COPY SHEET DISCHARGE DEVICE WITH REMOVABLE ROLLERS

Inventors: Tamaki Kaneko, Katsumi Mizuno, both of Tokyo, Japan

Assignee: RICOH Co., Ltd., Tokyo, Japan

Filed: Aug. 3, 1970
Appl. No.: 60,694

Foreign Application Priority Data
Nov. 13, 1969 Japan..........................44/87271

U.S. Cl. ..................................................101/232
Int. Cl. ..................................................B41F 13/54
Field of Search ....101/232, 233, 235, 242/55, 242/55.53, 67.2; 271/DIG. 2, 8 D, 51; 226/181

References Cited
UNITED STATES PATENTS
3,221,652 12/1965 Mestre ................................101/232
2,050,350 8/1936 Markowitz ..........................101/232
2,647,462 8/1953 Dell .................................101/232
2,436,765 2/1948 Davidson et al...................101/232
3,234,832 2/1966 Niesen et al. ..................101/232 X

Primary Examiner—Robert E. Pulfrey
Assistant Examiner—R. E. Suter
Attorney—Henry T. Burke, Robert Scobey, Robert S. Dunham, P. E. Henninger, Lester W. Clark, Gerald W. Griffin, Thomas F. Moran, R. Bradlee Boal and Christopher C. Dunham

ABSTRACT
A printed copy sheet discharge device for rotary offset printing machines which is effective to control the relative positions of an impression cylinder of the duplicator and a pair of copy sheet discharge rollers comprising an adjustable spring-loaded shaft, parallel to the shaft of said impression cylinder and on which the rollers are rotatably mounted and maintained in contact with or spaced apart a small distance from the peripheral surface of said impression cylinder so as to facilitate discharge of printed copy sheets from the impression cylinder. The roller shaft is mounted at either end in spring-loaded arms whose position is adjustable by means of suitable set screws and which permit the shaft and rollers to be readily removable from the duplicator. Additional rollers are mounted on the roller shaft, which cooperate with a cylindrical delivery roller having suitable rings thereon for further guiding of the copy sheets into a receiving tray.

7 Claims, 4 Drawing Figures
COPY SHEET DISCHARGE DEVICE WITH REMOVABLE ROLLERS

BACKGROUND OF THE INVENTION

This invention relates to an improved printed copy sheet discharge device for rotary offset printing machines and more particularly to a device which permits fine adjustment of the position of the discharge rollers.

In rotary offset printing machines, an ink repellent etching solution is first applied to a master plate mounted on a rotary master cylinder and then ink is applied to the master plate, and the image on the master plate is transferred to a blanket cylinder maintained in pressing contact with the master cylinder while rotating, whereby the image transferred to the blanket cylinder can be duplicated on a copy sheet fed between the blanket cylinder and an impression cylinder adapted to rotate while being maintained in pressing contact with the blanket cylinder. Copy sheets are fed to the impression cylinder continuously until a predetermined number of copy sheets have been printed for one master plate. The supply and discharge of the copy sheets are effected at substantially high speeds. Generally, discharge of printed copy sheets is effected by means of a pair of copy sheet discharge rollers of relatively small diameter cooperating with the impression cylinder and peeling pawls maintained in contact with the impression cylinder and pressing thereagainst with a small force. In order to positively discharge printed copy sheets at high speed, it is required to effect minute adjustments of the relative positions of the peripheral surface of the impression cylinder and the copy sheet discharge rollers which may be maintained in contact with or spaced apart a small distance from each other in accordance with the thickness or quality of the particular copy sheets used. When the copy sheets used have a relatively large thickness, the printed copy sheets may have thereon a mark of discharge rollers or the images thereon may be blurred if the degree of contact of the discharge rollers with the peripheral surface of the impression cylinder is too high. Conversely, when the copy sheets used have a relatively small thickness, it will be impossible to effect discharge of printed copy sheets satisfactorily because not enough paper discharge action is exerted on the printed copy sheets if the degree of contact is too low.

