

Nov. 12, 1963

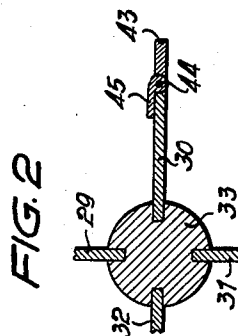
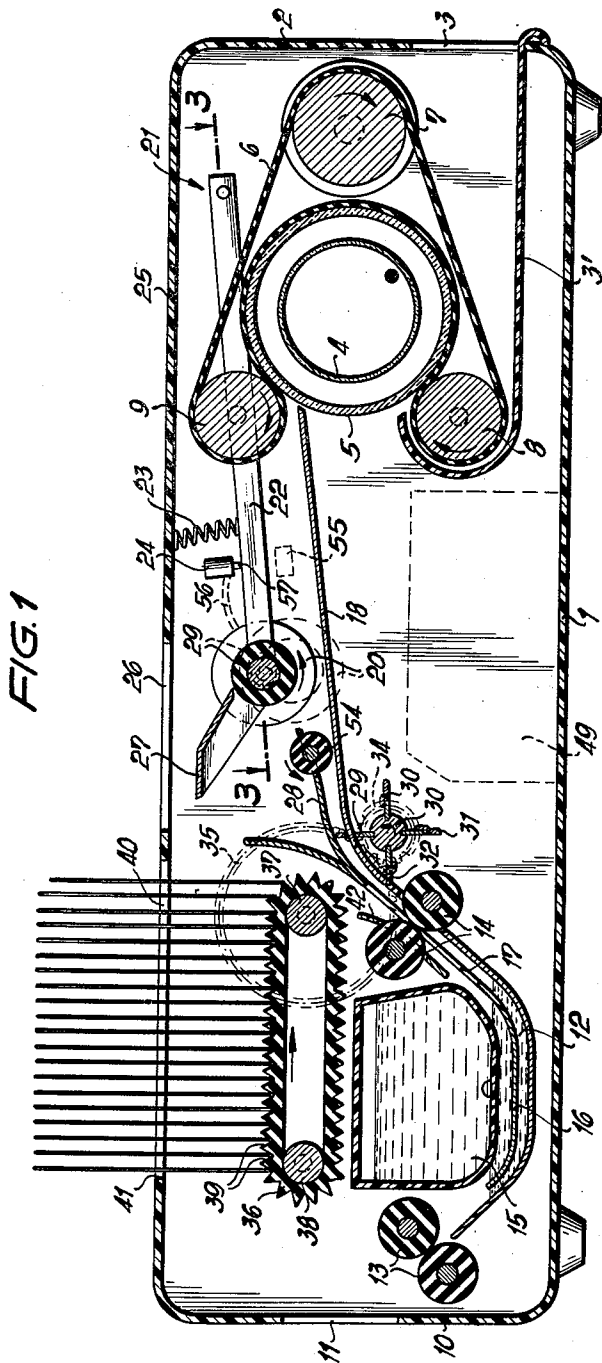
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3,110,490

