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COPYING APPARATUS

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Fig. 1

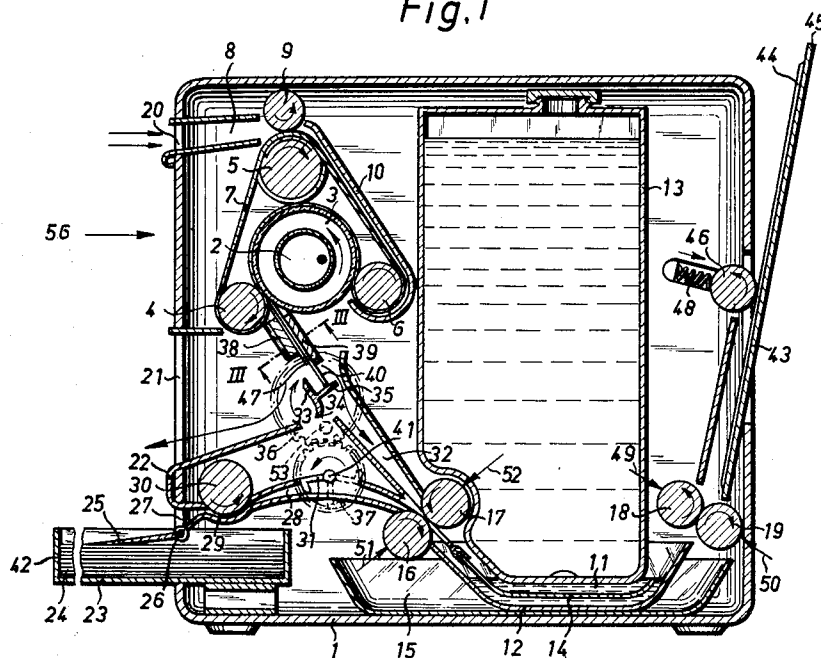


Fig. 2

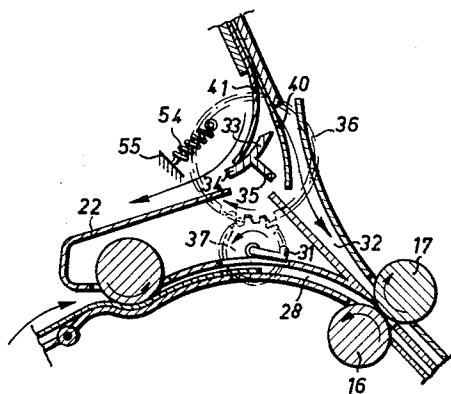
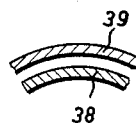


Fig. 3



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COPYING APPARATUS

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This invention relates to copying apparatus utilizing an exposure device and a developing device, preferably a diffusion developing device, arranged within a housing comprising guide elements and lead elements for separating the original from a negative layer carrier, for feeding a positive layer carrier and for passing-on the superimposed layer carriers, a stripping element being provided for separating said original from said negative layer carrier which may be pivoted by the leading edge of the original or the negative layer carrier.

It is not always possible to use these stripping elements, as the force for operating the stripper element must exclusively be exerted by the leading edge of a sheet of paper or the layer carrier respectively. In this it is quite well possible that the layer carrier or the sheet of paper which are superimposed, are closely guided to the stripper and initially causing it to pivot but then slide-off from the stripper so that it does not fully obtain its separating position and will return to its position of rest. This danger is especially great if the adjustment must be carried out by very thin sheets of paper. In addition there is the danger the sheet of paper engaging the abutment of the stripper will bend after a sufficient portion has left the guide in front of the stripper.

One object of the invention is to provide an improved construction of a stripper forming a separating device for the original and the negative layer carrier.

Another object of the invention is to provide an improved construction of a stripper forming a separating device for the positive layer carrier and the negative layer carrier in which the leading edge of the original or the negative layer carrier has to exert a reduced force, as compared with the prior stripper, for operating said stripper.

