Sept. 15, 1959 G. SCHWIENBACHER 2,903,954

APPARATUS FOR THE PRODUCTION OF PHOTOGRAPHIC COPIES

Filed Jan. 23, 1956

Fig.1

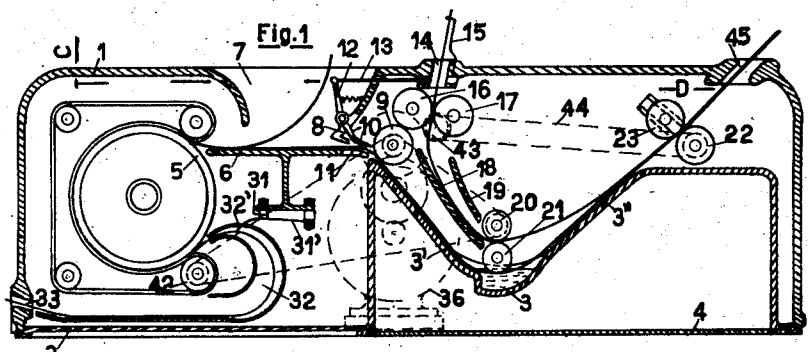


Fig.2

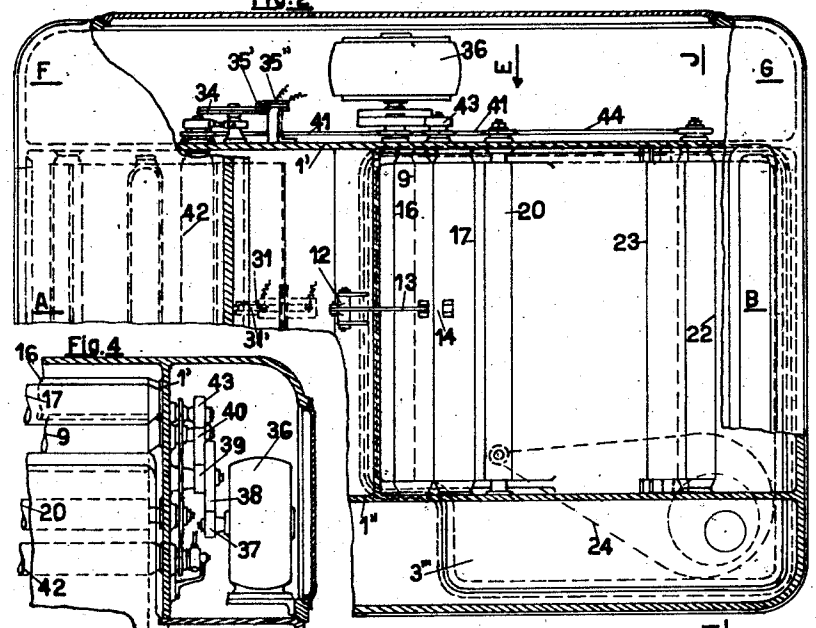
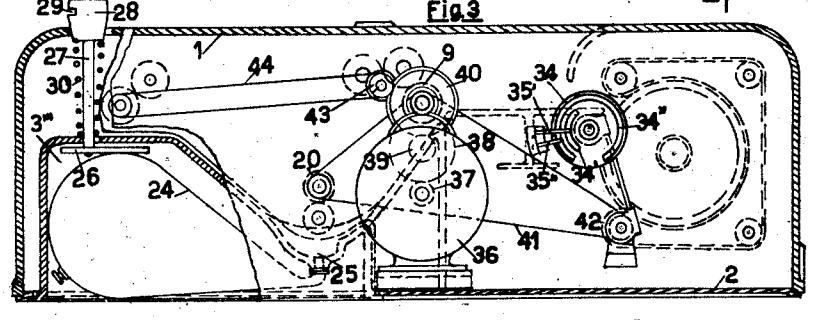


Fig.4

Fig.3



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APPARATUS FOR THE PRODUCTION OF PHOTOGRAPHIC COPIES

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4 Claims. (Cl. 95—77.5)

The invention relates to an apparatus for the production of photographic copies in which the exposure of the negative paper is effected by the continuous process and the positive paper is treated by the diffusion process. With such apparatus, the original had to be withdrawn by hand and the negative paper had to be inserted together with the positive paper, again by hand, into the supply or feed-in passage of the developer bath, this procedure being tedious and time-wasting when producing a relatively large number of positives. Not only the negative papers but also the positive papers travelled through the liquid, whereby the support of the positive layer also absorbed the developer liquid, the result of which was that such photographic copies were yellow and required a long drying time. Furthermore, in the known equipment, the exposure lamp for the negative paper was automatically switched off after each passage of the original and the negative paper in order that the exposure cylinder should not be heated too strongly before the following original and negative paper were inserted; the driving motor remained switched on or had to be switched on again by a separate switch after being switched off, this also being tedious. Finally, the emptying and renewal of the developer liquid presented certain difficulties, particularly because the containers previously used for the developer liquid had to be made particularly large, since small quantities oxidized too quickly, whereby they were soon not suitable for use and consequently had to be frequently replaced.