It has hitherto been customary as shown in FIG. 1 to provide abutting rollers 43, on either end of a shaft mounting the copy sheet discharge rollers 41, which outer rollers are adapted to abut against the peripheral surface of an impression cylinder on opposite sides so as to prevent the copy sheet discharge rollers 41 from dropping into a recess 42a formed in the central portion of the surface of the impression cylinder 42. With this arrangement, it is almost impossible to effect adjustments of the degree at which the copy sheet discharge rollers 41, are maintained in pressing contact with the impression cylinder. Besides, it is difficult to adjust the relative positions of the copy sheet discharge rollers 41 and the abutting rollers 43 for optimizing the degree of contact of the copy sheet discharge rollers 41 with the peripheral surface of the impression cylinder 42. Copy sheet discharge rollers of the prior art are constructed such that they cannot be removed from the duplicator with ease, so that when the copy sheet discharge section is jammed with copy sheets it is a troublesome operation to remove from the machine sheets that have become stuck. The numeral 44 in FIG. 1 designates a gear mounted on one side of the impression cylinder 42.

Accordingly, the present invention provides a printed copy sheet discharge device for rotary offset printing machines which is adapted to permit minute adjustments of the relative positions of a pair of printed copy sheet discharge rollers and the peripheral surface of the impression cylinder so that every type of copy sheet can be discharged satisfactorily after duplication and which permits ready removal of the printed copy sheet discharge rollers from the duplicating machine, thereby contributing to increased ease with which the duplicating machine can be handled.

SUMMARY OF THE INVENTION

The present invention involves a copy sheet discharge apparatus for rotary offset printing machines comprising a shaft, having guide rollers mounted thereon and supported at its ends by spring-loaded arms which urge it toward the impression cylinder of the machine, and a stop means acting against the spring action and adjustable by means of set screws to position the rollers with respect to the surface of the impression cylinder to accommodate the discharge of different types of copy sheets. The shaft may be readily removed from the support arms in which it is held by the spring action and additional rollers are mounted thereon which cooperate with a cylindrical delivery roller having suitable rings thereon for further guiding of the copy sheets into a receiving tray.

Thus, the apparatus of the present invention affords more versatile and smoother discharge of the copy sheets and permits ready access to the impression cylinder in the event of jamming or other problems in the machine.

Additional features and advantages of the invention will become evident from the description set forth hereinafter when considered in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of a printed copy sheet discharging device of the prior art;
FIG. 2 is a side view of one embodiment of the printed copy sheet discharge section of a rotary offset duplicating machine according to the present invention, showing the copy sheet discharge section of a rotary offset duplicating machine with one side plate removed;
FIG. 3 is a front view of the copy sheet discharge section of FIG. 2; and
FIG. 4 is a perspective view of important portions of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 2 shows the copy sheet discharge section of a rotary offset printing machine. A blanket cylinder 2 and an impression cylinder 3 are shown as being rotatably mounted on respective shafts connected to side plates 1 of the machine and maintained in pressing contact with one another. The blanket and impression
cylinders rotating in directions a and b, respectively, transfer an image of a master plate onto copy sheets fed one after another from the right between the two cylinders. Printed copy sheets are then passed through a discharge device generally designated at 4 and piled in a stock on a discharged copy sheet receiving tray 5.

A delivery roller 6 rotatably supported by the side plates 1 has mounted at one end thereof a gear 7 which is in meshing engagement with an intermediate gear 8 which in turn is in meshing engagement with a gear 9 secured to one end of the impression cylinder 3 (see FIG. 3). Thus, the roller 6 is driven through the gear system 7, 8, 9 each time the gear 8 is engaged by gear 9 when the impression cylinder 3 is rotating.

