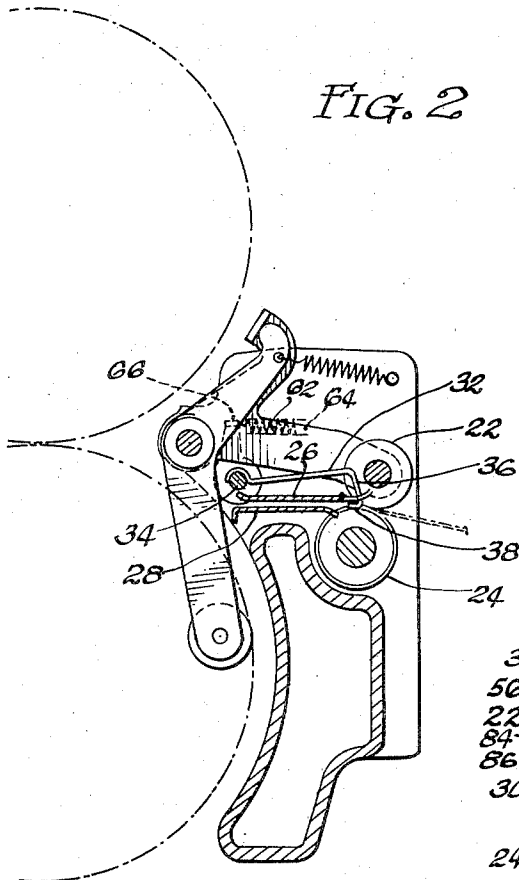


FIG. 3

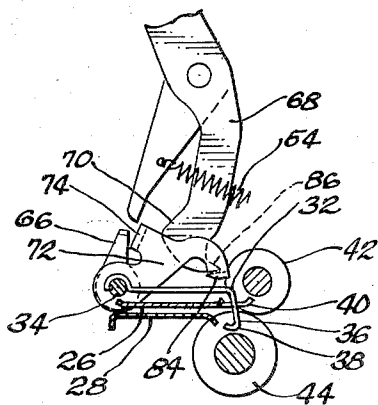
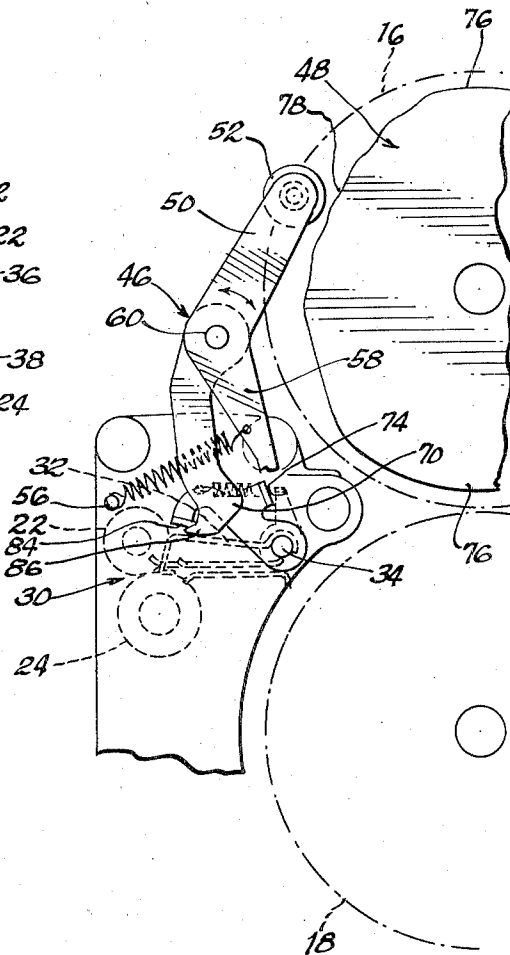


