

[54] **MASTER SWITCH TO ACTUATE
DAMPENER IN AUTOMATIC DUPLICATOR**

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abandoned.

[52] U.S. Cl. 101/132.5; 101/147

[51] Int. Cl. B41 25/16

[58] Field of Search 101/132, 130, 132.5, 140,
101/141, 142, 144, 147, 232; 271/86; 93/93

K

[56] **References Cited**

UNITED STATES PATENTS

3,577,916 5/1971 Tonkin et al. 101/148

Primary Examiner—Edgar S. Burr

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Attorney, Agent, or Firm—Burgess, Ryan and Wayne

[57] **ABSTRACT**

An offset lithographic duplicating machine is adapted to reproduce master plates having markings on marginal areas indicative of the number of copies to be made therefrom. A photoelectric reading device reads the markings as a master plate enters the machine from a storage area and sends signals to a memory device which records the number of copies indicated. A counter records the copies completed and the master plate is ejected from the machine when the full number is completed. A master plate feed mechanism then feeds a succeeding master plate from the storage area and the process is repeated.

2 Claims, 6 Drawing Figures

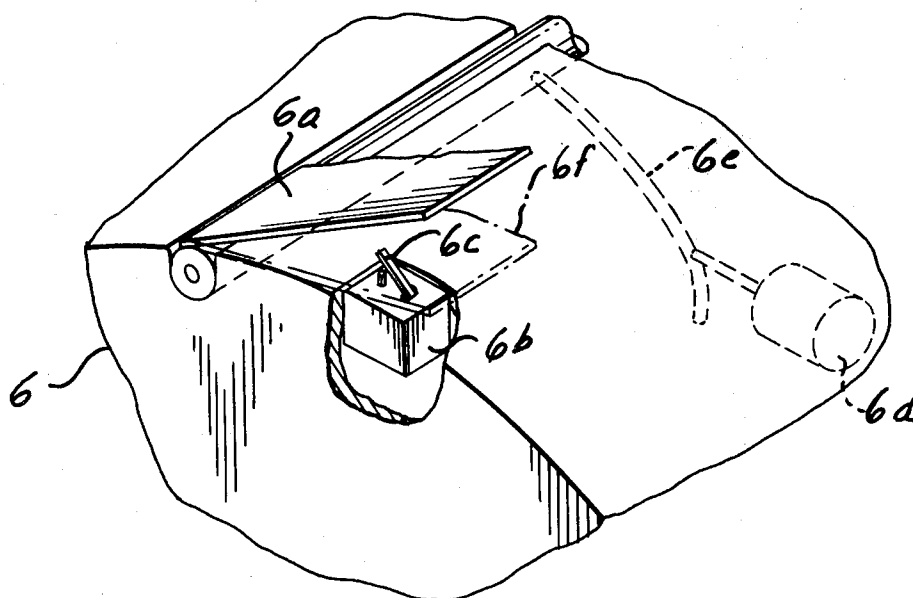


FIG. 1

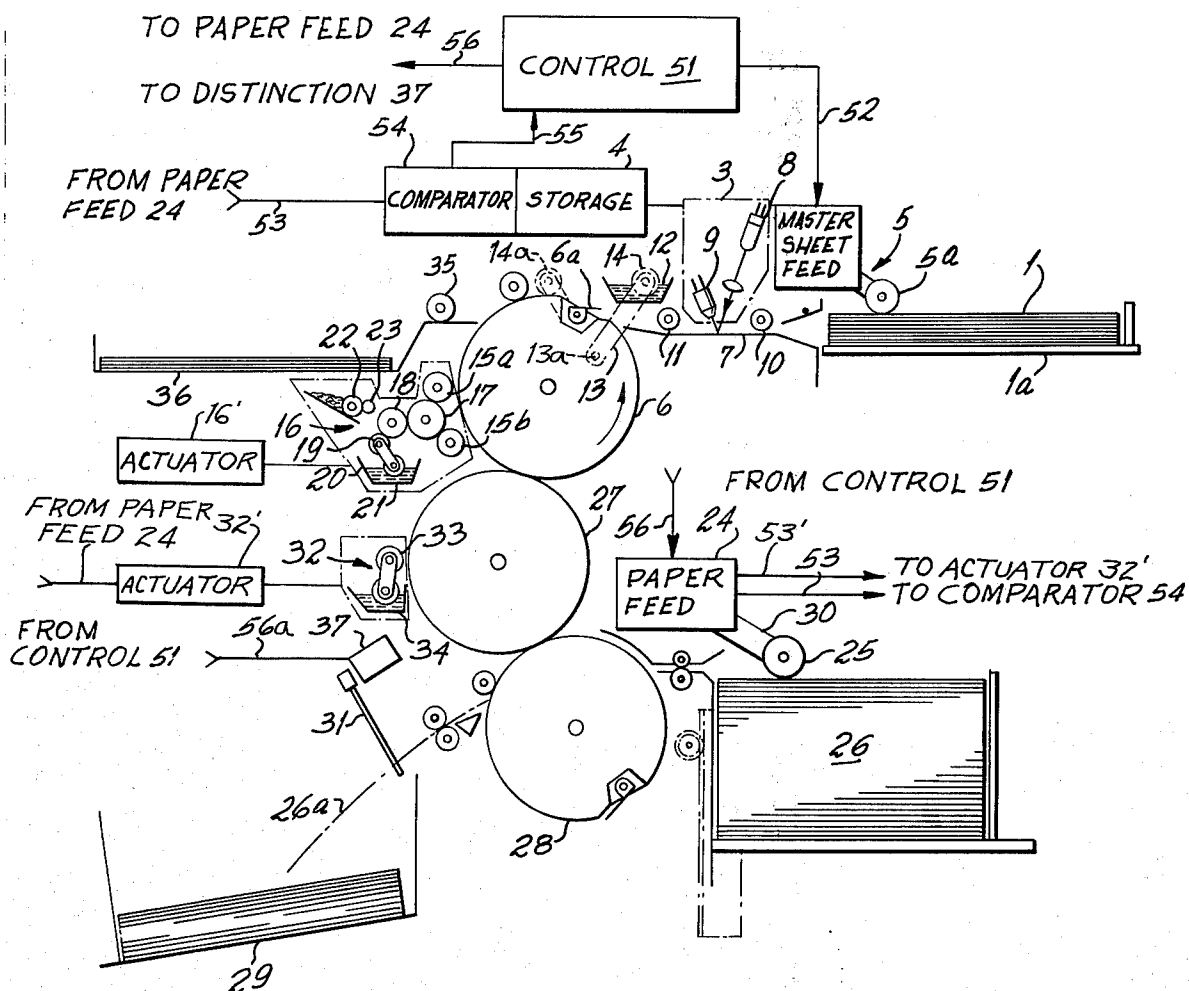


FIG. 2

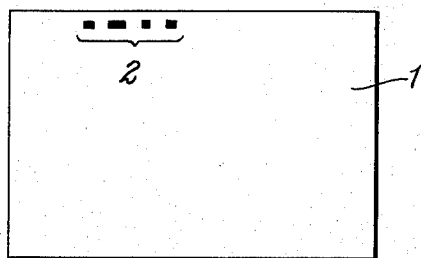


FIG. 3

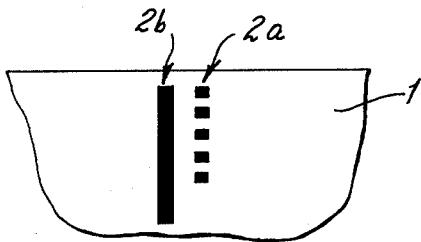


FIG. 5

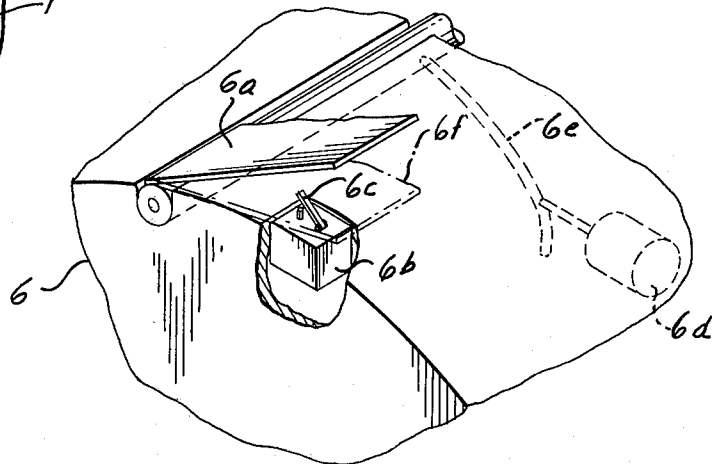


FIG. 4

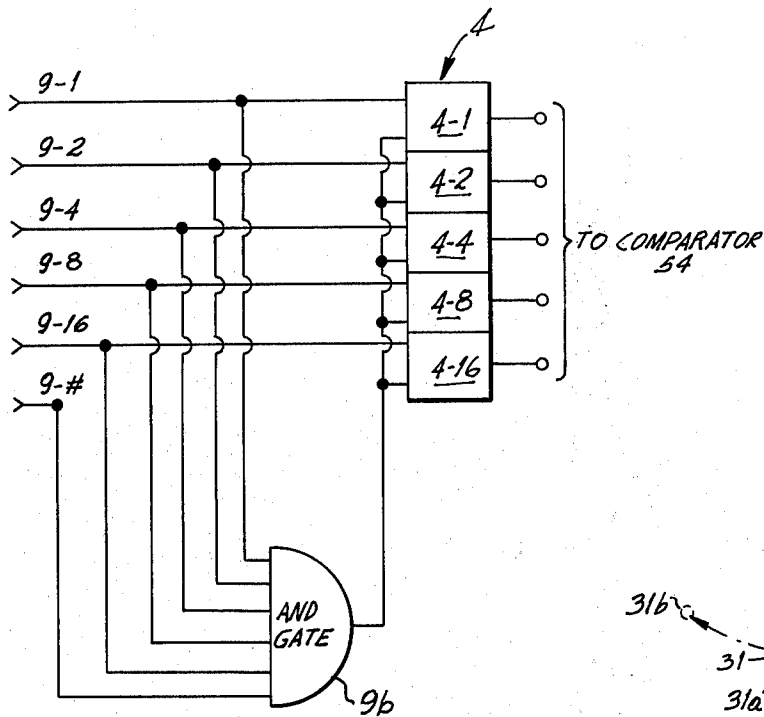
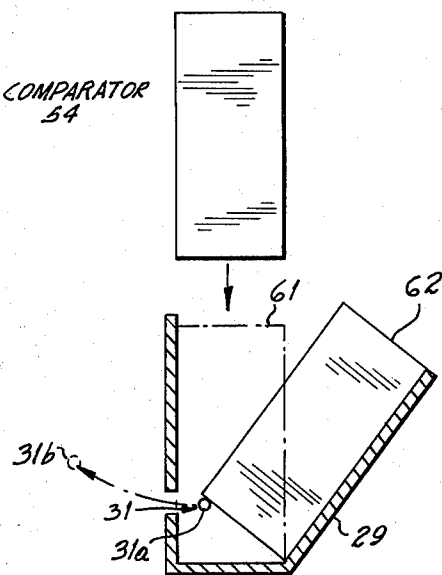