The gear 8 is rotatably mounted at the forward end portion of a shaft 10 secured to one side plate 1 at right angles thereto. A shaft 11 is secured to the other side plate at right angles thereto and opposite the shaft 10, so that the shafts 10 and 11 extend toward each other. Support arms 12 and 13 are pivotally supported at their bases by the shafts 10 and 11, respectively, and extend upwardly as shown in FIG. 3. The support arm 12 is prevented from dislodgement from the shaft 10 by the gear 8 and the support arm 13 is prevented from dislodgement from the shaft 11 by a washer 14 provided at the forward end of the shaft 11. A spring 15 is loosely mounted on the shaft 10, with the spring engaging at one end a rod-shaped stopper 17 secured to one side plate 1 and engaging at the other end a bent portion or lug 12a on the support arm 12. A spring 16 is loosely mounted on the shaft 11, with the spring engaging at one end a stopper 18 secured to the other side plate 1 and engaging at the other end a bent portion or lug 13a on the support arm 13. The springs 15 and 16 urge the forward ends of the support arms 12 and 13 to move in pivotal motion toward the peripheral surface of the impression cylinder 3. The pivotal motion of the support arms 12 and 13 is restricted by adjusting set screws 19 and 20, threadably fitted in the lugs 12a and 13a of the support arms 12 and 13, respectively, and abutting at the forward ends thereof against the stoppers 17 and 18, respectively. Besides urging the support arms 12 and 13 to move in pivotal motion as aforementioned, the springs 15 and 16 also urge the support arms 12 and 13 toward the gear 8 and washer 14 on the shafts 10 and 11, respectively.

A shaft 21 disposed parallel to the peripheral surface of the impression cylinder 3 is supported at opposite ends in the upper ends of the support arms 12 and 13, with small diameter portions 21a on opposite ends of the shaft 21 being received in openings formed at the upper ends of the support arms 12 and 13. The shaft 21 can be mounted on and removed from the support arms 12 and 13 by moving one of the arms for example, the support arm 12 against the biasing force of the spring 15 toward the side plate 1 to which the shaft 10 is secured and then releasing the upper end of the support arm 12 from engagement with the small diameter portion 21a of the shaft 21. Alternatively, the shaft 21 may be gripped by hand and moved either to right or left in FIG. 3 so as to release the small diameter portion 21a, for example, from engagement with the upper end of the support arm 12. By readily mounting the shaft 21 on the support arms 12 and 13 or removing the same therefrom as aforementioned, it is possible to mount on the copy sheet discharge section and remove therefrom suitable rollers (22, 23) which are mounted on the shaft 21 as subsequently to be described. This arrangement also facilitates removal of stuck copy sheets when the copy sheet discharge section is jammed, or the replacement of used rollers with new ones when necessary.

Copy sheet discharge rollers 22 and 23 are rotatably mounted on short hub members 24 and 25, respectively, which are slidably fitted on the shaft 21.

The hub members 24 and 25 exert a substantial frictional force on the shaft 21, so that they may be moved axially of the shaft 21 and securely disposed in optimum positions depending on the width of particular copy sheets. The hub members 24 and 25 have secured thereto the ends of roller arms 28 and 29 which rotatably mount pressing rollers 26 and 27 at the opposite ends thereof, respectively. The pressing rollers 26 and 27 are maintained in pressing contact with the peripheral surface of the delivery roller 6. The degree of contact of the copy sheet discharge rollers 22 and 23 with the impression cylinder 3 or the size of the clearance therebetween can be readily and positively adjusted by tightening or loosening the set screws 19 and 20 while the machine is in operation.

Generally, the impression cylinder 3 is adapted to be pressed against the blanket cylinder 2 only when a copy sheet is being fed therebetween. When no copy sheet is present between them, they are spaced apart from each other. Therefore, if the degree of contact of the copy sheet discharge rollers 22, 23 with the impression cylinder 3 is adjusted while the impression cylinder 3 is maintained in pressing engagement with the blanket cylinder 2, the impression cylinder 3 will be spaced apart from the copy sheet discharge rollers 22 and 23 when the impression cylinder 3 moves apart from the blanket cylinder 2. This avoids rotation of the copy sheet discharge rollers 22 and 23 when no copy sheet is fed between the impression cylinder 3 and the blanket cylinder 2, thereby precluding wear and tear on the copy sheet discharge rollers and damage which might otherwise be caused to the peripheral surface of the impression cylinder 3 by the copy sheet discharge rollers 22, 23.