FIG. 4

INVENTOR.
Wallace R. Fowlie
BY Ooms, McDougall,
Williams and Herik
Attorneys

Nov. 18, 1958

W. R. FOWLIE

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FIG. 5

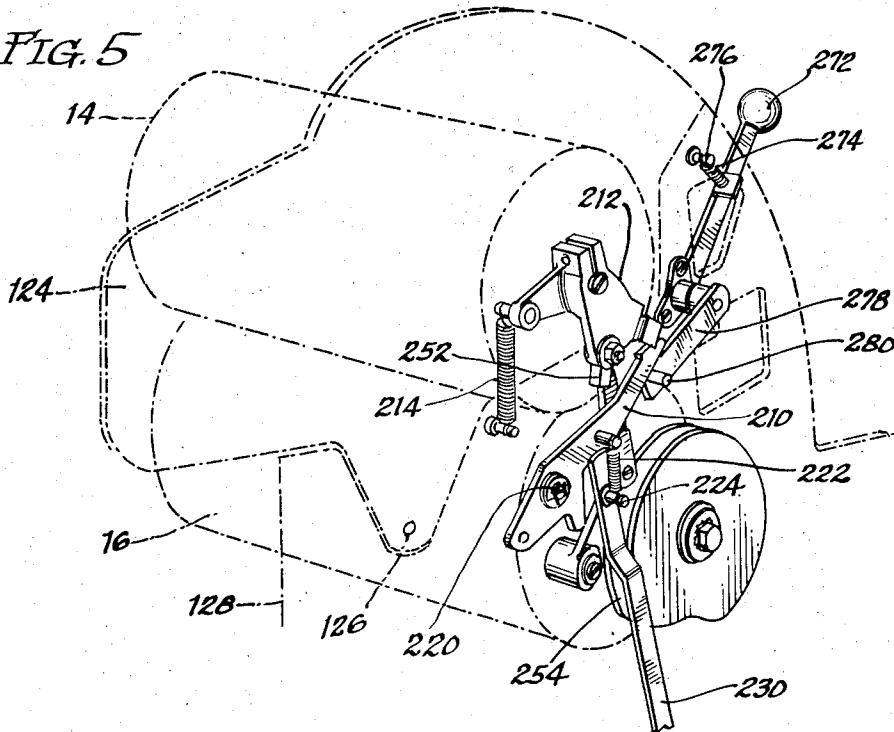
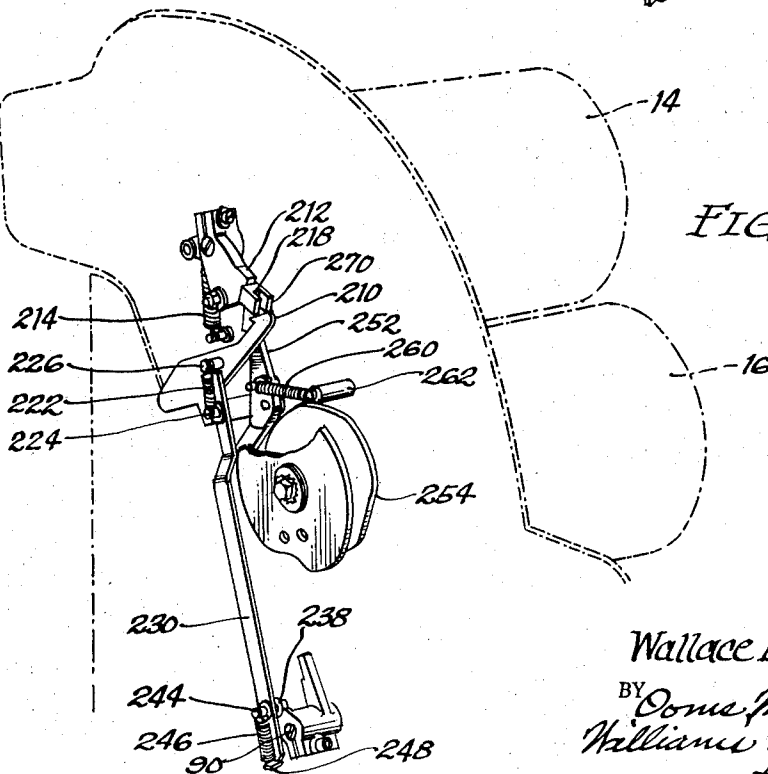


FIG. 6



INVENTOR.
Wallace R. Fowlie
BY *Conrad McDougall,*
Williams and Marsh
Attorneys

Nov. 18, 1958

W. R. FOWLIE

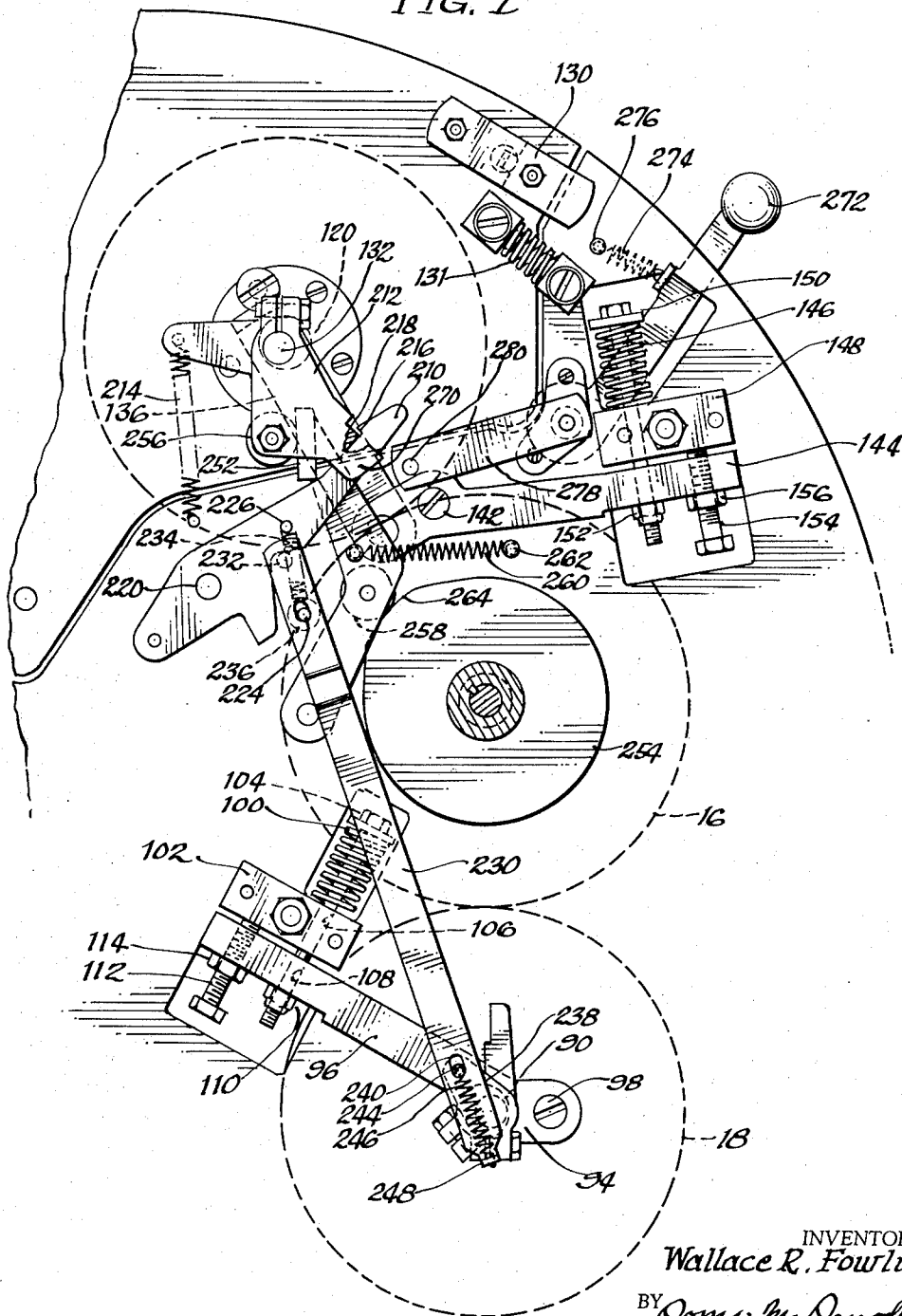
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CYLINDER SEPARATING MECHANISM FOR DUPLICATORS

