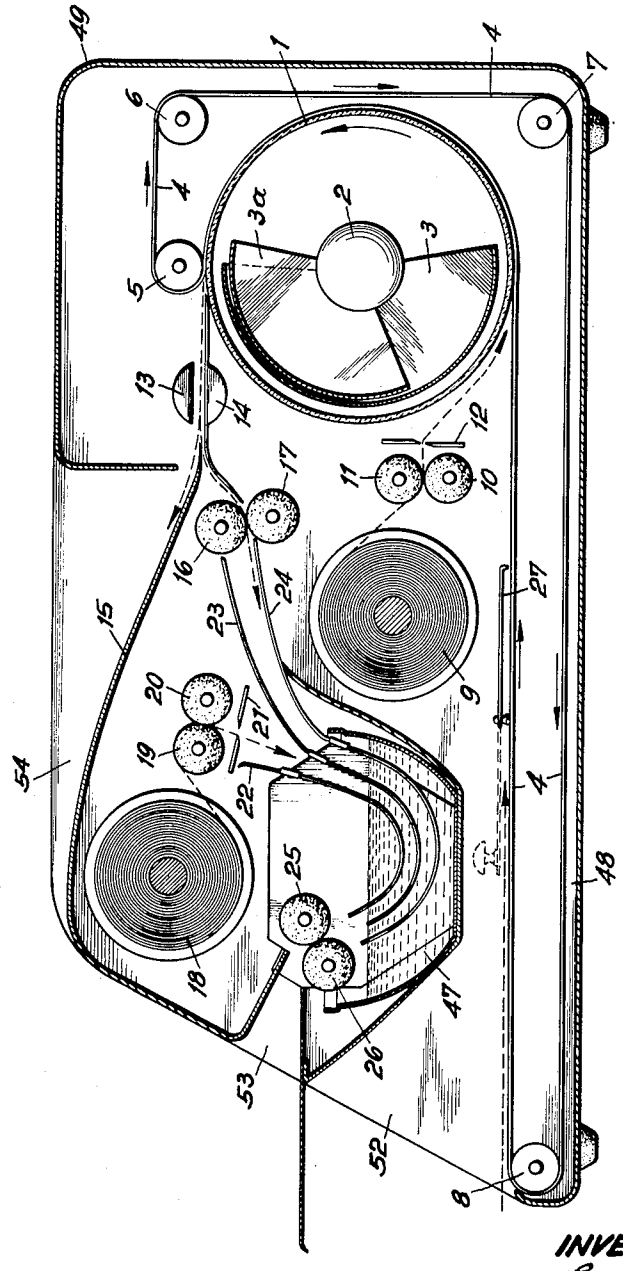
Jan. 31, 1956 W. LIMBERGER 2,732,778

DEVICE FOR MAKING PHOTOSTATIC COPIES

Filed June 16, 1952 2 Sheets-Sheet 1

FIG. 1



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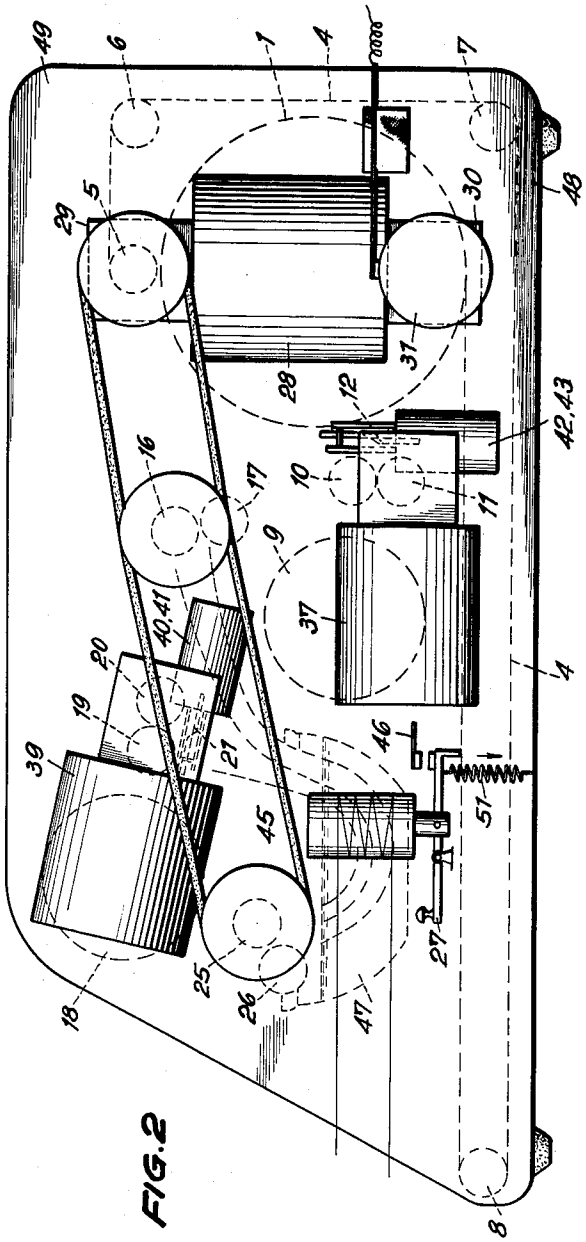