The invention is characterized in that after the known exposure of the negative paper by the continuous process, the original leaves the apparatus, while means are provided which allows the positive paper to enter the apparatus, that further means conduct the negative and positive papers through the developer bath in such manner that the positive paper does not travel through the liquid, but is only just moistened on its layer side by means of a conveyor roller raising the liquid, and these means guide the two papers towards compensating rollers in such manner that before reaching the said rollers, the surface of the positive paper is applied to the wet negative paper so that the layers thereof are in contact and the said rollers press the two papers together and lead them out of the apparatus, that the container for the developer bath can be removed downwardly from the apparatus housing, can be fed from a reserve container and can be emptied into the latter by additional means, and that an additional switch for the light and motor circuit is connected electrically in parallel with the light and motor switch which is actuated by the insertion of the original and the negative paper.

One embodiment of the arrangement according to the invention is shown by way of example in the drawing, wherein:

Figure 1 is a longitudinal section on the line A—B of Figure 2;

Figure 2 is a plan view, partly in section on the line C—D of Figure 1;

Figure 3 is a side elevation in the direction of the arrow E, according to a section on the line F—G of Figure 2;

Figure 4 is a cross-section on the line H—J of Figure 2.

In the figures, 1 represents the apparatus housing with the bottom closure plate 2, while 3 is the container for the developer bath with the closure plate 4. Arranged at the place where the original and the negative paper issue from the exposure cylinder 5 is a horizontally disposed guide plate 6, facing which is an opening 7 in the top wall of the housing 1. At that end of this opening 7 which is remote from the exposure cylinder 5, a wall 8 of the housing extends at an angle towards the guide plate 6, while at least one roller 9 guiding the negative paper into the developer bath is provided parallel to the exposure cylinder and on the opposite side with respect to the said wall 8.

A double lever is pivotally mounted parallel to the guide roller 9 on that wall 8 of the housing 1 extending at an inclination to the guide plate 6, the downwardly directed arm 10 of said lever projecting into a slot 11 formed in the guide plate 6, while the upwardly directed arm 12 of the double lever is pivotally connected to a horizontally extending closure rod 13 projecting into a slot 14 which is provided in the top wall of the apparatus housing at right angles to the path of movement of the negative paper for the entry of the positive paper into the said housing, this positive paper being guided in the holder 15.

Provided beneath the slot 14 and parallel to the guide roller 9 are two driving rollers 16 and 17 for introducing the positive paper into the housing. Situated beneath the rollers 16 and 17 is at least one guide wall 18 of the apparatus housing the said wall extending as far as the inlet for the positive paper between two additional superimposed driving rollers 20 and 21 which are arranged parallel to the rollers 16 and 17. The lower roller 21 of the two rollers 20 and 21 is immersed with its bottom half in the developer liquid and wets the layer side of the positive paper, while a wall 3′ of the liquid container 3 following the guide roller 9 for the negative paper extends downwardly substantially parallel to the last mentioned guide wall 18 to serve as a guide for the negative paper, which is situated beneath the bottom roller 21 after it has entered the liquid. The wall 3″ of the liquid container extends with an upward inclination and serves as means for guiding the negative and positive papers to the two compensating, or press, rollers 22 and 23 arranged above the liquid 3. The lower roller 22 is rotatable but its bearing is not displaceably arranged, whereas the journals of the upper compensating roller 23 can be moved at right angles to the direction of movement of the negative and positive papers. The liquid container 3 projects into the apparatus housing 1 through an opening provided in the bottom plate 2 of said housing 1 and a compressible reserve liquid container 24 is provided in the lateral portion 3‴ of the liquid container between the wall 3″ thereof which leads at an inclination towards the compensating rollers 22; the container 24 is connected to the lowest part of the liquid container 3, while a pressure device is connected with the upper part of the container 24. As more clearly shown in Fig. 3, the pressure device consists of a plate 26 which bears against the upper part of the reserve container 24 and a pressure rod is fixed in this plate at right angles thereto. The rod 27 extends through an opening in the top wall of the liquid container 3 and is provided at its upper end with a press-button 28 which is formed with a slot 29 arranged at right angles to its longitudinal axis; a return spring 30 is provided between the bottom surface of the press-button 28 and the top wall of the reserve container 24.