Filed Sept. 26, 1956

4 Sheets-Sheet 4

FIG. 7



INVENTOR.
Wallace R. Fowlie
BY *Osma, McDougall,
Williams and Wersh*
Attorneys

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2,860,577

CYLINDER SEPARATING MECHANISM FOR DUPLICATORS

Wallace R. Fowlie, North Riverside, Ill., assignor to A. B. Dick Company, Niles, Ill., a corporation of Illinois

Application September 26, 1956, Serial No. 612,236

5 Claims. (Cl. 101—218)

This invention relates to printing machines or duplicators and pertains particularly to a mechanism for separating the cylinders of a duplicator.

One object of the present invention is to provide a new and improved mechanism for separating the printing and impression cylinders of a duplicator, when paper sheets are not fed between the cylinders, so as to prevent the application of printed matter to the impression cylinder.

A further object is to provide a new and improved cylinder-separating mechanism which is applicable to a three-cylinder offset duplicator having a master or plate cylinder, a blanket or offset cylinder, and an impression cylinder.

It is a further object to provide a mechanism which will separate the master and impression cylinders from the blanket cylinder, in a new and improved manner, whenever a paper sheet is not fed between the blanket and impression cylinders.

Another object is to provide a new and improved cylinder-separating mechanism which incorporates means whereby at least one of the cylinders is resiliently held in its normal operating position, so as to be yieldable under unusual stress.

A further object is to provide a new and improved cylinder-separating mechanism which is applicable to a three-cylinder offset duplicator and is so arranged that the impression and master cylinders are spring-biased into their normal positions and are yieldable to prevent damage to the duplicator by unusual stress, such as may be developed by the feeding or more than one sheet of paper between the blanket and impression cylinders.

It is another object to provide a new and improved cylinder-separating mechanism having an adjustable spring-biasing arrangement whereby the spring pressure applied between the cylinders may be varied.

Another object is to provide a new and improved cylinder-separating mechanism which is effective and dependable in operation, yet is reasonably simple in construction and low in cost.

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

Fig. 1 is a diagrammatic side elevational view of a three-cylinder offset duplicator equipped with a cylinder-separating mechanism constituting an illustrative embodiment of the present invention, the view being taken from the left-hand side of the machine.

Fig. 2 is a fragmentary elevational sectional view showing certain details of the feeler arrangement which detects the presence or absence of a sheet of paper fed to the machine, and initiates the action of the cylinder-separating mechanism in the event that paper is absent, the view being taken from the right-hand side of the machine.

Fig. 3 is a fragmentary side elevational view showing additional details of the feeler arrangement, the view being taken from the left-hand side of the machine.

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Fig. 4 is a fragmentary elevational sectional view, somewhat similar to Fig. 2, but showing additional details and a change of position of the feelers.

Figs. 5 and 6 are perspective views, looking toward the left-hand side of the machine, to show additional features of the cylinder-separating mechanism of Fig. 1.

Fig. 7 is a view showing the features of Figs. 5 and 6 in side elevation, the view being taken toward the left-hand side of the machine.

As already indicated, Figs. 1-7 illustrate an exemplary cylinder-separating mechanism 10 as applied to a three-cylinder offset duplicator 12. It will be realized, however, that the invention may be applied, at least in part, to any type of duplicator or printing machine.

The duplicator 12, illustrated by way of example in Fig. 1, comprises a master cylinder 14 adapted to carry a printing sheet or plate upon which an image to be printed is developed, usually by the lithographic process. The image is formed in printing ink and is transferred to a blanket or offset cylinder 16, with which the master cylinder 14 is engageable. Paper sheets are fed between the blanket cylinder 16 and an impression cylinder 18, which are closely adjacent so that the impression cylinder 18 will press the successive sheets against the blanket cylinder 16. The image on the blanket cylinder 16 is thereby transferred to each paper sheet. During each revolution of the blanket cylinder 16, the image thereon is renewed by engagement of the blanket cylinder with the master cylinder 14.

In this case, the blanket or printing cylinder 16 is rotatable about a shaft 20 which is fixed in position, with respect to the lateral movement. The master cylinder 14 and impression cylinder 18 are mounted so as to be capable of lateral translatable movement, into and out of normal engagement or printing relation with the blanket cylinder 16. The cylinder-separating mechanism 10 is adapted to separate the master and impression cylinders 14 and 18 from the blanket cylinder 16, whenever no paper sheet is fed between the blanket and impression cylinders 16 and 18.

It will be understood that any conventional or suitable means may be employed to feed paper sheets between the blanket and impression cylinders 16 and 18. The illustration of sheet-feeding means in the present application is merely by way of example. In the illustrated machine, the paper sheets are fed between the blanket and impression cylinders 16 and 18 by a pair of interengageable forwarding rollers 22 and 24 (Fig. 2), which receive the individual sheets from a sheet-separating mechanism (not shown) and advance the sheets toward the cylinders 16 and 18 between a pair of generally horizontal guide plates 26 and 28. The forwarding rollers 22 and 24 may be operated by any suitable mechanism, which need not be described in detail.

The presence or absence of a sheet being fed to the cylinders 16 and 18 is detected by a feeler mechanism 30 (Figs. 2-4). In this case, the feeler mechanism 30 comprises one or more feelers 32 which are secured to a shaft 34 and constitute arms extending outwardly from the shaft. Each of the feelers 32 has a downwardly projecting end portion 36 which is formed at its lower end with a shoe portion 38 adapted to engage the upper side of a paper sheet as it enters the space between the plates 26 and 28. The feet or downwardly projecting portions 36 of the feelers 32 are movable vertically through slots 40 formed in the outer edge of the upper guide plate 26. The forwarding rollers 22 and 24 are also provided with slots 42 and 44 to accommodate the feelers 32.