FIG. 2

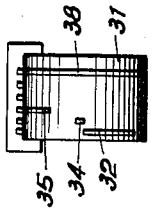


FIG. 4

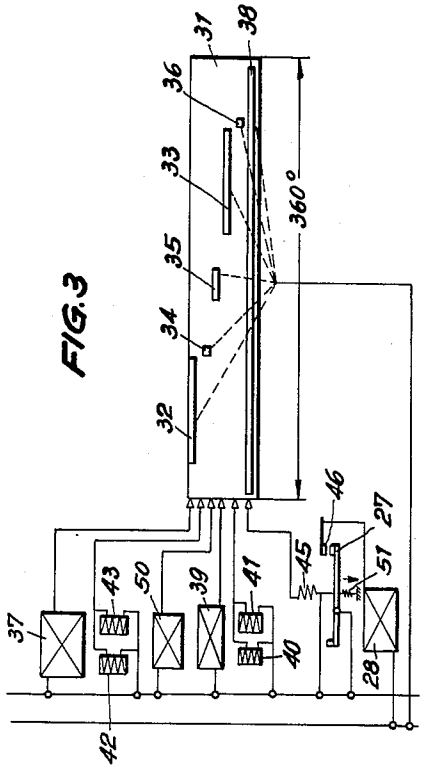


FIG. 3

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DEVICE FOR MAKING PHOTOSTATIC COPIES

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Application June 16, 1952, Serial No. 293,790

Claims priority, application Germany June 19, 1951

1 Claim. (Cl. 95—77.5)

This invention relates to a device for making photostats and more particularly to an automatic device for such purpose.

It is an object of this invention to provide a device for efficiently practising the well-known photostatic printing method in which a light-sensitive coating (negative paper) is used for producing a latent image thereon by exposing it to light while in direct superposed contact with the original to be reproduced, and in which such latent image is then transferred onto a light-sensitive coating (transfer paper) by moistening both coatings in a developer solution and thereafter pressing them against each other. For effecting the various steps of this method it has been customary to employ separate devices, especially one for exposing and one for moistening and pressing. In this manner, however, it was only to a limited extent possible to simplify and speed up the making of photostatic copies. The encountered difficulties were especially due to the fact that the manipulations for handling the exposure device were entirely different from those required for handling the separately arranged moistening and pressing device. Thus, it was impossible to correlate the manipulation of both devices and thereby simplify operation.

It is a further object of this invention to obviate the above difficulties and to provide a simple photostatic copying device in which the exposure and printing or copying means on one hand and the moistening and pressing means on the other hand are correlated and arranged on a common base plate and designed to be driven by motor power, whereby the exposure means comprise a hollow cylinder of transparent material around the periphery of which the negative paper is passed by a traveling conveying belt in superposed contact with the original from which a copy is to made, and within which the light source for effecting the exposure is mounted. The moistening and pressing means, generally known as such, comprise a container for a developer solution with guiding means for separately passing therethrough the exposed negative paper and the transfer paper and two power-driven press rolls which are arranged behind said container and are pressed against each other between which the negative paper and the transfer paper are passed in such a way that their coatings are in contact one with another, after having been moistened in the developer solution.

By such arrangement the invention provides a compact device in which all essential elements are mounted on a common base plate and are completely correlated with one another in their operation, whereby considerably simplified manipulation and higher speed in the making of photostatic copies are achieved. Because it is advantageous to make the light affection on the original and negative paper adjustable in order to suit various transparency and light-sensitivity conditions, this invention provides for such adjustment, and in a preferred embodiment there are arranged for this purpose a stationary and a turnable mask between the light source and the transparent cylinder.