FIG. 6



MASTER SWITCH TO ACTUATE DAMPENER IN AUTOMATIC DUPLICATOR

This is a continuation of application Ser. No. 105,926 filed Jan. 12, 1971, now abandoned.

The invention relates generally to lithographic duplicating machines of the offset type and particularly to automatic machines of this type.

Lithographic offset duplicating machines are well known, and devices for rendering their operation more or less automatic have been developed. U.S. Pat. No. 3,102,470 to Cragg et al, for example, shows such a machine combined with various automatic devices for carrying out the sequence of steps required to produce a desired number of copies from a single master sheet. The device shown in the aforementioned U.S. Pat. No. 3,102,470 requires that the operator insert manually a lithographic master sheet into the machine. The leading edge of the master sheet is inserted into a clamping device provided upon a main cylinder. After such insertion the operator must push a button which operates certain relays and results in the clamping of the leading edge of the lithographic master by said clamping device. The operator then manually sets a dial switch to indicate the number of copies required. Finally, he moves an etch handle which places an applicator in contact with the surface of the lithographic master, and depresses a start button. All operations from that point on are carried on automatically by the control mechanisms disclosed in U.S. Pat. No. 3,102,470. In particular, the lithographic master is moistened with a suitable fluid which renders the non-image bearing portions of the master repellent to an oily ink and prepares the image bearing portions to receive said ink. Moistening having been completed, the lithographic master is linked, the ink is transferred to a blanket roll, and from a blanket roll to a series of copy sheets which are pressed against the surface of a blanket roll. After the number of copies has been preset by the operator, the machine automatically ceases to make copies and discharges the used lithographic master sheet into a receiving tray.

The known offset lithographic machine of the kind described above and shown in U.S. Pat. No. 3,102,470 requires the services of an operator to carry out the steps of positioning a lithographic master sheet on the main cylinder, presetting manually a counter with a number of copies desired, and initiating the copying cycle by pressing a start switch. It is therefore apparent that the attention of the operator is required every time the lithographic master sheet is replaced by a second lithographic master sheet.

It is an object of the present invention to modify the known machines of the type described above in such a way that a storage area or tray may be loaded with a plurality of lithographic master sheets and the machine started, after which each sheet will advance into the machine, be clamped to the main cylinder, and employed to create a desired number of copies, after which it is ejected into a receiving tray and the next master sheet fed into the machine for further copying cycles.

It is desired that the modified machine be usable where different numbers of copies are required from successive master sheets, and it would not be that it is not possible to program the machine to make a given number of copies from each such master sheet.

The invention contemplates in one embodiment the use of lithographic master sheets having a marginal area which is not reproduced during a copying cycle. The marginal area is provided with marks indicative of the number of copies to be made from the particular master sheet. An automatic master sheet feeding device feeds the master sheets one by one into the press beneath a photoelectric mark-reading device which reads the marks on the marginal area and sends suitable electric signals to a memory device which records the number of copies to be made from the particular sheet. The master sheet then proceeds to the main cylinder where it is automatically clamped. The main cylinder is then automatically set in motion during a moistening operation in which the master sheet is moistened in the manner described above in connection with the known machines. The operation of the offset press of present invention after the initiation of the premoistening step is similar to that of the press described above in connection with U.S. Pat. No. 3,102,470. After the desired number of copies has been printed the used master sheet is ejected to a storage tray and the next succeeding master sheet advances into the machine from the storage area in which the master sheets are piled.

According to the invention there is provided an improved lithographic offset printing machine of the kind adapted to make copies of master sheets in which each master sheet has indicia of the number of copies to be made therefrom. The improvement includes master sheet feeding means for feeding, when activated, a master sheet from a storage area into the printing machine along a guiding passage; means for discerning the indicia on the master sheet and originating a signal characteristic of the number indicated by the indicia so read, memory means comprising storage means for receiving the signal and storing the number; means for originating a signal to the memory means to indicate the production of each copy from the master sheet; means for comparing the number of copies produced from a master sheet with the number recorded in the storage means and for originating a completion signal when the number of copies produced equals the number recorded in the storage means, and means responsive to the completion signal for terminating the production of copies from a master sheet and for initiating the feeding into the machine of a succeeding master sheet, by activating the master sheet feeding means.