In the illustrated feeler mechanism 30, the feelers 32 are adapted to be moved by a cam follower lever 46 operable by a cam 48. The lever 46 has an arm 50 which carries a roller 52 adapted to engage the cam 48. To

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bias the roller 52 against the cam 48, a coil spring 54 is tensioned between a fixed anchor 56 and another arm 58 of the lever 46. Both of the arms 50 and 58 are secured to a supporting shaft 60.

The cam follower lever 46 is arranged to actuate the feelers 32 and, at the same time, is adapted to be controlled by the feelers. In this case, the feelers are biased downwardly, against the paper sheets, by a coil spring 62 which is connected between a fixed anchor 64 and an upwardly extending arm 66 secured to the feeler shaft 34. The cam follower lever 46 is adapted to raise the feelers 32 so as to admit paper sheets into the space between the guide plates 26 and 28. For this purpose, the lever 46 is provided with a third arm 68 which extends downwardly from the shaft 60. The heel portion 70 on the arm 68 is engageable with an arm 72 secured to the feeler shaft 34. More specifically, the heel portion is engageable with an ear or lug 74 formed on the arm 72. From Figs. 3 and 4, it will be seen that the heel portion 70 engages the ear 74 and swings the feelers 32 upwardly when the arm 50 is swung outwardly by a high portion or contour 76 on the cam 48. The high portion 76 extends for a large part of the periphery of the cam 48. It will be seen that the cam 48 also has a low portion or contour 78 which permits the spring 54 to swing the lever 46 in the opposite direction, clockwise as viewed in Fig. 3. Such movement of the lever 46 permits the feelers 32 to move downwardly so as to engage any paper sheet that may be present between the guide plates 26 and 28.

If no paper sheet is present between the guide plates 26 and 28, the feelers 32 descend fully, to or below the level of the lower guide plate 28, as shown in Fig. 4. The cam follower lever 46 completes its clockwise stroke and follows the cam 48 to the lowermost point on its low contour 78. When this happens, the cam follower lever 46 initiates the cylinder-separating action of the mechanism 10, in a manner to be described shortly.

If a paper sheet is present between the plates 26 and 28, the sheet arrests the feelers 32, as shown in Figs. 2 and 3. When this occurs, the feeler mechanism 30 prevents the cam follower 46 from completing its full stroke. For this purpose, the arm 72 is formed with a second lug or ear 84 which is movable into the path of a hook or toe portion 86 formed on the lower end of the arm 68. When the feelers 32 are arrested by a sheet between the guide plates 26 and 28, the lug 84 is positioned so that the toe portion 86 will hook under the lug 84 as the cam follower lever 46 swings clockwise. The engagement of the hook portion 86 with the lug 84 arrests the clockwise movement of the cam follower 46, with the result that the roller 52 follows the cam 48 only part of the way to the lowermost point on the low contour 78. In other words, the cam 48 and the roller 52 part company, as indicated in Figs. 1 and 2.

As long as sheets continue to be fed under the feelers 32, the follower lever 46 oscillates through a limited range without affecting the subsequent elements of the cylinder-separating mechanism 10. However, if there is a failure to feed a sheet, the cam follower lever 46 makes a full stroke, with the result that the arm 58 initiates the action of the cylinder-separating mechanism.

The effect of the cylinder-separating mechanism 10 is to throw the master and impression cylinders 14 and 18 away from the blanket cylinder 16. In the present case, the cylinders 14 and 18 are not only supported for such retracting movement, but also are arranged to be resiliently biased into their normal operating positions. The illustrated impression cylinder 18 is rotatable about a shaft 90 which may be pivoted and translated to a limited extent, but is non-rotatable with respect to the rotation of the cylinder 18. To provide for the lateral retraction of the cylinder 18 by the cylinder-separating mechanism 10, the shaft 90 is provided with eccentric end pivots 92 which may be turned or rocked in bearings 94. The cylinder-separating mechanism 10 is adapted to bring

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about such rocking movement of the eccentric pivots 92. It will be seen from Fig. 1 that clockwise rotation of the pivots 92 will translate the shaft 90 downwardly and thus will retract the cylinder 18 from the blanket cylinder 16.

To provide for spring-mounting of the cylinder 18, each of the bearings 94 is movable laterally. In this case, each of the bearings 94 is formed on a lever 96 which is swingable about a fixed pivot 98 spaced horizontally from the shaft 90. Thus, downward swinging movement of the levers 96 will move the cylinder 18 downwardly.

Each of the levers 96 is biased upwardly by a coil spring 100, compressed between a block 102 and a bolt 104 which extends through the spring 100 and apertures 106 and 108 in the block 102 and the lever 96. Each bolt 104 is fitted with a nut 110 whereby the loading of each spring 100 may be adjusted. The upward movement of each lever 96 is limited by an adjustable stop screw 112 which is threaded through the lever 96 and is engageable with the block 102. A lock nut 114 is mounted on each stop screw 112 and is engageable with the lever 96 so that the screw 112 may be locked in its adjusted position.

The compression of the springs 100 may be adjusted to give the desired impression pressure when the paper sheet is fed between the blanket and impression cylinders 16 and 18. This adjustment may be effected by turning the adjusting nuts 110 on the bolts 104. Usually, the stop screws 112 are adjusted so that there is slight clearance between each screw and the corresponding block 102 when a sheet of paper is present between the blanket and the impression cylinders 16 and 18. When no sheet of paper is present, the stop screws 112 engage the blocks 102. If an unusually thick sheet or two or more sheets are fed between the cylinders 16 and 18, the springs 100 will yield to permit the passage of the sheets without damage to the machine.