APPARATUS FOR PRODUCING COPIES

Filed May 11, 1960

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 3

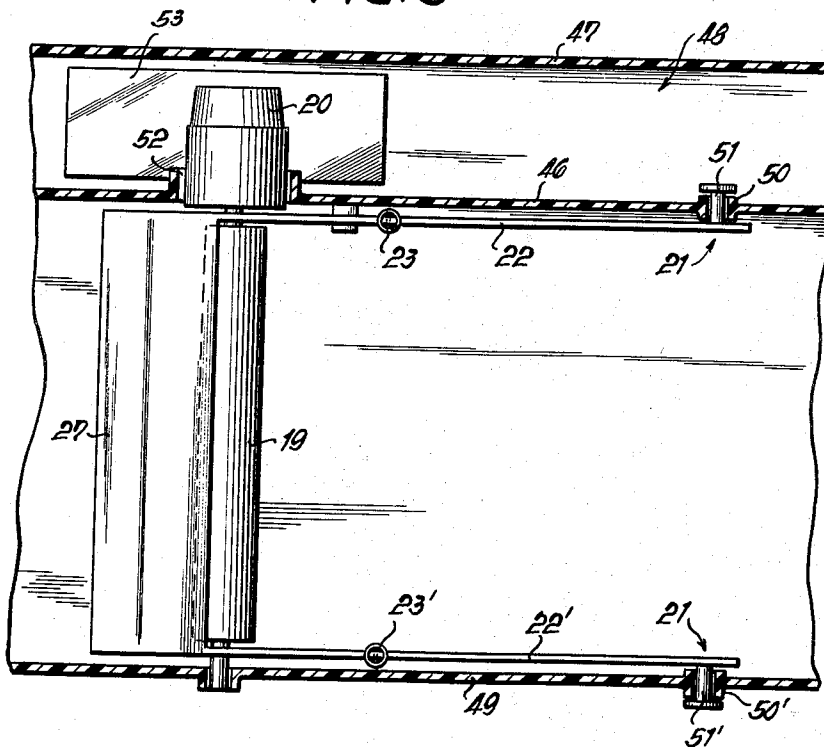
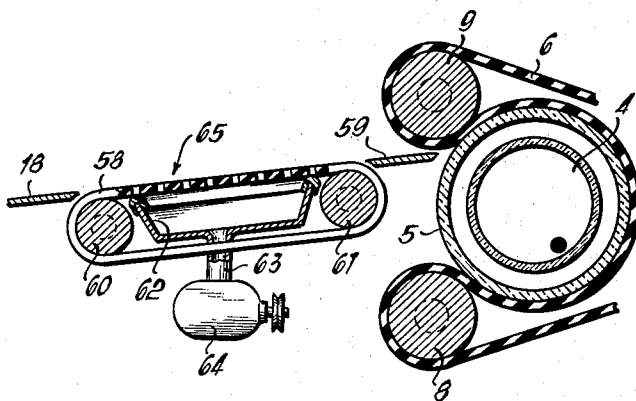


FIG. 4



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APPARATUS FOR PRODUCING COPIES

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5 Claims. (Cl. 271-26)

This invention refers to an apparatus for producing copies, comprising an exposure device and a developing device arranged within a housing, and between which a transporting arrangement is disposed for separating the original and for guiding it out of the housing.

The construction of known apparatus of this type is relatively complicated. The means for separating the original and for guiding it out of the housing comprise, for example, a stripper which may be pivoted towards the forwardly displaced leading edge of the original, or the negative layer carrier respectively. Due to this operation apparatus of this type requires a certain experience and attention, as each time when introducing an original and a negative layer carrier into the exposure device these must be adjusted with respect to the forwardly displaced leading edge. Besides this, there is the danger that the stripper might injure the surface of the original or the layer carrier.

Furthermore it is known to use separating rollers as a separating device the rollers rotating in the same direction, one of said rollers lifting the original off from the negative layer carrier which is passing through the nip of the rollers. If two separating rollers are used the nip of the rollers requires adjustment with respect to the negative layer carrier to be worked. Also difficulties may be encountered if at least one of the rollers of this pair of separating rollers is supported resiliently and different layer carriers or originals of differing quality are used, as the pressure of the separating roller cannot be adjusted. In addition in the known apparatus the separating roller is constantly rotating as long as the apparatus is switched on.

One object of the invention is to provide a new apparatus, which is easy to operate and adapted to work reliably on any negative layer carriers and originals.

Another object of the invention is to provide an apparatus in which a second positive layer carrier unto which the image exposed on the negative layer carrier is to be transferred is fed from a magazine, thus facilitating the operation by restricting it to the handling of the original and the negative layer carrier.

According to the invention a separating device which may be engaged manually is arranged between the exposure device and the developing device.