A copy sheet fed by a copy sheet feed device (not shown) is caught by known paws, (not shown) provided in a recess 3a formed on the peripheral surface of the impression cylinder 3, and released from the paws when the leading edge of the sheet moves beyond the copy sheet discharge rollers 22 and 23. The copy sheet released from the gripping paws is scooped at its leading edge by peeling paws 30 maintained in light pressing contact with the peripheral surface of the impression cylinder 3 and guided by upper edges 3oa of the peeling paws 30 to be introduced between the delivery roller 6 and the pressing rollers 26 and 27, so that the sheet can be discharged by the rollers 26 and 27 onto the tray 5.

Rings 31 and 32 are frictionally fitted over the delivery roller 6 which rings can also be moved axially of the roller 6 to optimum positions depending on the width of particular copy sheets used. The rings 31 and 32 and the pressing rollers 26 and 27 are effective to prevent the copy sheet released by the delivery roller 6 from sagging by its own weight and to permit the copy sheet to move straight forwardly.
What we claim is:

1. A printed copy sheet discharge device for rotary offset printing machines of the type having a blanket cylinder, and an impression cylinder which is adapted to rotate while bearing against said blanket cylinder and wherein copy sheets are fed between said two cylinders for effecting duplication, said device comprising:
   a. a pair of support arms each pivotally connected at one end to respective side plates of the machine;
   b. a shaft supported at its opposite ends by the other ends of said pair of support arms to be disposed parallel to the peripheral surface of said impression cylinder and at least one of said pair of support arms being movable axially of said shaft;
   c. copy sheet discharge rollers rotatably mounted on said shaft;
   d. a pair of springs respectively urging said pair of support arms in a direction in which said copy sheet discharge rollers are moved toward the peripheral surface of said impression cylinder and at least one of said pair of springs urging said axially movable support arm to press said shaft against the other of said pair of support arms;
   e. a pair of stoppers connected to said respective side plates of the machine for interrupting the pivotal motion of said support arms in the direction of the peripheral surface of said impression cylinder; and
   f. means for setting the point at which said pair of stoppers interrupts the pivotal motion of said pair of support arms so as to thereby control the degree of contact of said copy sheet discharge rollers with the peripheral surface of said impression cylinder.

2. A device as claimed in claim 1 wherein said point setting means comprises a pair of screws each mounted on one of said pair of support arms for pressing at the forward end against one of said stops.

3. Apparatus for discharging copy sheets from a printing machine of the type having a blanket cylinder and an impression cylinder rotatably abutting each other and between which said copy sheets are fed to be printed and then discharged wherein the improvement comprises:
   a. discharge roller means positioned adjacent the surface of said impression cylinder in the discharge path of said copy sheets and including:
      1. a shaft disposed parallel to the peripheral surface of said impression cylinder; and
   b. pivotable means for supporting said discharge roller means parallel to the axis of said impression cylinder and including:
      1. a pivot on said machine; and
   c. spring means urging said supporting means toward said impression cylinder and including a spring urging said support arm toward the rotational and lateral movement on said pivot so as to press said copy sheet discharge rollers on said shaft against said impression cylinder and to press said shaft axially against said supporting means.
   d. stop means fixed to the machine for holding said supporting means against rotation under the action of said spring means; and
   e. adjustable means cooperating with said stop means to selectively position said discharge roller means with respect to the surface of said impression cylinder for directing said discharged copy sheets to pass therebetween.

4. Apparatus as in claim 3 wherein said adjustable means comprises a set screw threaded in said support arm and abutting a fixed surface on said stop means.

5. Apparatus as in claim 3 further comprising:
   e. a set of peeling pawls positioned beneath said discharge roller means and lightly engaging the surface of said impression cylinder for removing the copy sheets therefrom;
   f. a delivery roller adjacent said pawls for receiving and guiding the removed copy sheets; and
   g. pressing rollers mounted on said discharge roller means and engaging said delivery roller in the path of said copy sheets for guiding said sheets on said delivery roller.

6. Apparatus as in claim 5 further comprising a ring member slidably fitted on said delivery roller and cooperating with one of said pressing rollers in guiding said copy sheets.

7. Apparatus as in claim 5 further comprising a gear assembly for driving said delivery roller in response to the rotation of said impression cylinder.

* * * * *