The supporting arrangement for the master cylinder 14 is somewhat similar to that for the impression cylinder 18. Thus, the master cylinder 14 is rotatable about a shaft 120 which is stationary except for the rocking and translatory movements which accompany cylinder separation. In this case, the shaft 120 is journaled in bearings 122 carried on swing frames 124 which are rockable to a slight extent about pivots 126. The swing frames 124 may support an inking mechanism adapted to apply ink to the master cylinder 14. The swing frames 124 are swingable with respect to stationary main frames or plates 128. Alignment between the plates or frames 124 and 128 is maintained by bars 130 which are secured to the swing plates 124 and are arranged to overlap the main plates 128. Compressed coil springs 131 are provided between the plates 124 and 128 to limit the extent to which the plates 124 may swing toward the plates 128.

To provide for separation of the master cylinder 14 from the blanket cylinder 16, the master cylinder shaft 120 is formed with eccentric pivots 132 which are journaled in bearings 134. In this case, the bearings 134 are movable laterally to provide for spring-mounting of the cylinder 14. Thus, the bearings 134 are formed on links 136. Each link 136 is pivotally connected to one arm 138 of a lever 140 which is swingable about a fixed pivot 142. Each lever 140 has another arm 144 which is elongated and is biased upwardly by a coil spring 146. As in the case of the spring-mounting for the impression cylinder, each spring 146 is compressed between a fixed block 148 and a bolt 150 which is connected to the corresponding lever arm 144 and is provided with a nut 152 for adjusting the loading of the spring 146. A stop screw 154 limits the upward movement of each lever arm 144. As before, a lock nut 156 is mounted on each screw 154.

The springs 146 bias the levers 140 in a clockwise direction so that the links 136 and the cylinder 14 are pulled downwardly. The compression of the springs 146

may be adjusted to give the desired pressure between the master and blanket cylinders 14 and 16. The stop screws 154 are usually adjusted so that there will be slight clearance between each stop screw and the corresponding block 148, when the cylinders 14 and 16 are engaged.

It will be recalled that the cam follower lever 46 makes a full clockwise stroke when the feelers 32 detect the absence of paper between the guide plates 26 and 28. This stroke brings about separation of the cylinders 14 and 18 from the blanket cylinder 16. The arrangement for bringing about such separation comprises a latching pawl 160 having a shoulder or tooth 162 which is engageable with a shoulder or abutment 164 on a lever 166 secured to one of the eccentric pivots 92 on the impression cylinder shaft 90. When the pawl 160 is engaged with the abutment 164, it prevents the lever 166 from swinging clockwise, even though it is biased clockwise by a coil spring 168 stretched between a fixed anchor 170 and an arm 172 formed on the lever 166. When the pawl 160 is moved away from the abutment 164, the lever 166 is swung clockwise by the spring 168. The resulting clockwise rotation of the shaft 90 translates the impression cylinder 18 downwardly, out of engagement with the blanket cylinder 16.

The pawl 160 is adapted to be released by the downwardly extending arm 58 on the cam follower lever 46. More specifically, the arm 58 is engageable with a pin 170 secured to an arm 172 on a lever 174 which is effective to operate the pawl 160. An adjustable stop screw 176 is mounted on the arm 172 and is engageable with an arm 178 on the pawl 160. The stop screw 176 is so arranged as to operate the pawl 160 positively in a clockwise direction, while providing for counterclockwise lost motion between the lever 174 and the pawl 160. A coil spring 180 is stretched between arms 182 and 184 on the pawl 160 and the lever 174. The spring 180 normally maintains the stop screw 176 against the arm 178 on the pawl 160. It will be seen that the lever 174 and the pawl 160 are biased clockwise by a coil spring 186 which is stretched between the fixed anchor 56 and the arm 184 on the lever 174. The spring 186 biases the pawl 160 toward the position in which it latches the lever 166 with the impression cylinder 18 in its normal printing relation to the blanket cylinder 16.

If paper is not present between the guide plates 26 and 28, the follower lever 46 makes a full stroke, with the result that the arm 58 engages the pin 170 and swings the lever 174 and the pawl 160 counterclockwise. The pawl 160 is thereby disengaged from the lever 166. Accordingly, the spring 168 swings the lever 166 and the eccentric shaft 90 clockwise so as to throw the cylinder 18 away from the blanket cylinder 16.

Provision is made for throwing in the impression cylinder 18 after approximately one revolution. Thus, the lever 166 is adapted to be operated by a cam follower lever 190 which is engageable with a roller 192 on the lever 166. The cam follower lever 190 is biased counterclockwise about a pivot 194, by means of a coil spring 196 stretched between the lever 190 and a fixed anchor 198. The cam follower lever 190 is adapted to be swung clockwise by a high contour or portion 200 on a cam 202. It will be seen that the lever 190 carries a roller 204 which is adapted to engage the cam 202.

During each revolution of the impression cylinder 18, the high contour 200 on the cam 202 swings the follower lever 190 clockwise against the roller 192, so as to swing the lever 166 counterclockwise. This throws in the impression cylinder 18. Actually, the lever 166 is swung counterclockwise beyond its normal operating position, so as to relieve the pressure between the latching shoulders 162 and 164 on the pawl 160 and the lever 166. With the latching pressure relieved, the feeler mechanism can readily swing the pawl 160 away from the lever 166. The provision of the lever 174 permits the spring 180 to yield until the latching pressure is relieved, whereupon

the spring 180 swings the pawl 160 away from the lever 166. This assumes that paper is not present. If paper is present, the arm 58 does not actuate the lever 174, with the result that the spring 186 holds the pawl 160 in engagement with the lever 166.