According to an advantageous embodiment the separating device comprises a roller which may be moved manually, and a guide surface associated with this roller disposed behind the exposure device.

Preferably the guide surface is formed by an endless belt conveyor the belt being made of rubber, plastic material, or a material having similar friction characteristics. An especially preferred embodiment uses a perforated conveying belt and provides a vacuum source at the back side or lower side of the conveying belt, thereby providing a certain adherence of the negative layer carrier to the guide surface and improving the separating proceeding.

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In addition the last mentioned embodiment has the advantage that the apparatus may be arranged vertically as the negative layer carrier is held on the conveying belt by the vacuum on the back side of the belt, independent of the position of the belt conveyor. In the vertical arrangement the guide surface serving as actuating lever for the separating device is arranged in the zone of the forwardly disposed circumferential surface of the separating roller.

The operation of the apparatus according to the invention is greatly facilitated by providing an automatic feed for the positive layer carrier out of a magazine, adapted to hold a plurality of positive layer carriers. This magazine may be filled in an especially easy manner without necessitating to dismantle and/or lift any means pressing against the sheets or feed means.

According to the invention a drivable conveying element is provided for separately supporting single positive layer carriers arranged behind each other, said transport element being coupled by abutment means with the feed path of the negative layer carrier. According to an especially advantageous embodiment this conveying element is formed by an endless belt provided with separate notches each to receive one layer carrier which for example may be supported with their upper part on the edge of an opening in the housing.

Further advantages and features of the invention will become apparent from the attached drawings, in which an advantageous embodiment of the invention has been shown by way of example and which shall be described followingly.

In the drawings:

FIG. 1 is a sectional side view of the apparatus in which only those parts are shown which are essential for the invention,

FIG. 2 is a sectional part view of FIG. 1 showing a detail in an enlarged scale,

FIG. 3 is a sectional part view along line 3-3 in FIG. 1 showing a detail only, the other parts having been omitted for clarity, and

FIG. 4 is a sectional part side view of an element which with respect to FIG. 1 has been changed illustrating another embodiment.

The apparatus comprises a flat housing 1 with a feed slot 3 for the original and the negative layer carrier provided for example at the lower end of the front wall 2. Behind the front wall 2 the exposure device is disposed, comprising a cylinder 5 surrounding a light source 4, and one or more endless feed belts 6 guided over rollers 7, 8 and 9 and slung around the cylinder 5.

A guide path 9 leading from the slot 3 to the roller 8 is guiding the original and the negative layer carrier into the nip between the roller 8 and the cylinder 5. An outlet slot 11 for the negative and the positive layer carrier is provided in the rear wall of the housing.

In front of the outlet slot within the housing the developing device is disposed which in accordance with the illustrated embodiment is of the diffusion developing type and comprises a bath container 12, a pair of transporting and squeezing rollers 13 and a pair of guiding and transporting rollers 14. The bath container 12 is covered by a supply container for developing liquid. The bottom of this container forming the upper guide surface through the bath at the same time.

The layer carriers are separately guided through the developing bath for example by a guide surface 16. This guide surface may be perforated. Preferably this guide surface extends from the inlet side slanting down into the developing bath and within this a distance substantially parallel to the liquid level while its end is slantingly directed upwardly to the liquid level. The guide surface 16 extends through the pair of guiding and transporting rollers 14 by providing the guide surface 16 for example with an opening 17 in the middle, in which the pair of rollers 14 are engaging each other. The rollers of this pair of rollers are driven. However it is also possible to subdivide the guide surface 16 in the zone of the pair of transporting rollers 14 and to guide the different ribs of this guide surface through circumferential grooves of the transporting rollers.

A guide surface 18 extends between the pair of guiding and transporting rollers 14 and the exposure device which for example is an extension of the upwardly directed inlet side of the bath container 12, defining the lower part of the guide path for the negative layer carrier. Onto this guide surface the original and the negative layer carrier coming from the exposure device are advanced, the negative layer carrier lying directly on the guide surface while the original is lying on top of it.