According to another aspect of the invention, there is provided in a lithographic offset press adapted for use with master sheets, each master sheet bearing indicia indicating the number of copies to be made therefrom, said press having presettable control means for controlling the press so that, when the control means is activated, a number of copies equal to a number preset into the control means is produced and the master sheet is then ejected, means for feeding a master sheet from a storage area into the press along a guide passage; means for reading the indicia and setting the presettable control means for the production of the number of copies so read; and means for feeding a succeeding master sheet from the storage area to the press upon the ejection of the first master sheet.

It will be apparent from the brief description above that the machine incorporating the invention may be loaded with a large number of lithographic master sheets, turned on, and operated without manual control

while it prints the desired number of copies from each of said sheets in succession.

The construction of illustrative embodiments as well as further objects and advantages thereof, will become apparent when read in conjunction with the accompanying drawings, wherein:

FIG. 1 is a schematic side view showing the arrangement of an offset press embodying the invention.

FIG. 2 is a plan view of a lithographic master sheet to be used in the offset press of FIG. 1.

FIG. 3 is a partial view of a master sheet illustrating the machine readable indicia thereon.

FIG. 4 is a block diagram of a portion of the storage, and the read device of FIG. 1.

FIG. 5 is a perspective view of a portion of the main drum and clamp arrangement thereon as shown in FIG. 1.

FIG. 6 is a top view of the displacement device and receiving table of FIG. 1.

The invention is designed for use with an original lithographic master sheet 1 which bears on a marginal portion thereof markings indicative of the number of copies to be made from said sheet. As shown in FIG. 2, the markings 2 may be placed adjacent a side edge of the lithographic master sheet and may comprise a series of rectangles. The markings 2 are shown here as black markings on a white background, which can be read by a photodetector arrangement which is described below and shown in FIG. 1. Any convenient or conventional markings can be used as long as they have the following two characteristics: one, they must be machine readable, and two, they are prevented from reproducing on the copies. The markings indicate the number of copies which are to be printed from the master sheet. Therefore, the markings whether visually dark images on a white background, as shown in FIG. 2, which can be read by a photodetector pick up, or magnetic markings which can be read by a magnetic head, all must have the property that they can be machine readable, by a machine which will provide signals which are characteristic of the number indicated by the markings. The second requirement of the markings 2, that they will not reproduce from the master sheet onto the printed copies, can be accomplished by placing the markings to a side or non-printing portion of the master sheet 1, or by entering the markings 2 on the master sheet with an ink that will not reproduce. Alternatively, magnetic markings would not reproduce from the photo-lithographic master sheet. Thus, the markings 2 may be of any convenient or conventional kind which are compatible with, machine reading, and non-reproducible on the copies made from the master sheet. It is possible, however, that in certain embodiments, it would be desirable to indicate the number of copies reproduced, and in which instance it might be desirable to reproduce the markings (which indicate the number of copies made from said sheet) on the copies themselves, in which case the markings 2 would be of an inked material which will reproduce on the copies.

As may be seen in FIG. 1, a stack of lithographic master sheets 1 is supported by a master sheet storage tray 1a. A lithographic master sheet feeding device 5 is adapted to lower a friction roller 5a against the upper surface of the uppermost lithographic master sheet when the device 5 receives an electric signal from a control 51. The lithographic master sheet feeding de-

vice 5 is well known in existing duplicating machines where they feed sheets of copy paper to printing rollers. Any convenient or conventional sheet feeding device may be used. The uppermost master sheet 1 is fed by the friction roller 5a to a guiding passage 7. It is advanced to the left as shown in FIG. 1 along the guiding passage by master sheet feed rollers 10 and 11. During this process, the master sheet 1 passes beneath a reading device 3 which is adapted to scan the marks 2 thereon and transmit to a memory device 4 a signal indicative of the number of copies to be made from the master sheet thus scanned. Reading devices of this type are known, an example being shown in U.S. Pat. No. 2,950,049 to Mazer et al. As shown in FIG. 1, the reading device 3 comprises a lighting source 8 which illuminates the marginal portion of the master sheet and a photoelectric transfer element 9 which measures the reflected light from the marginal portion. The photoelectric transfer element initiates an electric signal in response to variations in the intensity of the reflected light which results from the passage of master sheet 1 beneath the transfer element 9 of the marks 2.