The cylinder-separating mechanism 10 is also effective to throw off the master cylinder 14 from the blanket cylinder 16 when paper is not present at the appropriate time between the guide plates 26 and 28. In this case, the separation of the master cylinder 14 is brought about in response to the separation of the impression cylinder 18 from the blanket cylinder 16. In many respects, the separating mechanism for the master cylinder 14 is similar to that for the impression cylinder 18. Thus, the separating mechanism is adapted to operate a pawl 210 which normally latches a lever 212 against counterclockwise movement even though the lever 212 is biased counterclockwise by a coil spring 214. A shoulder 216 on the pawl is engageable with a shoulder 218 on the lever 212.

The illustrated pawl 210 is swingable about a pivot 220 and is biased clockwise by a coil spring 222 stretched between a fixed anchor pin 224 and a pin 226 on the pawl 210. It will be seen that the spring 222 tends to swing the pawl 210 away from the lever 212.

During normal operation, when paper is being fed between the cylinders 16 and 18, the pawl 210 is held against the lever 212 by a link 230 which is slideable longitudinally. A pin 232 on the link 230 is engageable with a shoulder 234 on the underside of the pawl 210. It will be seen that the link 230 has a longitudinal slot 236 which is slideably received over the fixed pin 224.

The link 230 is adapted to be moved upwardly and downwardly by an arm 238 secured to the impression cylinder shaft 90. More specifically, the link 230 is formed with a longitudinal slot 240 which is slideably received over a pin 244 mounted on the arm 238. Thus, the slot 240 and the pin 244 define a lost-motion connection between the arm 238 and the link 230. The lost motion is taken up in one direction by a coil spring 246 which is stretched between the pin 244 and a lug 248 at the lower end of the link 230. It will be seen that the spring 246 biases the link 230 upwardly.

When the impression cylinder 18 is thrown away from the blanket cylinder 16, the impression cylinder shaft 90 rocks counterclockwise, as seen in Fig. 7. This swings the arm 238 downwardly. Accordingly, the pin 244 pulls the link 230 downwardly. Such movement of the link 230 disengages the pin 232 from the pawl 210 so that the spring 222 can pull the pawl away from the lever 212. The lever 212 is thereby released for counterclockwise movement by the spring 214. Such rocking movement of the lever 212 rotates the pivot 132 of the master cylinder shaft 120, to which the lever 212 is secured. Accordingly, the master cylinder 14 and the swing frames 124 are moved away from the blanket cylinder 16. After about one revolution, the master cylinder 14 is again thrown toward the blanket cylinder 16 by a follower lever 252 which is operable by a cam 254. The follower lever 252 is engageable with a roller 256 on the lever 212. A roller 258 on the lever 252 is engageable with the cam 254. The roller 258 is biased against the cam 254 by a spring 260 which is stretched between the lever 252 and a fixed anchor 262.

The cam 254 has a high portion or contour 264 which swings the lever 252 counterclockwise during each revolution of the blanket cylinder 16. The lever 252 engages the roller 256 and swings the lever 212 clockwise, slightly beyond its normal position. If paper is being fed, the pawl 210 moves into latching engagement with the lever 212. Such movement of the pawl is brought about by the spring 246, which biases the link 230 and the pawl 210 upwardly when the impression cylinder 18 is thrown in, as shown in Fig. 7.

During each revolution of the blanket cylinder 16,

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the cam 254 swings the lever 252 sufficiently to relieve the latching pressure between the lever 212 and the pawl 210. The pawl 210 can then move away from the latching abutment 218 on the lever 212 if the link 230 has moved downwardly due to the failure to feed a paper sheet between the cylinders 16 and 18. It will be understood that the cylinders 14, 16 and 18 have the usual gaps (not shown) in their cylindrical peripheries, to accommodate the usual clamping devices for holding the master, the blanket and the paper sheets on the cylinders. The latching pressure between the pawl 210 and the lever 212 is relieved when the gaps on the master and blanket cylinders 14 and 16 are opposite each other. At this time, it is permissible to move the master cylinder 14 closer to the blanket cylinder 16 than it is when the cylinders are in engagement.

Likewise, the latching pressure between the pawl 160 and the lever 166 is relieved when the gaps in the blanket and impression cylinders 16 and 18 are opposite each other. Thus, the impression cylinder 18 may be moved closer to the blanket cylinder than it is when the cylinders are in engagement.

It will be seen that the lever 212 has a forked lower end portion 270 which straddles the pawl 210. The latching abutment 218 on the lever 212 is formed at the upper end of the forked portion 270.

When paper is not being fed, the master and impression cylinders 14 and 18 will be thrown away from the blanket cylinder 16. Consequently, the blanket cylinder 16 will not be given successive applications of ink from the master cylinder 14. In this way, overinking of the blanket cylinder is avoided.

However, it sometimes is desirable to bring the master cylinder into engagement with the blanket cylinder when paper is not being fed. This may be done when the blanket cylinder is to be inked up initially, after a new master has been mounted on the master cylinder 14. Accordingly, provision is made for retaining the master cylinder 14 against the blanket cylinder manually. In the illustrated machine, a hand lever 272 is provided for this purpose. When it is desired to throw in the master cylinder 14, the hand lever 272 may be swung clockwise, as viewed in Fig. 7, by hand, against the biasing action of a spring 274 which is stretched between the lever 272 and in anchor 276. An arm 278 is secured to the lever 272 and is provided with a pin 280 which is engageable with the lower edge of the pawl 210. When the lever 272 is swung clockwise, the pin 280 lifts the pawl into latching engagement with the lever 212. As long as the manually developed pressure is maintained on the lever 272, the lever 212 will remain latched, with the master cylinder 14 in engagement with the blanket cylinder 16.

It may be helpful to offer a brief summary of the operation of the cylinder-separating mechanism 10. During each revolution of the blanket cylinder 16, the cam follower lever 46 swings clockwise (Fig. 3) to permit the lug 74 and the feelers 32 to swing counterclockwise. Meanwhile, a sheet of paper is presented to the forwarding rollers 22 and 24 and is fed between the plates 26 and 28 by the rollers. The sheet arrests the downward movement of the feelers 32 in such a position that the lug 84 is in the path of the hook or toe portion 86 on the arm 68. Thus, the lug 84 arrests the movement of the cam follower lever 46 and prevents it from completing its clockwise stroke.