The present invention provides furthermore means by which the original, the negative paper and the transfer paper are guided automatically in proper correlation and sequence through the exposure device and the moistening and pressing device, whereby all treatments occur in correctly timed relation beginning with the insertion of the original into the device. According to the invention it is thereby advisable to supply the negative paper and the transfer-paper in the form of rolls or reels disposed within the device, and to interpose between the roll of negative paper web and the transparent cylinder a controlled cutting device actuated in such a manner that it cuts off negative paper sheets which are substantially as long as the original at an instant which assures that such sheets are properly superposed on the original and are passed in such superposed relation with the original between a conveying belt and the transparent cylinder; and to interpose furthermore between the roll of transfer paper web and the moistening device a cutting device which is controlled to cut a transfer paper sheet which is substantially just as long as the negative sheet at the proper instant to assure that the negative and the transfer paper sheet pass simultaneously through the moistening device.

The arrangement of the several devices in a manner as provided by this invention results in a full-automatic photostatic copying outfit in which the functions of the exposing device are adapted to and interlocked with the device for moistening and pressing thus requiring a minimum of hand operation.

In a preferred embodiment of this invention the several devices are actuated electrically and are controlled by a rotary switching mechanism with contact segments on a rotary disk or drum and stationary contact fingers contacting such disk or roll.

Further features, advantageous arrangements, and constructive details of this invention will become apparent from the following detailed description of a preferred embodiment of this invention as shown, by way of example, in simplified representation in the accompanying drawings in which

Fig. 1 is a diagrammatic longitudinal section of a photostatic copying device according to this invention;

Fig. 2 is a diagrammatic side view of the same device showing especially the driving means and indicating the essential interior elements illustrated in Fig. 1 in dotted lines;

Fig. 3 is a diagram of the electric control circuit for correlated actuation of the several elementary devices of the outfit in which the control disc or drum with its contact segments is shown in developed representation; and

Fig. 4 is a diagrammatic side view of said control drum.

Referring especially to Fig. 1, there can be seen arranged on a common base plate 48, an exposure device incorporating a hollow cylinder 1 of glass or other suitable transparent material and a light source 2 rigidly mounted within said cylinder, a container 47 for developer solution, and a pair of press rollers or rolls 25, 26 rotatably mounted directly above the level of the developer solution and adapted to be driven by a power drive in a manner to be described later. All above mentioned elements are enclosed in a common housing 49. A movable mask 3*a* is arranged within the transparent cylinder 1 and mounted rotatably about the same axis as the latter. A stationary mask 3 is also disposed within cylinder 1 and is adapted to cooperate with movable mask 3*a*.

An endless conveying belt 4 is looped around a peripheral portion of cylinder 1, which belt 4 is guided by pulleys 5, 6, 7, 8 and is urged against the peripheral sur-

face of cylinder 1. The pulley 5 is the driving pulley and is therefore connected to a suitable power source in a manner still to be explained.

Arranged with sufficient spacing at one side of transparent cylinder 1, there is a reel 9 journaled at both ends and adapted to receive a roll of low-sensitive negative paper. Two rubber rollers 10, 11, which can be separated but during operation are pressed against each other, are arranged between reel 9 and cylinder 1. A motor 37 (Fig. 2) drives one of these rubber rollers in the embodiment illustrated by way of example.

An electrically actuated cutting device 12 is interposed between rubber rollers 10, 11 and cylinder 1. In the example shown, this cutting device is actuated by two electromagnets 42, 43, Fig. 3, but it will be understood that other suitable actuating means may be employed. Two adjustable suction nozzles 13 and 14 are arranged somewhat above transparent cylinder 1. Suction is created in said nozzles by a suction device (not shown) connected thereto and driven by a motor 50. A partition 15 extends with its edge directed toward nozzles 13, 14, and two rollers 16, 17, pressed continuously against each other, are arranged beneath partition 15 in rear of nozzles 13, 14.

A roll of transfer paper is disposed on reel 18 arranged above container 47. Two rollers or rolls 19 and 20, which can be separated but are pressed against each other during operation, serve for feeding the transfer paper web from reel 18 toward the moistening container 47. One of these two rollers 19, 20 is driven by a motor 39. Interposed between rollers 19, 20 and container 47 is an electrically operated paper cutting device 21 which, in the example illustrated, is actuated by two electromagnets 40, 41, Fig. 3. Adjacent to both pairs of rollers 16, 17 and 19, 20, there are arranged three guide plates 22, 23, and 24 which extend through the developer solution and into the vicinity of the pair of press rollers 25, 26. The path between the guide plates 22, 23 serves for guiding the transfer paper through the developer solution and toward the press rollers 25, 26. Correspondingly, the path between the plates 23, 24 serves for guiding the exposed negative paper through the developer solution toward the same press rollers 25, 26.