Memory devices suitable for use as memory of the type shown are well known and generally involve the use of transistorized flip-flop circuits. In response to a series of pulses received from the photoelectric transfer element, such circuits record the pulses and thereby the desired information as to the number of copies to be created. Any convenient or conventional memory storage device may be used for example, a binary register of the kind described in Millman and Taub *Pulse and Digital Circuits*, New York, McGraw Book Company, 1956, for example the chapter beginning on page 326 or chapter 13 and particularly pages 411 and the following pages, would show circuitry for receiving pulses and which are indicative of a number and storing them electrically. The marks 2 on the master sheet may be in binary form, where a first mark, or absence thereof, would indicate one sheet; the second mark would indicate two more sheets; a third mark, four more sheets; a fifth mark, eight more sheets; a sixth mark, sixteen more sheets, etc. Thus, for example, if the first through fifth marks are present, there is one, plus two, plus four, plus eight, plus 16 for a total of 31 sheets to be printed from that master. If for example, only the first, third, fourth and fifth marks are present, then one, plus four, plus eight, plus 16 are to be reproduced or a total of 29 sheets. This is a conventional binary notation and the presence or the absence of a signal in these positions would be gated to, typically, the first, second, third, fourth and fifth stages respectively of a binary register. These types of registers are described in the aforesaid Millman and Taub publication, along with suitable circuitry for gating the pulses from the photodetector 9 to the registers in the storage. The organization of this type of circuit, and its construction is well known to electrical engineers, and it is envisioned that the memory and storage device 4 is not of a novel design and that any convenient or conventional memory or storage may be used, whether of the binary type just briefly described, or of any other machine memory form.

As a specific example, there is shown in FIG. 3 an edge portion of master sheet 1, having indicated thereon in binary notation the number of copies to be reproduced from this master sheet. The indicia consists of five dots shown here as 2a. They may be proceeded

by a solid bar mark 2b which may extend beyond the edge of the lowermost of the dots 2a. The role of the mark 2b is to prepare the memory or storage 4 and to send to it a signal which indicates to the memory "stand by, here comes the signal which is to be remembered." In this example, there are six photodetector reading heads. The heads are arranged in line to be transverse relation to the direction of movement of the master sheet 1, and scan over the bar 2b and the dots 2a, as the sheet moves below them.

Referring now to FIG. 4, there is shown a schematic diagram of the photodetector read heads and the memory device 4. The six read heads and the conductor connected to them are designated as 9-1; 9-2; 9-4; 9-8; 9-16; 9-#. The subscripts indicate the binary weighted numbers 1, 2, 4, 8, and 16. The 9-# comes from the bottommost head and is used for resetting the counter. The presence of the dark spots 2a and 2b will produce an electrical pulse on the corresponding read head as it passes over the dark spot.

The outputs of all of the photodetectors are connected to an AND gate 9b. AND gate 9b has the property that it will provide an output signal when, and only when, all of the signals applied at its inputs are pulses. Thus, upon the bar 2b passing beneath the read heads, a pulse is provided by all of the read heads on lines 9-1 to 9-#. Thus, AND gate 9b is activated and the pulse is provided at its output.

The memory device is shown here as a five stage binary counter. Each stage has a binary or flip flop. The stages are identified as 4-1; 4-2; 4-4; 4-8; and 4-16 which correspond to the binary weights. The output signal from AND gate 9b is applied to the "reset" terminal of each binary 4-1 to 4-16 and resets all of the binaries, thus clearing the counter, or setting it equal to zero. As the master sheet passes beneath the read heads, so that the indicia 2a is read, a pulse is selectively applied on leads 9-1 through 9-16 depending on whether there is a mark below the read head. These pulses set the binaries 4-1 to 9-16 in the memory device 4. Thus, the indicia 2a on the master sheet is machine read into memory device 4.

The master sheet feed rollers 10 and 11 eventually advance the leading edge of the master sheet 1 into a main cylinder clamp 6a. The clamp may be caused to grip the master sheet by a mechanism such as that of U.S. Pat. No. 3,102,470 except that it is modified for automatic operation. That is, whereas the device shown in U.S. Pat. No. 3,102,470 requires an operator to close a switch in order to activate it, a similar closing could be effected by a microswitch element activated by the leading edge of the master sheet 1 as it advances into the clamp 6a.

FIG. 5 shows in perspective view the main cylinder 6, the main cylinder clamp 6a, and a microswitch element 6b located on the outer periphery of the main cylinder clamp just underneath the inside of the throat of the clamp 6a, adjacent to where clamp 6a is hinged to the cylinder 6. The master sheet 1 enters into the throat between the clamp 6a shown in its opened position, and the cylinder 6. This would be the master sheet coming from the right in the drawing as it leaves the guide passage 7. The master sheet enters into the throat when it arrives to thereby depress the contact 6c of the microswitch 6b. Closing of the switch 6c activates a motor element 6d located on the inside of the cylinder, which in turn activates a lever arm 6e which is rigidly con-

nected to the clamp 6a forcing the clamp into its downward clamped position, thereby locking the master sheet 1 into the space throat between the cylinder clamp 6a and the cylinder 6. When the cylinder clamp is in its down position, it is in the dotted position shown as 6f.

An alternative embodiment is to use the clamp 6a with the press shown in U.S. Pat. No. 3,102,470 which contemplates that the operator will close a starting switch in order to activate the press and initiate the printing of a desired number of copies. The function of the manually operated starting switch described above is modified in applicant's device for automatic operation, as for example, by using the microswitch 6b having the feeler 6c which detects the leading edge of the master sheet 1 as it enters the clamp 6a. The closing of the contact 6c on switch 6b performs the same function as the operator closing the manual switch in U.S. Pat. No. 3,102,470.