If no paper sheet is fed between the plates 26 and 28, the feelers 32 move down fully, as shown in Fig. 4. Accordingly, the lug 84 is moved to a position below the path of the hook portion 86, as shown in Fig. 4, so that the cam follower lever 46 is free to complete its clockwise stroke.

The arm 58 engages the pin 170 and swings the lever 174 counterclockwise (Fig. 1). This tends to stretch the spring 180 and swing the pawl 160 away from the lever 166. As the high contour 200 on the cam 202 passes

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the roller 204, the lever 190 is swung sufficiently in a clockwise direction to move the lever 166 counterclockwise away from the latching shoulder 162 on the pawl 160. With the latching pressure thus relieved, the spring 180 is able to swing the pawl 160 away from the lever 166.

As the high contour 200 on the cam 202 moves away from the roller 204, the lever 190 is swung counterclockwise by the spring 196. Concurrently, the lever 166 is swung clockwise by the spring 168. This rotates the eccentric shaft 90 and thereby moves the impression cylinder 18 away from the blanket cylinder 16.

The rocking movement of the impression cylinder shaft 90 swings the arm 238 counterclockwise. As a result, the pin 244 on the arm 238 pulls the link 230 downwardly. This moves the pin 232 away from the latch 210 so that the latch is free to move away from the lever 212.

The high contour 264 on the cam 254 swings the lever 252 counterclockwise sufficiently to swing the lever 212 away from the latching shoulder 216 on the pawl 210. With the latching pressure relieved, the spring 222 is able to swing the pawl 210 away from the lever 212. The weight of the pawl 210 also tends to swing the pawl away from the lever 212.

As the roller 258 descends from the high contour 264 on the cam 254, the lever 252 swings clockwise. Simultaneously, the lever 212 swings counterclockwise so as to rotate the eccentric shaft 120 and swing the master cylinder 14 upwardly, away from the blanket cylinder 16. The swing frames 124 are also swung upwardly.

With the impression cylinder 18 out of engagement with the blanket cylinder 16, there is no transfer of ink to the impression cylinder. Likewise, there is no transfer of ink from the master cylinder 14 to the blanket cylinder 16.

The impression cylinder 18 is reset by the cam 202, which swings the lever 190 clockwise against the roller 192 and thereby swings the lever 166 counterclockwise. The lever 166 is relatched by the pawl 160, if a paper sheet is fed between the guide plates 26 and 28. If not, the lever 166 remains unlatched.

In like manner, the lever 212 is reset by the cam 254 so that the pawl 210 can relatch the lever 212. The pawl 210 can be moved into latching position manually, by swinging the hand lever 272 clockwise (Fig. 7). In this way, a new image can be developed on the blanket cylinder.

The impression cylinder 18 is loaded by the springs 100, which are yieldable in the event that two or more sheets of paper are fed between the blanket and impression cylinders. When such an unusual stress occurs, the blanket cylinder 18 swings the supporting levers 96 downwardly against the resistance of the springs 100. The force exerted by the springs 100 may be changed by adjusting the nuts 110. The adjustable stop screws 112 limit the upward movement of the impression cylinder 18 when there is no paper sheet between the cylinders 16 and 18.

Similarly, the master cylinder 14 is loaded by the springs 146, which are adjustable by changing the positions of the nuts 152. The stop screws 154 limit the downward movement of the master cylinder 14.

It will be recognized that the cylinder-separating mechanism provides for effective and dependable separation of both the master and the impression cylinders from the blanket cylinder, whenever there is a failure in the feeding of a paper sheet to the machine. At the same time, the mechanism provides for spring-loading of the master and impression cylinders, so that the cylinders can yield to prevent damage to the machine under conditions of unusual stress upon the cylinders.

Various modifications, alternative constructions and equivalents may be employed without departing from the true spirit and scope of the invention, as exemplified in

the foregoing description, and defined in the following claims.

I claim:

1. In a printing machine, the combination comprising a blanket cylinder, a master cylinder movable into and out of engagement with said blanket cylinder, an impression cylinder movable into and out of printing relation with said blanket cylinder, first and second eccentric shafts supporting said master and impression cylinders respectively for rotation and movement toward and away from said blanket cylinder, first and second bearing means supported for movement toward and away from said blanket cylinder and rotatably supporting said first and second eccentric shafts respectively, first and second spring means yieldably biasing said first and second bearing means respectively toward said blanket cylinder, first and second adjustable stop means limiting movement of said first and second bearing means respectively toward said first and second eccentric shafts respectively and swingable therewith, said levers being swingable between first and second positions with said master and impression cylinders in and out of printing relation respectively with said blanket cylinder, first and second springs biasing said first and second levers respectively toward said second positions, first and second pawls for latching said first and second levers respectively in said first positions against movement to said second positions, means for feeding successive sheets between said blanket and impression cylinders, control means for detecting the feeding and nonfeeding of successive sheets between said blanket and impression cylinders, means operable by said control means in response to nonfeeding of sheets for disengaging said second pawl from said second lever and thereby initiating movement of said second eccentric shaft to said second position and movement of said impression cylinder away from said blanket cylinder, means operable in response to movement of said second eccentric shaft to said second position for disengaging said first pawl from said first lever and thereby initiating movement of said master cylinder away from said blanket cylinder, and first and second means for cyclically resetting said first and second levers respectively to said first positions for relatching by said first and second pawls respectively.