A holder 27 for inserting the original to be photostatically copied is mounted above the endless conveying belt 4 between pulley 8 and cylinder 1, which holder serves simultaneously as a switch for starting the main driving motor 28. This motor drives through a transmission 29 the pulley 5 and therewith the conveying belt 4 continuously during operation. Furthermore, this motor drives through a transmission of suitable ratio the pairs of rollers 25, 26 and 16, 17, and, additionally, through a transmission 30 control disk or drum 31. In the embodiment illustrated and described, this control drum is constructed as a drum switch and provided on its periphery with six contact ways or segments in suitable angular relation and axial spacing as indicated in Figs. 3 and 4. To each one of these contact segments belongs a stationary contact finger and each one of the so-provided circuit closing means serves one of the following purposes: The contact segment 32 with its finger starts and stops the motor 37 which drives the pair of feed rollers 10, 11; the contact segment 33 controls the drive motor 39 of the pair of feed rollers 19, 20; the contact segment 34 serves to momentarily close the circuit of electromagnets 42, 43 and thereby actuates the paper cutter 12; the contact segment 36 actuates correspondingly paper cutter 21 by momentarily closing the circuit of electro-magnets 40, 41; the contact segment 35 controls the suction in the pair of nozzles 13, 14 by way of motor 50 driving the suction device; finally, the contact segment 38 actuates a switching relay 45 the function of which will be presently described. The armature of relay 45 actuates a double lever 27, Fig. 3, which can also be manipulated by hand for closing a contact 46 and thereby starting the main driving motor 28 which in turn sets in motion the operative cycle of the photostatic copying device and particularly the drum switch which controls during one revolution all the steps of a complete working cycle. The double lever 27, as can best be seen in Fig. 1, serves simultaneously as a clamping device and holds the original in its entering position until such lever 27 is pressed down, the main driving motor thereby switched on, and the operating cycle started. The contact lever 27, after being actuated, is detained in its switched-on position by the energized electromagnet 45 until drum switch 31 has turned to a position in which the contact between segment 38 and its finger is interrupted and electromagnet 45 switched off. The lever 27 then returns to its normal or inoperative position by action of a spring 51.

The housing 49 of the copying device is provided with three openings, one opening 52 for insertion of the original, one opening 53 for removal of the treated transfer paper still in contact with the negative paper, and a third opening 54 for removal of the original from which a copy has been made on the negative paper by exposure to light while passing cylinder 1 and which has then been deposited upon partition 15.

The segments on drum switch 31 are so arranged in axial spaced relation to one another and in angular relation to the off-position of the drum and have each one such effective length that the appertaining contact fingers make and break the respective circuit of the electrical control means or driving motors properly timed in such an order and for such duration that the following operating cycle of the device is assured:

The original is put with its side to be copied upward and with its front edge abutting the stop on lever 27 upon the conveying belt 4.

Manual pressing down of contact lever 27, first starts the main driving motor 28 and somewhat later energizes the switching magnet 45. Simultaneously, the original is released and travels on conveying belt 4 toward transparent cylinder 1. Before, however, having reached said cylinder, drum switch 31 closes contact 32 and the driving motor 37, driving feed rollers 10 and 11, is set in motion. The rolls 10, 11 draw the web of negative paper, coating downward, from its reel 9 and enter its end portion between cylinder 1 and conveying belt 4. This movement is properly timed in such a manner that the front edges of the original and of the negative paper are substantially in alignment. After the negative paper web has advanced a distance corresponding to the length of the original, the drum switch closes contact 34 in the energizing circuit of magnets 42, 43, which magnets actuate paper cutting device 12, which in turn severs a sheet of negative paper from the web. In the meantime the contact 32 has traversed its contacting way on drum 31, the contacts separate and the driving motor 37 and consequently also the feed rollers 10 and 11 come to a standstill. The web of negative material on its reel, thereafter, is not moved again during the remainder of the operating cycle. The severed sheet of negative material now passes the exposure zone at the periphery of the transparent cylinder 1, which cylinder will preferably be held stationary, and the negative sheet is pressed into close contact with the original by the action of the conveyor belt 4. The exposure time can be adjusted by shifting the turnable mask 3*a* relative to stationary mask 3 and thereby changing the size of the light window. It will be noted that in the example illustrated, the negative paper is exposed by the reflection method, i. e., the negative paper is interposed between the original and the light source instead of behind the original. This method has the advantage that not only one-sided but also double-sided originals can be photostatically copied. Besides, this method lends itself to a simpler and more compact construction of the copying device.