A contact switch 31 is arranged beneath the guide plate

6 and the contact spring 31' thereof projects into an opening 32' of the supply passage 32 for the original and negative paper, the said passage extending from the insertion point 33 up to the insertion point at the exposure cylinder 5. A control disc 34 is provided on the partition 1' on the motor side of the apparatus housing and the said disc has slip rings 34' and 34'' arranged concentrically thereon, the brushes 35' and 35'' for switching on and off the motor circuit and the circuit of the exposure lamp bearing on the said rings.

The guide roller 9, the driving rollers 16, 17 and 20, 21 and the compensating rollers 22, 23 are mounted between two partitions 1' and 1''. These rollers are driven by driving members which are arranged between one partition 1' and the outside wall of the apparatus housing, while the lateral portion 3''' of the liquid container 3 extends between the second partition 1'' and the opposite outside wall of the apparatus housing.

The driving members for the rollers and the like consist of an electric motor 36 which drives the guide roller 9 by means of a reduction gear 37, 38, 39, 40, the said roller 9 driving the upper roller 20 of the liquid container 3 and a roller 42 of the exposure cylinder 5 by means of a chain drive 41. The roller 42 is positively connected for rotation on the control disc 34 for the motor circuit and the lamp circuit of the exposure cylinder, while the lower compensating roller 22 is driven through an intermediate wheel 43 and the chain drive 44 from the reduction gear wheel 40 connected to the guide roller 9.

The original is inserted with the negative paper through the inlet opening 33 after the positive paper has been positioned in the holder 15, the said paper being still held away from the driving rollers 16 and 17 by the closure rod 13. The original travels with the negative paper through the supply passage 32 and closes the contact 31 by contacting the spring 31' and displacing it upwardly. By this means, the motor circuit and the exposure lamp circuit are closed. In addition to driving the various rollers and cylinders, the motor also sets the control disc 34 in rotation; the brushes 35' and 35'' bear on the slip rings of the control disc 34. The slip ring 34' keeps the circuit of the exposure lamp closed until the original and negative paper have left the exposure cylinder, after the end of the original and the end of the negative paper have already freed the contact spring 31' and thus the contact 31 has opened again. The slip ring 34'' keeps the motor circuit closed until the positive paper has issued together with the negative paper from the slot 45 in the apparatus housing.

After the negative paper has been exposed, the original is removed by hand through the opening 7. The negative paper continues to move forward and rotates the lower arm 10 of the double lever in an upward direction; by this means, the rod 13 is moved out of the slot 14 and the positive paper is freed. The latter paper is gripped by the driving rollers 16 and 17 and travels towards and between the driving rollers 20 and 21. The photographic layer of the positive paper which does not dip into the liquid, is wetted or moistened, with developer liquid by the roller 21, the lower half of which is immersed in the liquid. Simultaneously with the introduction of the positive paper, the negative paper is deflected by the roller 9 into the developer bath and travels underneath the roller 21 and thus through the liquid. Both papers then pass along the wall 3'' to the compensating rollers 22 and 23, where the positive is produced by the diffusion process.

The liquid of the reserve liquid container 24 is supplied in the necessary quantity into the lower part of the liquid container 3 by depressing the press-button 28 and the latter is held in the depressed position by the slot 29 engaging on the top wall of the housing 1.

After the negative has been exposed, it is also possible for the original to be extracted upwardly through the opening 7 by providing automatic means which are not shown in the drawing.

Instead of initiating the introduction of the positive paper between the two driving rollers 16 and 17 by displacement of the rod 13 by means of the double lever 10, 12 and instead of providing a control disc 34 with slip rings and brushes as a second motor and lamp switch, it is possible, although this is not shown in the drawings, for the working operations caused by each element to be carried out by members which are in direct communication with the driving chain for the rollers; in particular, the driven chain wheel o fthe driving roller 17 is not provided with teeth over its entire circumference, so that a part of its circumference is defined by a surface and in particular a plane surface. Provided on that limiting surface of the chain wheel which is parallel to the chain wheel axis and at right-angles to this surface is a driving pin which periodically takes up a position in the path of movement of a second driver pin provided with the driving chain at right-angles to its direction of movement in the plane of one of the links of the driving chain. As long as this flat limiting surface of the chain wheel of the driving roller 17 is parallel to the direction of movement of the driving chain, the said chain wheel is not rotated by the driving chain and thus the positive paper is also not introduced into the apparatus. It is only when the driving pin of the driving chain has rotated the chain wheel of the driving roller 17 by a certain distance on striking the driving pin of said chain wheel that the teeth of this chain wheel mesh with the driving chain and the chain wheel is rotated by a complete revolution in order then to stop again. During the rotation of the chain wheel, the positive paper is pushed by the driving rollers 16 and 17 to such an extent into the apparatus that it can be gripped by the rollers 20 and 21.