2. In a printing machine, the combination comprising first and second printing cylinders, an eccentric shaft supporting said second cylinder for rotation and movement into and out of printing relation with said first cylinder, a lever secured to said shaft and swingable therewith between first and second positions with said second cylinder in and out of printing relation with said first cylinder, a spring biasing said lever toward said second position, a pawl for latching said lever in said first position against movement toward said second position, means for feeding successive sheets along a predetermined path between said cylinders, feeler means movable in a predetermined advancing direction across said path and being adapted to be arrested in a first position by any sheet traveling therealong, said feeler means being movable beyond said first position across said path to a second position in the absence of any sheet, a spring biasing said feeler means in said direction for advancing said feeler means, cam follower means engageable with said feeler means for retracting said feeler means away from said path, a cam for actuating said cam follower means, a second spring for biasing said cam follower means against said cam, said cam follower means being movable in a first direction by said cam for retracting said feeler means and in a second direction by said spring to provide for advancing movement of said feeler means, a member on said feeler means and movable therewith into a first position in the path of said cam follower means for arresting movement in said second direction

with said feeler means in said first position, said member being out of the path of said cam follower means with said feeler means in said second position, and an element on said cam follower means for disengaging said pawl from said lever in response to full movement of said cam follower means in said second direction, said element thereby being effective to initiate movement of said second cylinder away from said first cylinder.

3. In a printing machine, the combination comprising a blanket cylinder, rotatable master and impression cylinders movable into and out of printing relation with said blanket cylinder, first and second eccentric shafts supporting said master and impression cylinders respectively for movement toward and away from said blanket cylinder, first and second bearing means supported for movement toward and away from said blanket cylinder and rotatably supporting said first and second eccentric shafts respectively, first and second spring means yieldably biasing said first and second bearing means respectively toward said blanket cylinder, said shafts being rotatable between first and second positions with said master and impression cylinders in and out of printing relation respectively with said blanket cylinder, first and second yieldable means biasing said first and second shafts respectively toward said second positions, first and second latch means for latching said first and second shafts respectively in said first positions against movement to said second positions, means for feeding successive sheets between said blanket and impression cylinders, control means for detecting the feeding and nonfeeding of successive sheets between said blanket and impression cylinders, means operable by said control means in response to nonfeeding of sheets for disengaging said second latch means and thereby initiating movement of said second eccentric shaft to said second position and movement of said impression cylinder away from said blanket cylinder, means operable in response to movement of said second eccentric shaft to said second position for disengaging said first latch means and thereby initiating movement of said master cylinder away from said blanket cylinder, and first and second means for cyclically resetting said first and second shafts respectively to said first positions for relatching by said first and second pawls respectively.

4. In a printing machine, the combination comprising first and second rotatable printing cylinders, an eccentric shaft supporting said second cylinder for movement into and out of printing relation with said first cylinder, said shaft being rotatable between first and second positions with said second cylinder in and out of printing relation with said first cylinder, yieldable means biasing said shaft toward said second position, latch means for latching said shaft in said first position against movement toward said second position, means for feeding successive sheets along a predetermined path between said cylinders, feeler means movable in a predetermined advancing direction across said path and being adapted to be arrested in a first position by any sheet traveling therealong, said feeler means being movable beyond said first position across said path to a second position in the absence of any sheet, a spring biasing said feeler means in said direction for advancing said feeler means, cam follower means engageable with said feeler means for retracting said feeler means away from said path, a cam for actuating said cam follower means, a second spring for biasing said cam follower means against said cam, said cam follower means being movable in a first direction by said cam for retracting said feeler means and in a second direction by said spring to provide for advancing movement of said feeler means, a member on said feeler means and movable therewith into a first position in the path of said cam follower means for arresting said cam follower means against movement in said second direction with said feeler means in said first position, said member being out of the path of said cam follower means with said feeler means in said second position, and an element on said cam follower

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means for disengaging said latch means in response to full movement of said cam follower means in said second direction, said element thereby being effective to initiate movement of said second cylinder away from said first cylinder.

5. In a printing machine, the combination comprising a rotatable blanket cylinder, rotatable master and impression cylinders movable into and out of printing relation with said blanket cylinder, first and second eccentric shafts supporting said master and impression cylinders respectively for rotation and movement toward and away from said blanket cylinder, first and second bearing means supported for movement toward and away from said blanket cylinder and rotatably supporting said first and second eccentric shafts respectively, first and second spring means yieldably biasing said first and second bearing means respectively toward said blanket cylinder, first and second adjustable stop means limiting movement of said first and second bearing means respectively toward said blanket cylinder, first and second levers secured to said first and second eccentric shafts respectively and swingable therewith, said levers being swingable between first and second positions with said master and impression cylinders in and out of printing relation respectively with said blanket cylinder, first and second springs biasing said first and second levers respectively toward said second positions, first and second pawls for latching said first and second levers respectively in said first positions against movement to said second positions, means for feeding successive sheets along a predetermined path between said blanket and impression cylinders, feeler means movable in a predetermined advancing direction across said path and being adapted to be arrested in a first position by any sheet traveling therealong, said feeler means being movable beyond said first position across said path to a second position in the absence of any sheet, cam follower means

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engageable with said feeler means for retracting said feeler means away from said path, a cam for actuating said cam follower means, a third spring for biasing said cam follower means against said cam, said cam follower means being movable in a first direction by said cam for retracting said feeler means and in a second direction by said spring to provide for advancing movement of said feeler means, a fourth spring biasing said feeler means in said predetermined direction for advancing said feeler means, a member on said feeler means and movable therewith into a first position in the path of said cam follower means for arresting said cam follower means against movement in said second direction with said feeler means in said first position, said member being out of the path of said cam follower means with said feeler means in said second position, an element on said cam follower means for disengaging said second pawl from said second lever in response to full movement of said cam follower means in said second direction, said element thereby being effective to initiate movement of said second eccentric shaft to said second position and movement of said impression cylinder away from said blanket cylinder, means operable in response to movement of said second eccentric shaft to said second position for disengaging said first pawl from said first lever and thereby initiating movement of said master cylinder away from said blanket cylinder, and first and second means for cyclically resetting said first and second levers respectively to said first positions for relatching by said first and second pawls respectively.

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