As the cylinder 6 rotates in the direction of the arrow, the master sheet held on its periphery is moistened with a desensitizing liquid 12 which periphery applied by a roller 14 mounted on the free end of a swinging arm 13. The activation of the swinging arm 13 may be initiated by any convenient or conventional means. For example, the movement of inactive arm 13 from its inactive position, as shown here in the drawing, to its active position which is counter-clockwise rotated approximately 90° and is shown by the phantom line and bearing legend 14a, may be initiated by a control signal from the microswitch 6b which would initiate means for flipping swinging arm 13 in the counterclockwise direction to be in active position 14a. Alternatively, this means for moving swinging arm 13 might be a motor or might be merely an element mounted on the side of cylinder 6, the element being positioned to protrude from the side of the drum to engage the swinging arm 13 in a first position and having a retracted position in which the arm 13 is not engaged. The element would be extended outward to engage swinging arm 13 separately on each rotation which is pivotally mounted at point 13a to a stationary member relative to the movable cylinder 6. The initiation of rotation of cylinder 6 will bring the retractable member into contact with swinging arm 13 causing it to flip over and thus come into contact with the master sheet to moisten it. Alternatively, the movement of swinging arm 13 could be initiated under the control of a signal from the control 51. In this case, the activation of the microswitch 6b and the closing of the clamp 6a produces a signal which is transferred to the control 51 which in turn initiates a signal going to the means for flipping over the arm 13.

The function of the desensitizing liquid is well known in this art. It coats the image bearing portions of the master sheet and renders them attractive to an oily ink, while at the same time, rendering the remaining portions of the master sheet oil-repellent. As a result of this coating step, the surface of the master sheet can be contacted with an oily ink which will adhere only to the image bearing portions thereof. A suitable chemical composition for the desensitizing liquid is a compound of sodium ferrocyanide, ammonium hydrogen phosphate, and di-ammonium hydrogen phosphate. The return of the roller 14 on the swinging arm 13 to its inactive or reservoir position, i.e., as shown on the right in the drawings, is accomplished after a predetermined

rotation of the cylinder 6. This may be accomplished by using the above example in which there was a motor which moved swinging arm 13 to the inactive position 14a, by having a time delay on the motor which then returns it or by having a detector (not shown) on cylinder 6 which would count two or three revolutions, and then cause the motor to be activated to return the swinging arm to the inactive 14. Alternatively, the control 51 could energize other means for the return of swinging arm 13.

After the master sheet has been moistened with desensitizing liquid 12, both ink and water are applied thereto by means of two form rollers 15a and 15b which are brought into contact with the main cylinder 6 by an actuator 16'. The actuator 16' is clearly disclosed in U.S. Pat. No. 3,431,841 entitled "Offset Duplicating Machine With Master Loading and Ejecting Mechanisms" and, therefore, a detailed description of the same is herein omitted. Ink is applied to ink transfer roller 23 from ink transfer roller 22. These elements constitute ink supply device 16. Ink transfer roller 23 is movable into contact with rider roller 18 which transfers the ink therefrom to rider roller 17 whence it reaches the form rollers 15a and 15b. In similar fashion, water retained in water trough 21 passes by way of roller 19 to rider roller 18 and thence to the rider roller 17 and the form rollers 15a and 15b. U.S. Pat. No. 3,147,702 illustrates similar inking arrangements.

After the master sheet has been properly inked a paper feed device is actuated and a friction roller 25 feeds the top sheet of paper copy from a stack 26 of printing paper. Each copy paper is grasped by pressure cylinder 28 and squeezed between cylinder 28 and a transfer cylinder 27, which has picked up the inked image from the master sheet. Each copy paper is discharged to the paper receiving table 29 after receiving an inked image. The initiation of the operation of the paper feeding device 24 may be provided by the control 51 or by a synchronizing signal from the inking device 16. Such control signals are well known in the art and are shown in the above cited patent.

The number of copies created from each master sheet may be measured by recording the movement of an arm 30 to which roller 25 is attached, since each cycle of arm movement causes the creation of one copy. The motion of the arm 30 may be recorded by a microswitch (not shown) which is activated in response to such motion and which thereupon sends an electric pulse signal to a comparator device 54, indicating that a copy has been made. Comparator 54 is connected to the memory device 4, which records the number of copies which are to be made by the printing machine. The pulses from paper feed device 24 pass through a conductor 53 to comparator 54 where they are counted and this number is then compared with the number stored in memory device 4. When the two numbers are equal, a completion signal is sent to the controller 51, for initiating termination of the printing cycle, i.e., inhibiting feed device 24 from supplying additional sheets of copy paper from the stack 26 to the printing machine, initiating cleaning of the cylinder 27, discharging the master sheet on cylinder 6; and then initiating the start of a new cycle by providing a signal to the master sheet feed 5 to begin reloading the cylinder 6 and starting the printing cycle again.