In the path of movement of the driver pin connected to the driving chain, a contact switch is also provided at such a position that it is opened by the driver pin of the driving chain striking the movable contact part of the contact switch when the positive and negative papers have left the compensating rollers; at this moment, the exposure lamp is switched off and the motor is stopped.

I claim:

1. Photographic copy producing apparatus comprising a housing, an initially ineffective exposure device rotatably arranged within said housing, a first aperture formed in said housing for enabling insertion of an original and a negative photographic sheet in superimposed relationship, first guidance means for guiding said superimposed original and negative sheets about said device, initially ineffective electrical driving means arranged within said housing, electrical contact means for rendering said exposure device and driving means effective upon insertion of said original and negative sheets, a second aperture formed in said housing for effecting withdrawal of said original sheet from said housing subsequent to guidance thereof about said device, an initially obstructed third aperture formed in said housing for enabling insertion of a positive photographic sheet into said housing upon being rendered unobstructed, lever means pivotally mounted within said housing for rendering said third aperture unobstructed upon operative engagement with said negative sheet subsequent to guidance thereof about said device, first electrically driven roller means for directing said positive sheet upon insertion thereof within said housing, an arcutate shaped vessel arranged within said housing and having a volume of development fluid contained therein, second guidance means for effecting immersive passage of said negative sheet through said fluid and for concurrently effecting passage of said positive sheet slightly above the level of said fluid within said vessel, second electrically driven roller means for moistening only the under surface of said positive sheet by said fluid during passage thereof above said fluid while maintaining the negative sheet immersed, third electrically driven roller means for effecting conforming pressing of said positive and negative sheets together after moistening of

the under surface of said positive sheet, a fourth aperture formed in said housing for effecting concurrent exit of said positive and negative sheets from said housing subsequent to the conforming pressing thereof, and electrical controlling means for regulating the operation of said exposure device and said electrical driving means.

2. Photographic copy producing apparatus according to claim 1 wherein said electrical driving means includes an electric motor arranged within said housing, and means for operatively interconnecting said first, second, and third electrically driven roller means and said electrical controlling means to said motor.

3. Photographic copy producing apparatus according to claim 1 wherein said electrical controlling means includes a rotatable disc arranged within said housing, a pair of slip rings concentrically formed on said disc, and electrical wiper members individually engaging said slip rings on said disc.

4. Photographic copy producing apparatus comprising a housing, an initially ineffective exposure device rotatably arranged within said housing, a first aperture formed in said housing for enabling insertion of an original and a negative photographic sheet in superimposed relationship, first guidance means for guiding said superimposed original and negative sheets about said device, initially ineffective electrical driving means arranged within said housing, electrical contact means for rendering said exposure device and driving means effective upon insertion of said original and negative sheets, a second aperture formed in said housing for effecting withdrawal of said original sheet from said housing subsequent to guidance thereof about said device, an initially obstructed third aperture formed in said housing for enabling insertion of

a positive photographic sheet into said housing upon being rendered unobstructed, lever means pivotally mounted within said housing for rendering said third aperture unobstructed upon operative engagement with said negative sheet subsequent to guidance thereof about said device, first electrically driven roller means for directing said positive sheet upon insertion thereof within said housing, an arcuate shaped vessel arranged within said housing and having a volume of development fluid contained therein, second guidance means for effecting immersive passage of said negative sheet through said fluid and for concurrently effecting passage of said positive sheet slightly above the level of said fluid within said vessel, second electrically driven roller means for moistening only the under surface of said positive sheet by said fluid during passage thereof above said fluid while maintaining the negative sheet immersed, third electrically driven roller means for effecting conforming pressing of said positive and negative sheets together after moistening of the under surface of said positive sheet, further guidance means intermediate the second and third electrically driven roller means for effecting contacting engagement between the moistened under surface of the positive sheet and the negative sheet, a fourth aperture formed in said housing for effecting concurrent exit of said positive and negative sheets from said housing subsequent to the conforming pressing thereof, and electrical controlling means for regulating the operation of said exposure device and said electrical driving means.

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