It is to be noted that the drive elements are not shown in the drawing. The driven, or respectively the rotating parts 7, 8, 9, 37, 38, 14 and 13 may for example be rotatably supported by the side walls of the housing lying parallel in the plane of FIG. 1, or they may be rotatably supported at least on one side in an intermediate wall according to FIG. 3 in which this wall is denominated with 46. By this intermediate wall a space 48 is formed between this wall and the side wall 47 of the housing within which drive means and especially gearing or drive transmission means may be arranged such as gears or endless helical springs and corresponding pulleys. It is also possible to arrange terminals for the main feed lines and if required a drive motor at 49 within the housing shown in FIG. 1 in which for example the drive shaft of the motor may extend into the space 48 and carry on its end drive means such as a gear or a pulley from which the drive connections are derived to the driven parts.

A separating roller 19 is provided for separating the original, the one shaft end of the roller being connected with a drive motor 20 driving the separating roller in such a direction that the circumferential surface of the roller facing the guide surface 18 is moving in a direction towards the exposure device. The separating roller is for example rotatably supported by two pivoting levers 22 pivotally connected at 21 with the walls of the housing or the intermediate walls. These pivoting levers also carry the electric motor 20. The arrangement is such that the separating roller 19 upon pivoting the levers 22 is movable substantially vertically towards the guide surface 18.

The position of rest, when the roller is lifted is shown in FIG. 1 in full lines. The pivoting levers 22 are pulled into this position by a spring 23. The uppermost position of the pivoting levers is determined by an abutment 24 provided within housing 1.

Within the range above the separating roller 19 an outlet opening 26 for the original is arranged in the top wall 25 of the housing. Below this outlet opening an actuating lever 27 is connected with the bearing arrangement for the separating roller 19 serving at the same time as a guide surface on which the original is guided through the outlet opening 26. The arrangement is such that, if the lever 27 is to be actuated from the front side of the apparatus, it is possible to press the lever down with the bent tips of the fingers, by means of this the original will automatically move into the open hand of the operating person.

In this the separating proceeding may be watched through the opening 26 so that the amount of pressure exerted, and particularly the time when the pressure is

applied may be chosen. The surface of the roller 19 is preferably resilient and if required somewhat roughened. Practice has shown however that also a smooth surface is functional to full satisfaction.

The electric motor may for example be actuated in dependence of the movement of the pivoting levers 22 by providing for example a limit switch on the abutment 24, said limit switch opening or closing the circuit for the electric motor 20.

This for example is achieved by flexible leads 56 with a switch arranged on the abutment 55. The actuating element of the switch extends beyond the abutment surface of the abutment 24 and may be actuated by the pivoting lever 22. The arrangement is such that the motor will be switched-on when the pivoting lever is moved against the tension of the spring 23 towards the guide surface 18, but will be switched-off when the pivoting lever 22 is pulled against the abutment 24. The other elements of the energizing circuit for the electric motor 20 have not been illustrated and are for example arranged within the space 48.

The separating position of the roller 19 has been shown in dashed lines in FIG. 1. It is to be understood, that the roller 19 may be moved to any position adjacent the guide surface 18, or may be urged in contact with it with a certain pressure. It is to be noted however that according to a special embodiment a direct engagement between the guide surface 18 and the separating roller 19 may be prevented by limiting the pivoting movement of the levers 22 in such a way that there will always remain a spaced distance between the roller 19 and the guide surface 18 which is smaller than the thinnest negative layer carrier being used.

FIGS. 1 and 3 show an abutment 55 below the pivoting levers 22 in dashed lines. This abutment may for example be connected with the intermediate wall 46 in the same way as the upper abutment 24.

FIG. 3 shows a plan view of the arrangement of the separating roller. The pivoting levers 22 and 22' are pivotally connected with the intermediate wall 46 and for example with one of the outer side walls 49 of the housing. Each of these walls are provided with bearing bushings 50, 50' through which a pivot pin extends. At the outside the pivot pins may have enlarged heads, or for example may also be provided with a nut for holding them in the bushings 50, 50'. If a pivot pin 51' is journalled in the outer side wall of the housing the bearing is preferably covered on the outside.

The manual operation facilitates the adaptation to the encountered conditions, while at the same time the separating proceeding may be watched so that an extremely exact adaptation is possible. According to an advantageous embodiment the separating device may be actuated through an opening of the housing through which the original is dispensed. In this the arrangement of the actuating lever is preferably so that it may serve as a guide surface for the separated original, and that the original is guided into the hand of the operating person who is actuating the lever.

Behind the separating roller 19 the guide surface 18 is covered by a guide surface 28 thus forming a channel for feeding the negative layer carrier into the developing device. A stop 33 in the form of a turn-stile extends with its arms 29, 30, 31 and 32 into the channel. This turn-stile 33 is rotated through a certain angle upon each passage of a negative layer carrier, the arrangement being so that one arm of the turn-stile will always be in the stop position after the negative layer carrier has passed.

Behind the separating device for example an advance roller 54 is provided driven in the direction marked by the arrow at the side of it, said advance roller having an elastic surface and being spacedly disposed from the guide surface in such a way that a layer carrier lying on the guide surface and being stopped by one of the arms

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of turn-stile 33 is not injured. As soon as the levers are relieved the friction is sufficient to transport the layer carrier to the pair of transporting rollers 14.

The turn-stile 33 cooperates via gears 34, 35 having a gear ratio of reduction with an endless band conveyor 36 serving as a feed magazine for the positive layer carriers. The conveying belt 36 is for example guided over two end rollers 37, 38 either of which may be driven. The belt of the belt conveyor is furthermore provided with means for separately and singly holding positive layer carriers. These holding means are formed by notches 39 arranged on the outside of the band. Above the conveying belt an opening 40 is provided in the top wall 25 of the housing 1. Through this opening positive layer carriers are placed in an upright position on the conveying belt in such a way that the lower edges of each sheet engages one of the notches so that the lower edges are separated. The upper ends of the positive layer carriers are contacting each other and are for example supported by the rear edge 41 of the opening 40.

The notches 39 may have a considerable depth to assure that the positive layer carriers are always kept in their respective notch even if there are left relatively few sheets only so that they then will be in a slanting position.

The distance between the notches 39 is so that due to the gearing ratio of the gears 34, 35 each angular movement of the turn-stile will cause one notch to be turned around the end roller 37 so far that the positive layer carrier engaging this notch may drop into a guide path between the extension of the guide surface 16 extending beyond the guiding and transporting rollers 14 and an additional guide surface 42. The arrangement is such that the negative and the positive layer carrier are passing the pair of guiding and transporting rollers together.

The belt conveyor 39 may be driven by a separate motor which for example may be arranged within the space 48. Suitably however the belt conveyor is driven by a central motor moving in the direction of the arrow. This motor may for example be arranged at 49 in FIG. 1, or at 53 in FIG. 3. The rate of advance of the conveying belt being such that the layer carriers are fed according to the normal operating cycle of the apparatus, or the introduction of the positive or respectively the negative layer carrier.

FIG. 2 shows the special construction of the turn stile 33 with its four arms 29, 30, 31 and 32. As likewise shown in FIG. 1 only the arm 30 has been shown completely. It will be noted that this arm 30, like all the others, carries at its end a pivoting lever 43, pivoting in one direction only. This pivoting lever 43 is connected with the end of the arm by a hinge 44. The arrangement is such that this lever will also be in a stretched position when the arm is in a horizontal position. This for example may be achieved by making the part 45 of the lever 43 contacting the arm a little heavier than the other part which is forming an extension of the arm. The provision of the pivoting lever is in the illustrated embodiment of importance, as upon rotating the turn stile each subsequent arm will move into the guide path of the negative layer carrier already, while the latter is still passing it. Thereby the pivoting lever 43 is tilted by the contacting pressure with the negative layer carrier which is moved by the pair of guiding and transporting rollers into the developing device. After the negative layer carrier has passed the turn-stile the pivoting lever 43 will automatically drop into its extended position thus blocking the guide channel for the negative layer carrier completely.

Instead of the described differing weights of the lever parts it is also possible to provide a weak spring in the hinge 44.

The apparatus is characterized by a very flat form, the magazine opening 40 for the positive layer carriers being arranged at the upper side behind the outlet open-

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ing 26 for the original so that it may easily be observed whether sufficient positive layer carriers are stored in the magazine.

The embodiment according to FIG. 4 shows that the middle part of the guide element, which is denominated with 18 in FIG. 1, is substituted by a belt conveyor 58. FIG. 4 shows the left end of the guide element 18 in accordance with FIG. 1, while in FIG. 4 the right end of this guide element is formed by a bridge 59 extending between the exposure cylinder 5 and the belt conveyor 58.

The conveying belt is guided over two end rollers 60, 61 one of which is driven. Preferably the conveying belt 58 is perforated. Below the lead side of the conveying belt a box 62 is arranged which is open towards the leading side of the belt, this opening being disposed between the end rollers 60, 61 and the longitudinal side borders below the side edges of the belt. The borders defining the opening may for example be provided with resilient sealing means on which the conveying belt will slide. The box 62 communicates with a vacuum source 64, for example a pump, via a duct which leads from the side of the box out of the conveying belt. The vacuum source may be arranged in the space 48 and may be driven for example by an endless helical spring from the central drive motor.

The vacuum acting on the conveying belt provides a reliable guide of the lower layer carrier on the conveying belt in the zone of the separating roller marked by the arrow 65. In addition this embodiment has the advantage that the conveying belt is advancing the layer carrier to the abutment of the turn stile 33 and beyond this until it reaches the pair of rollers 14. In this embodiment the transporting roller 54 is not required.

It is to be noted that single features and subcombinations are of advantage and may be used without reference to other features and subcombinations. Furthermore changes of details are possible without departing from the scope of the invention. The invention is not restricted to the illustrated and described embodiment.

What I claim is:

1. In an apparatus for producing copies, guide means, means for moving a first and a second sheet in superimposed position on said guide means, sheet separating means mounted adjacent to said guide means and comprising a separating element, support means for said separating element, means movably mounting said support means in relation to said guide means, manually operable means connected with said support means for effecting movement of said support means to selectively bring said separating element into and out of engagement with said first sheet, housing means in which said guide means is disposed, said support means comprising at least one lever, means pivotally connecting said lever with said housing means, stop means mounted on said housing means and projecting into the path of pivotal movement of said lever to limit the movement of said lever in the direction away from said guide means, and spring means connecting said lever with said housing means so as to bias said lever towards engagement with said stop means.

2. The apparatus as set forth in claim 1, including an electric drive motor mounted on said lever and adapted to rotate said separating element in such a direction that the part of its circumference adjacent said guide means moves in the direction opposite to the direction of movement of said sheets on said guide means, a limit switch associated with said stop means, and flexible conductor means connecting said limit switch in the electric circuit of said drive motor so as to stop said drive motor when said lever engages said limit switch.

3. The apparatus as set forth in claim 1, including abutment means mounted in said housing means in the path of movement of said lever to limit the movement of said separating element in the direction toward said guide means in such a way as to prevent said separating roller from engaging said guide means.

4. The apparatus as set forth in claim 1, in which said guide means includes an endless conveyor belt which is perforated, and a suction box mounted in said housing means in contact with said conveyor belt to exert suction action upon said sheets through said perforations.

5. The apparatus as set forth in claim 1, in which said manually operable means includes auxiliary guide means for said first sheet after its separation from said second sheet, said auxiliary guide means extending towards an opening in said housing means through which said manually operable means is accessible.

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