As noted before, the memory device 4 receives electrical signals from the reading device 3 to indicate the

number of copies which are to be printed. The comparator 54 receives on conductor 53 one pulse each time a copy paper is printed. The comparator 54 may consist of a binary counter made up of a number of stages. When the number in the counter is equal to the number in memory device, an output or completion signal is provided. Counters and registers of the kind shown in comparator 54 and memory device 4 and circuitry for providing a completion signal when the number in the comparator and memory device 4 are identical, may be any convenient or conventional type. Such suitable circuitry, is shown in the above cited Millman and Taub textbook, reference is made particularly to chapter 11, entitled "Counting" and to chapter 13, particularly the text beginning on page 211. This type of comparator and memory storage counter is shown in U.S. Pat. No. 3,392,914. As shown in FIG. 1 a completion signal is provided via conductor 55 to the control 51. Control 51 provides output signals activated by the completion signal to terminate operation of the paper feed device 24. This stop signal is provided on a conductor 56.

It will be understood that the control 51 may be constructed to control such varied operations as the stopping of the paper feed, starting of the inked image erasing device, stopping the inking of the master sheet, removing a first master sheet automatically and moving arm 30. However, it is also possible to have the control 51 suitable for only a single one of these operations, as for example, only the paper feed device 24. In this case, proper initiation of all the other steps in the press may be obtained by mechanically coupling them with the paper feed device 24.

Since the invention automatically replaces one master sheet with a succeeding master sheet and continues to make copies from the latter, it is obvious that the copies in the paper receiving table 29 will not all be identical. It is desirable that some means be provided to differentiate the copies made from one master sheet from the copies made from a succeeding master sheet. For this purpose, there is provided a displacement device 37 which, when energized, causes lever arm 31 to rotate. Such rotation moves the lower end of the arm 31 from a withdrawn position in which it is clear of the trajectory of copy papers entering the receiving table 29 to an extended position in which it intercepts and strikes the copy paper moving along the trajectory 26a. Any copy paper thus contacted will fall upon the stack of copies in the receiving table in a somewhat displaced position. The displacement device 37 is actuated during the feeding out of the last copy paper which is made from any one master sheet. The final stack of copy papers, therefore, exhibits a projecting sheet indicating where the copies made from one master sheet end and the copies made from the succeeding master sheet begin.

FIG. 6 is a top view of the receiving table 29. A first stack of paper 61 which was produced from one master sheet, is shown lying partially beneath a second group of printed paper 62, which was produced from a subsequent master sheet. Copy paper from the cylinder 27, 28 in FIG. 1, is shown in FIG. 6 as entering from the top of the FIG. 6 towards the bottom of the figure. In the absence of lever arm 31 being in position, the copy paper falls in the stack shown by legend 61. When the swinging arm 31 is moved to an actuating position, shown here as the phantom dotted line with legend 31a, to the position indicated by the legend 31b, the

next incoming paper at its left forward side, comes into contact with lever arm 31 at position 31a, thereby causing the paper to pivot in a clockwise direction and land in the stack of paper which bears legend 62. It will be appreciated that the paper comes into contact with the lower portion of lever arm 31 which deflects it, or rotates it, just slightly. The paper then falls downward and forward into the pile 62 as it clears the lower end of lever arm 31. Lever arm 31 is alternately moved into actuating position so as to contact the incoming paper for alternate master sheets, so that the copies from one master sheet lay in position 61, those of the subsequent master sheet lay in position 62, and those copies from the following master sheet then lay in position 61. Thus, the copies from each master sheet can be readily separated from each other. Lever 31 is controlled by displacement device 37 which moves the arms 31 either into position to contact the copies at a position 31a, or out of the way so as not to contact the incoming paper at a position 31b. A control signal from the control 51 is provided via conductor 56a to the displacement device 37. This is the completion signal from the controller which is initiated after all the copies from a particular master have been completed. The actuation of the displacement device 37 to move the arm 31 into actuating position, or out of actuating position may be initiated by other means than a control signal from control 51, e.g. it may be done by a mechanical linkage or electrical contact, such that the lever arm moves during the time interval between the last copy paper emerging between cylinders 27 and 28, and the first copy paper associated with the next master sheet emerging between the cylinders.

After the printing of the last copy paper from a given master sheet, an image erasing device 32 is actuated by an actuator 32' in response to the stopping of the paper feeding device. This actuator 32' is clearly disclosed in the above-mentioned U.S. Pat. No. 3,431,841 and, therefore, a detailed description of the same is herein omitted. The inked image erasing device 32 comprises a tray holding a washing liquid 34 which is conveyed to the transfer cylinder 27 by roller 33. Simultaneously, with the washing operation, the form rollers 15a and 15b are withdrawn from contact with the main cylinder 6 and the master sheet thereon. The master sheet is then released by the clamp 6a and delivered to receiving stand 36 by roller 35. After a timed interval, the image erasing device 32 is stopped automatically and the original sheet feed device 5 again is actuated by a signal from the control 51 to feed out another master sheet from the master sheet storage tray 1a.