A further object of the invention is to provide an improved apparatus having an exposure and a developing device and in which the introduction of the positive layer carrier is correlated by an abutment to the advance of the negative layer carrier towards the developing device.

Another object of the invention is to utilize the force developed by the advance of the positive layer carrier into its position of readiness for controlling the superpositioning of the negative layer carrier and the positive layer carrier within the developing device.

Still another object of the invention is to provide table means having an improved utilization of space.

A further object of the invention is to provide an apparatus having an improved half-automatic conveyance of the positive layer carrier.

Still another object of the invention is to provide an improved table apparatus in which the layer carriers dispensed at the back side of the apparatus are readily accessible from the front side of the apparatus.

According to the invention an angularly shaped stripper for separating the negative layer carrier and the original which is arranged behind the exposure device is connected with the conveyance abutment for the positive layer carrier so that its adjustment after being pivoted initially is at least partly carried out by the positive layer carrier.

According to an especially preferred embodiment of the invention the positive layer carrier is introduced from the top and conveyed, for example by gravity, or preferably by the action of a transport roller to the conveyance abutment in such a way that the direction of the advancing

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force is substantially passing the axis of support or respectively the pivoting axis of the conveyance abutment exerting on the latter a rotating moment after initially pivoting it in its direction of motion for opening the conveyance path for the positive layer carrier.

In this way the advancing force of the positive layer carrier simultaneously acts upon the adjustment of the stripper the moment of this adjustment however being determined by the leading edge of either the original or the negative layer carrier. By means of this the unobjectionable action is assured at the same time. Although an initial pivoting of the stripper may always be expected as described above an additional component of force is exerted according to the invention. The particular arrangement of the conveyance abutment assures, that this additional force becomes effective only at that moment when the conveyance of a positive layer carrier becomes necessary after an exposure.

According to an especially preferred embodiment the stripper and the conveyance abutment are arranged on a common pivoting axis. According to another advantageous embodiment the stripper and the conveyance abutment are coupled by gears. In this arrangement a ratio of movement between the stripper and the conveyance abutment may be provided in such a way, that a greater pivoting movement of the conveyance abutment for opening the conveyance path of the positive layer carrier corresponds to the adjustment movement of the stripper.

Preferably the stripper is formed angularly having three legs the extension of the stripper tongue serving as guide element for example for the original in the direction to the dispensing slot. It is to be noted that within the scope of the invention an arrangement is possible wherein the leading edge of the original may cause the adjustment movement as well as an arrangement wherein the adjustment movement is initiated by the leading edge of the negative layer carrier. The first mentioned arrangement is advantageous in that on the one hand the adjustment is achieved by the usually rather stiff original and, on the other hand, even in case of a failure in operation, the negative layer carrier and the original will be conveyed out of the apparatus without being transported through the developing device. If the negative layer carrier is leading, i.e. spaced forwardly relative the original, the advantage is gained that usually the strength of the negative layer carrier is known and thus there is a definite condition which may be accounted for by corresponding adjustments.

Further improvements of known apparatuses having a pair of transporting and squeezing rollers behind the developing device and a dispensing slot in the rear wall of the apparatus are achieved by the invention in that an upwardly inclined supporting surface is extending through the dispensing opening beyond the upper side of the apparatus. A transporting roll resiliently urged against this supporting surface will transport the layer carriers upwardly. By means of this arrangement the layer carriers transported out of the apparatus may be seen from the front side of the apparatus and may readily be grasped without necessitating the provision of additional measures for changing the direction of the layer carriers.

Further advantages and features of the invention will become evident from the following description of an embodiment of the invention shown by way of example schematically in the accompanying drawings.

In the drawings:

FIG. 1 is a vertical sectional side view of the apparatus according to the invention,

FIG. 2 is a somewhat enlarged partial section of FIG. 1,

FIG. 3 is a partial section along line III—III in FIG. 1. Preliminarily it is to be noted that an embodiment

is shown in the drawings in which the leading edge of the negative layer carrier is initiating the movement of the stripper and the conveyance abutment. As already mentioned another embodiment is sometimes preferred in which the leading edge of the original is initiating the adjusting movement. A device of this type substantially equals the other one except that the stripper is turned about 180°.

The illustrated apparatus comprises a housing 1 in which an exposure device 2 known per se is arranged behind the front wall and below the upper side of the housing. The exposure device comprises for example a cylinder 3 with a light source and rollers 4, 5 and 6 by means of which an elastic band 7 is guided around a part of the circumference of the cylinder 3. The band 7 at the same time serves as a feed conveyor as the roller 5 is arranged at the end of the feeding channel 8 and is cooperating with a counter roller 9. The rollers 5 and 9 will draw the original and the positive layer carrier into the apparatus and guide them between the band 7 and a guide surface 10 around the roller 6 to the inlet nip between the band 7 and the cylinder 3.

Furthermore a developing device 11 is arranged within the housing 1, which for example comprises a bath container 12 for the developing liquid. The bath container is covered on top by a supply container 13 for the developing liquid so that relatively small inlet and outlet openings are formed for the bath container. Within the bath container the layer carriers are separately guided by a guide surface 14.

The bath container proper is arranged within a trough 15 extending below a pair of transport rollers 16, 17 disposed before the bath container 12 and below a pair of transport and squeezing rollers 18, 19 behind the bath container so that liquid which may possibly drip-off will be caught by the trough.

The arrangement of the exposure device 2 in the left hand upper corner of the apparatus and the relatively flat construction of the bath container 12 provides a relatively large space within the housing for arranging the supply container 13 the bottom of which constituting at the same time a part of the developing device namely the upper guide surface for the layer carriers. Therefore the supply container 13 may have a considerable holding capacity without necessitating that the apparatus becomes very large.

The introducing slot 20 and also the dispensing slot 21 are arranged in the front wall of the apparatus. At the lower edge of this dispensing slot 21 a platform 22 is arranged extending into the housing towards the separating device.

Furthermore a container 23 for the positive layer carrier 24 is arranged in the front wall of the housing which in the illustrated embodiment partly extends into the housing. The dimensions of this container 23 correspond substantially to the positive layer carrier which in the zone extending out of the apparatus are urged together by a hinged lid 25 pressing on the top layer carrier. The lid is hinged connected to the housing at 26 and either presses on the top layer carrier by its own weight or for example, by a spring disposed in the hinged connection.

The lid 25 also serves as a supporting surface for guiding the positive layer carrier to the introducing slot 27 and into the feed path 28.

A concave curvature or deflecting area 29 into which a transporting roller 30 extends which is disposed thereabove is preferably arranged behind the introducing slot. This transporting roller is rotating above the lower guide surface of the guide path in such a way that it will engage a positive layer carrier without damaging its layer. Preferably the circumference of the roller is covered with a relatively soft material such as plush. Due to the curvature the positive layer carrier is urged by its own stiffness with a certain force against the roller so that it will be moved until its leading edge engages the conveyance

abutment 31. In this position the positive layer carrier adapts itself to the curvature 29, so that the roller 30 may freely rotate.

The feed path 28 is joining a feed path 32 for the negative layer carrier in front of the pair of transporting rollers 16, 17. The latter feed path 32 extends from the separating device to be described immediately.

The stripper consists of an angularly shaped element having three legs 33, 34, 35. At the ends of this element journal pins may for example be provided which are rotatably mounted in the housing. On one of the journal pins for example a gear 36 is mounted meshing with a gear 37 arranged on the pivoting axis of the conveyance abutment 31. By means of this the stripper angle 33, 34, 35 and the conveyance abutment 31 have drive connection in which the stripper will be in the position shown in FIG. 1 when the conveyance abutment 31 is in its left position shown in FIG. 1. It is to be noted, that the arrangement of the conveyance abutment and stripper is for example provided with an eccentric weight or weak springs for returning the elements into their original positions.

Between the stripper angle 33, 34, 35 and the outlet of the exposure device 2 a guide for the original and the negative layer carrier is arranged preferably consisting of two guide surfaces 38, 39. This guide serves to render a stiffening hold for the negative layer carrier and the original as they are being fed to engage the stripper abutment 35. According to FIG. 3 these guide surfaces 38, 39 may be constructed so that the original and the negative layer carrier are being curved laterally with respect to the direction of advance thus reducing the possibility of bending them in a direction of their advance and a right angle to the plane of the layer carrier.

In the illustrated embodiment the stripper abutment 35 extends at a right angle from the substantially aligned legs 33, 34, the leg 33 forming the stripper and the leg 34 a guide surface which will form a connection to the platform 22 after the stripper has been tilted. The rotating axis of the stripper is disposed for example at the junction of the legs 33, 34, 35. This axis may however also be arranged in the extension of the leg 35 beyond the legs 33, 34.

While FIG. 1 shows the position of rest in which the leading edge of a negative layer carrier 40 is just engaging the stripper abutment 35, FIG. 2 shows the stripper in the separating position and the conveyance abutment 31 in a position giving the path free.

Before the mode of operation is described attention is directed to the special construction and arrangement of the conveyance abutment 31. In the illustrated embodiment this abutment is formed by an L-shaped lever the one leg of which is blocking the feed path 28 in its normal position as shown in FIG. 1. As the pivoting or supporting axis of the conveyance abutment 31 is disposed directly adjacent or advantageously partly within the feed path 28 a pressure exerted by the positive layer carrier on the angularly extending free leg will substantially directly be transmitted to the supporting or pivoting axis, so that the conveyance abutment will not be pivoted.

However, if the conveyance abutment is somewhat pivoted the leading edge of the positive layer carrier moves on top of the leg of the conveyance abutment fixed to the pivoting axis thus producing a turning moment about the pivoting axis 41 the force of which resulting from the advance movement of the positive layer carrier by the roller 30. This advancing force has especially on account of the curvature 29 a certain force, and thus this curvature represents an important feature of the illustrated arrangement. The turning moment exerted by the positive layer carrier increases until the conveyance abutment attains about a perpendicular position downwardly (FIG. 1).

By means of the meshing gears 36, 37 the stripper angle 33, 34, 35 is moved correspondingly.

It is of advantage to provide returning means for the stripper with its legs 33, 34, 35 and the conveyance abutment 31. These returning means may for example consist of a weight 53 eccentrically arranged on one of the pivoting axes which in its starting position is in its stable state of equilibrium, out of which it is moved upon pivoting.

According to FIG. 2 a pull-back spring 54 may be provided engaging a rotatable part of this arrangement. This pull-back spring is advantageously very weak and is connected with an abutment 55 within the housing with its other end.

FIG. 1 shows a longitudinal sectional view of the apparatus through the chamber within which the parts for carrying out the exposure and the development are arranged. This chamber is disposed between two longitudinal walls parallel to the plane of the drawing. These longitudinal walls support the guide elements and the container for the positive layer carriers preferably rigidly and the rotating part rotatably. The rotating parts are the different illustrated rollers and cylinder the journal pins of which are extended through bearings arranged in the longitudinal walls. If an adjustable arrangement of the rotatable rollers is provided bearing blocks guided in slots of the longitudinal walls are used. The bearing blocks are urged by springs in direction corresponding to the direction of adjustment or tightening the band running around the cylinder or urging a guide element in contacting engagement. According to this for example the transporting roller 46 may resiliently be pressed against the guide surface 44 the direction of pressure exerted by the spring due to the support in the slots of the side walls being indicated by arrow 48. The rollers 18, 19 are correspondingly supported in slots and urged together as indicated by the arrows 49 and 50. The corresponding function of the rollers 16 and 17 is indicated by the arrows 51 and 52.

As far as the parts are driven a shaft not illustrated is extending beyond a bearing in the longitudinal wall and provided outside of the longitudinal with drive element such as a pulley or a gear. At the outside of this longitudinal wall a separate drive chamber is arranged containing the electrical terminals, the switching and the drive elements. All rotating rollers and the cylinder of the exposure device 2 may for example be driven either via endless helical springs or gears by a common drive motor.

According to FIG. 1 the stripper 33, 34, 35 and the abutment 31 are journaled independently of the drive motor a bearing having very little friction being provided. The shafts extending into the drive chamber of these parts journaled in antifriction bearings are carrying in the illustrated embodiment cooperating drive means such as gears 36 and 37 causing a rotatable dependency of these parts with respect to each other.

Additionally it is pointed out that the housing may be opened either on one side or on top by a removable cover to allow accessibility to the parts within the housing. The arrangement of a cover extending for example to the level indicated at 53 is preferred as thereby the supply container 13 is readily accessible for refilling, and furthermore as this allows maintenance of the parts. The longitudinal above mentioned walls suitably extend uninterruptedly upwardly to the cover.

In describing the functioning it is referred to FIG. 2 also, in which the movable parts are shown in their end positions. It will be noted that the conveyance abutment is moved from a right position into a left position rotating approximately 180°. Contrary to this the stripper angle 33, 34, 35 only rotates about 45°. This difference in movement is achieved by corresponding dimensioning of the gears 36 and 37.

If the leading edge of the negative layer carrier 40 engages the abutment by 35 the stripper angle 33, 34, 35 as well as the conveyance abutment 31 are pivoted. Di-

rectly following the pressure of the leading edge of the positive layer carrier causes a turning moment on the conveyance abutment as described, whereby the further adjustment of this abutment and the stripper angle is achieved by the common action of the positive layer carrier and the negative layer carrier. Due to this the free end of the stripper leg 33 engages the negative layer carrier 40 before the leading edge of the original 47 has reached the stripper angle. Upon continued advance the original then glides over the stripper leg 33 and its extension 34 upon the platform 22 and to the dispensing opening 21 while the passage for the negative layer carrier 40 into the guide path 32 is given free, which has been blocked initially by the conveyance abutment 31. Simultaneously the guide path 28 for the positive layer carrier is given free by pivoting the conveyance abutment.

If it is desired to achieve a control by the leading edge of the original the stripper angle 33, 34, 35 is turned around 180° so that the abutment leg 35 extends to the left of the legs 33, 34 as seen in the drawing FIG. 1.

The arrangement of the positive layer carrier 24 in the container 25 having about the same dimensions as the positive layer carriers in connection with the lid 25 has the advantage of obtaining a very simple feed of the top layer carrier into the introducing slot 27. The operating person presses for example upon the top layer carrier in front of the lid 25 and pulls it back whereby it is abutting the front wall 42 of the container and bends upwardly until the edge of the layer carrier that was disposed within the housing comes free of the lid. If the layer carrier is then released the pulled back edge automatically jumps over the upper side of the lid into the introduction slot. This way of operating is extremely easy and enables quick feeding of a positive layer carrier avoiding that it must be pulled out of a package.

In order to further facilitate the operation the apparatus comprises a supporting surface 44 inclined upwardly and extending through the dispensing slot 43, the upper edge 45 of said supporting surface extends upwardly beyond the upper side of the housing. For example in the zone of the dispensing slot 43 a transport roller 46 is arranged resiliently pressing against the supporting surface. This transport roller receives the layer carriers coming from the pair of squeezing and transporting rollers 18, 19 and will transport them upwardly along the supporting surface 44. They may readily be seen and grasped by the operating person from the front side by reaching over the housing.

This invention is not to be limited to the illustrated details. Changes are without departing from the scope of the invention possible for any one skilled in the art.

Furthermore subcombination which may be utilized separately are to be protected according to the following claims.

What I claim is:

1. An apparatus for making copies, comprising a housing, an exposure device and a developing device arranged within said housing, first introducing means in one wall of said housing leading to the inlet of said exposure device and serving to guide an original and a negative layer carrier with the negative layer carrier in advanced position relative to said original, second introducing means in one wall of said housing serving to introduce a positive layer carrier, first dispensing means arranged at another housing wall and attached to the outlet of said developing device, second dispensing means serving to dispense said original arranged at said first housing wall, means for joining said negative layer carrier and said positive layer carrier disposed at the outlet of said developing device, a first guide path for said positive layer carrier disposed between said second introducing means and said joining means, a second guide path between the outlet of said exposure device and said joining means for feeding said negative layer carrier to said developing device, abutment means arranged within said first guide

path rotatably supported and blocking said first guide path in one position, said abutment means being swung through said first guide path upon initial movement, angularly formed stripping means which is pivotally mounted in said second guide path and movable by the edge of the advancing layer carrier into effective position, said abutment means and stripping means being connected with intermeshing drive means so that engagement of the stripping means by said advancing negative layer carrier causes said abutment means in said first guide path to be released from its blocking position and moved by the advancing positive layer carrier to unblocking position, thereby contributing through the intermediary of said intermeshing drive means to said movement of the stripping means into said effective position, return means being provided for movement of said abutment means and stripping means to the initial position upon passage of said negative and positive layer carriers.

2. An apparatus according to claim 1, in which said drive means are gears having such a ratio that said abutment means upon actuation is rotated through a greater angle than said stripper means, the larger gear of said stripper means carrying a returning weight moving said stripper means and said abutment means back to their primary positions.

3. An apparatus according to claim 1, in which said stripper means comprises three legs arranged in such a way that an abutment leg extends into said second guide path, while another leg forming the stripper proper is converging towards its free end forming a sharp edge, said stripper leg upon pivoting said abutment leg out of said second guide path will be moved into this guide path, and in which said stripper leg is extended towards the opposite side of said stripper edge to form a third leg forming upon actuation of said stripper a guide element towards said second dispensing means.

4. An apparatus according to claim 1, in which said abutment means within said first guide path is an L-shaped pivoting lever the pivoting axis of which is located adjacent said first guide path, arrangements being made that the short angular leg of said lever extends substantially at a right angle through said first guide path in its primary position.

5. An apparatus according to claim 1, in which said second guide path comprises guide elements arranged between the outlet of said exposure device and said stripper means, said guide elements being curved in a plane perpendicular to the direction of advance of said original and said negative layer carrier.

6. In apparatus for producing copies, first guide means, first transport means for advancing a first piece of sheet

material through said first guide means, second guide means, second transport means for advancing a second piece of sheet material through said second guide means, said first and second guide means extending to a junction of the same, third guide means, third transport means beyond said junction for advancing said first and second pieces of material together through said third guide means, stop means in said first guide means between said first transport means and said junction and movable between a position in which it bars advancement of said first piece of sheet material and another position in which it permits such advancement, abutment means in said second guide means between said second transport means and said junction and movable between a position in which it is engaged by the front edge of the advancing second piece of sheet material and another position in which it is not so engaged, and movement transmission means interconnecting said stop means and abutment means, whereby engagement of said second piece of sheet material with said abutment means initiates movement of said abutment means and through said transmission means causes release of said stop means from its barring position.

7. The apparatus as set forth in claim 6, including means biasing said stop means, abutment means, and transmission means toward the position in which said stop means occupies its barring position.

8. The apparatus as set forth in claim 7, in which said movement transmission means comprises a first gear secured to the pivot axis of said stop means, and a second gear of greater diameter secured to the pivot axis of said abutment means, said first and second gears being intermeshing, and said second gear being unbalanced to provide said biasing means.

9. The apparatus as set forth in claim 6, in which said first transport means comprises a driven roller in said first guide means and a curved wall portion of said first guide means concentric with said roller and spaced radially therefrom to provide a curved passageway for said first piece of sheet material.

10. The apparatus as set forth in claim 6, in which said stop means comprises a pivotally mounted substantially L-shaped lever which in its barring position has one of its legs disposed transversely through said first guide means and the pivot axis substantially in the same plane as the front portion of said first piece of sheet material.

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