After the original and the severed negative sheet have passed the exposure zone and have nearly reached the end of the conveying portion of belt 4, the drum switch 31, by means of contact 35, starts the suction device to

create suction in the nozzles 13 and 14. This suction sucks apart the original and negative sheets such that the original, lying on top, is deflected upward and the negative paper, downward.

Conveying belt 4, still having a hold on the rear end portions of the original and the negative sheets, pushes both sheets onward past the suction nozzles into the path of partition 15 where the upwardly deflected front end of the original sheet passes on top of the partition and the downwardly deflected front end of the negative sheet passes beneath the partition toward the feed rollers 16 and 17. These rollers take hold of the negative sheet and feed it into the space between guide plates 23 and 24, into the developing bath, and toward the pair of squeegee rollers 25, 26. The original sheet, after disengagement with conveying belt 4, but lying with its rear portion still on top of the negative sheet, is further advanced by frictional contact with the latter and finally comes to rest upon the partition 15 from which it can be removed as desired.

At the instant the negative paper enters between the rollers 16 and 17, as mentioned above, the contact 33 on drum switch 31 closes the circuit of the driving motor 39 for the pair of feed rollers 19, 20 which feed the front end portion of the transfer paper web into the space between guide plates 22, 23 and through the developer bath so that its front edge arrives at the press or squeegee rollers 25, 26 at substantially the same time as the negative paper. After a length of transfer paper corresponding to the length of the original and negative sheets has been passed by the rollers 19, 20, contact 36 on drum switch 31 closes, momentarily, the energizing circuit of electromagnets 40, 41 to actuate the cutting knives 21 and sever a sheet of transfer paper from the web. The press or squeegee rollers 25 and 26, between which the negative and the transfer sheets now enter, press the sheets, coating against coating, firmly together until they have passed the rollers and are deposited upon plate 44. The cycle of operation is now completed; contact 38 interrupts the circuit and the device stops.

After about 30 seconds the negative and transfer sheets can be separated, revealing the transfer sheet as a photostatic copy of the original.

This positive copy on the transfer paper can be used immediately. On the negative sheet is a negative copy which may be discarded, or, if it is to be saved for normal printing, it can be treated for such purposes in any generally known manner.

The above description is limited to a preferred embodiment of this invention which is shown by way of example, but it will be understood by those skilled in the art that various changes may be made in certain details of the present construction, and I therefore do not intend to be limited except as defined by the scope and spirit of the appended claim.

What I claim is:

In apparatus for producing photostatic copies from an original sheet with the use of a photostatic negative and transfer paper, support structure, said negative and said transfer paper being in roll form, reels rotatably supporting said rolls on said support structure, electrically driven means for severing a portion of the negative from its roll to a length corresponding to the length of the original sheet, electrically driven means for feeding said original sheet and said severed negative portion in superimposed relation past a light source to produce a latent image of the original upon a light sensitive coating on said negative portion, a transparent cylinder encompassing said light source, said electrically driven means including an endless belt supported on said support structure for movement around a portion of said cylinder to carry said superimposed original sheet and severed negative portion past the light source, electrically driven means for separating the said negative portion from the original after movement past said light source, a developing vessel on said support structure, electrically driven means for severing a portion of the transfer paper from its roll to a length corresponding to the length of said negative portion, electrically driven means for separately inserting said exposed negative portion and said severed transfer paper portion into said vessel, electrically driven means for pressing said exposed negative portion and said severed transfer paper portion against one another as they emerge from the developing vessel and for moving said portions through the vessel, said vessel including means for guiding said portions in separated condition through the vessel, and means for controlling the operation of said electrically driven means in correctly timed relation, said controlling means being electrically driven and being switched on in dependence upon the insertion of the original for feeding to said light source, a movable stop arranged adjacent said means for feeding said original past said light source, resilient means for holding said stop in a position to prevent said original from a feeding movement, electrical contact means combined with said stop, said contact means being closed by moving said stop against the action of said resilient means, said contact means being adapted to switch on said electrical means, and means for holding said contact means closed until the completion of the photostatic copy on said transfer paper portion.

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