In summary, there has been described an apparatus for the continuous operation of a photo-lithographic offset printing machine. A complete printing cycle begins when a signal is provided from control 51 via conductor 52 to a master sheet feed 5, which starts a master sheet along a guide path. Along this path, the machine reading device 3 reads indications 2 on the master sheet as to the number of copies which are to be printed from that master sheet. The information as to the number of copies is entered in a memory device 4. The master sheet is then attached to a printing cylinder 6; the master sheet is then prepared; e.g. densitized inking apparatus is initiated; and a paper feed device is started to feed copy paper to the printing cylinder. As each sheet of paper is fed, an electrical signal is applied to a comparator, which compares the number of elec-

trical signals received (i.e., proportional to the number of copies already fed to the printer) with the number of copies to be printed, which is stored in memory device 4. When the number of copies actually printed agrees with the number of copies which are to be printed, a completion signal via conductor 55 is sent to the control 51 which in turn provides a stop signal to the paper feed device. This in turn initiates a removal of the master sheet from the press, a cleaning of the ink roller, and activation of the displacement device 37 and lever arm 31 for the paper stacking arrangement. Finally, the control 51, after a predetermined time delay (to enable the unloading of the previous master sheet, and the cleaning of the printing roller) sends a start signal via conductor 52 to the master sheet feed to initiate the next printing cycle.

Thus there has been shown a printing machine which operates continuously and automatically, and requires only the original stacking of the master sheet and the stacking of copy paper. The machine will automatically print the correct number of copies from each master sheet, as was not heretofore available in the prior art machines. The labor formerly required to man a printing machine is thus dispensed with.

Although illustrative embodiments of this invention have been described in detail herein with reference to the accompanying drawings, it is to be understood that the invention is not limited to those precise embodiments, and that various changes and modifications may be effected therein by one skilled in the art without departing from the scope or spirit of the invention.

I claim:

1. In a lithographic offset printing machine for use with a plurality of discrete master sheets each having marking indicia thereon indicating the number of prints to be made from each of the discrete master sheets, the combination comprising:

- a main cylinder for carrying said each of the discrete master sheets;
- a transfer cylinder disposed in contiguous relation with said main cylinder for receiving an offset image from said each of the discrete master sheets;
- a pressure cylinder disposed on contiguous relation with said transfer cylinder for pressing copy sheets against said transfer cylinder;
- a master sheet feeding device to feed said each of the discrete master sheets to said main cylinder;
- a clamp mounted on said main cylinder for retaining said each of the discrete master sheets thereon;
- a switch on said main cylinder positioned to be engaged by a leading edge of each said master sheet fed to said main cylinder to thereby actuate said switch;
- drive means on said main cylinder coupled to said clamp and responsive to actuation of said switch by said master sheet to close said clamp to thereby retain said master sheet on said main cylinder;
- a moistening device for moistening said each of the discrete master sheets;
- control means responsive to said actuation of said switch by said master sheet for producing a control signal when said master sheet is retained by said clamp;
- means responsive to said control signal for operating said moistening device for moistening said master sheet retained in said main cylinder;

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reading means disposed between said master sheet
feeding device and said main cylinder to scan the
marking indicia on said each of the discrete master
sheets and generating a first electrical pulse signal
representing the number of prints to be made therefrom;
a memory device electrically connected to said read-
ing means to store said first electrical pulse signal
indicative of the number of prints to be made from
said each of the discrete master sheets;
means for actuating an ink supply device to cause the
application of ink and water to said each of the dis-
crete master sheets after moistening;
copy sheet feeding means to feed the copy sheets to
said pressure cylinder and including means for gener-
ating a second electrical pulse signal indicative of
the number of copy sheets being fed to said pres-
sure cylinder;
comparing means electrically connected to said
memory device and said means for generating said
second electrical pulse signal, said comparing
means comparing said first and second electrical
pulse signals and generating a completion signal
when the value of said first electrical pulse signal

equals that of said second electrical pulse signal;
means for actuating an image erasing device to re-
move the image from said transfer cylinder in re-
sponse to the stopping of said copy sheet feeding
means;
means for removing said each of the discrete master
sheets from said main cylinder upon completion of
printing; and
control means operable by said completion signal to
terminate operation of said copy sheet feeding
means and to operate said removal means to re-
move said each of the discrete master sheets from
said main cylinder, said control means being fur-
ther operable to actuate said master sheet feeding
means to feed a following individual master sheet
to said main cylinder.

2. The combination according to claim 1, further
comprising a displacement device electrically con-
nected to said control means and having a lever arm ac-
tuated in response to said completion signal to provide
contact with copy sheets printed from one master sheet
to be displaced with respect to the copy sheets printed
from an earlier printed master sheet.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,898,928 Dated August 12, 1975

Inventor(s) Tamaki Kaneko

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

Column 1, lines 65-66: Delete "that it is not".

Column 4, line 23: Delete "suitable for use as memory"

Column 5, line 7: Before "transverse" insert --in--.

line 29: After "device" insert --4--.

Column 7, line 8: After "inactive" add --position--.

line 31: Change "paper copy" to --copy
paper--.

line 54: Change "the" to --they--.

Column 8, line 18: Change "Controll" to --Control--.

On the Title Page, please insert the convention
priority data, which is as follows:

--Japanese Application No. 46954/67, Filed
July 21, 1967--

Signed and Sealed this

twenty-third Day of December 1975

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks