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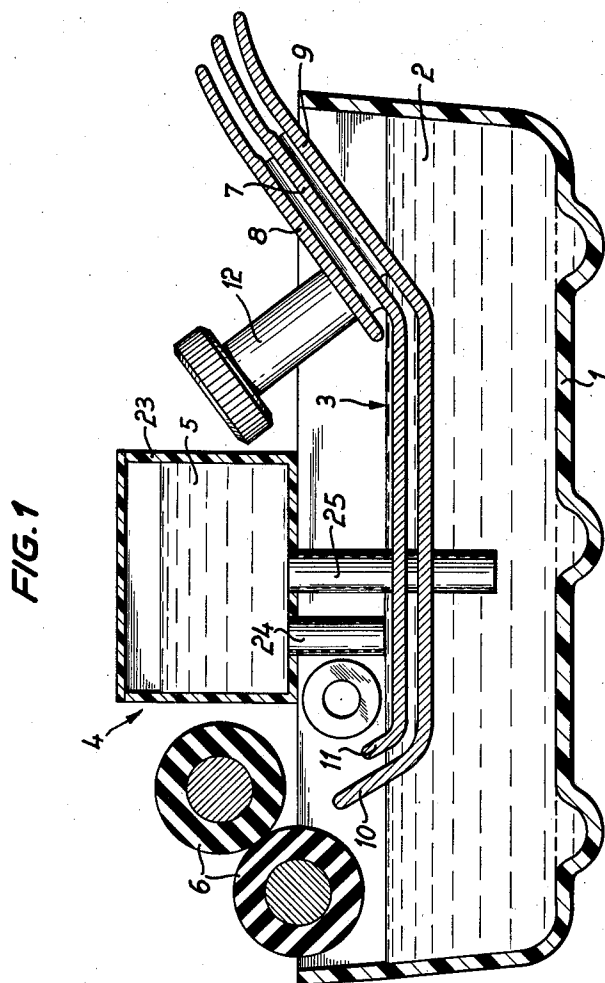
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3,103,153

DEVELOPING DEVICE FOR MAKING COPIES

Filed April 2, 1959

2 Sheets-Sheet 1



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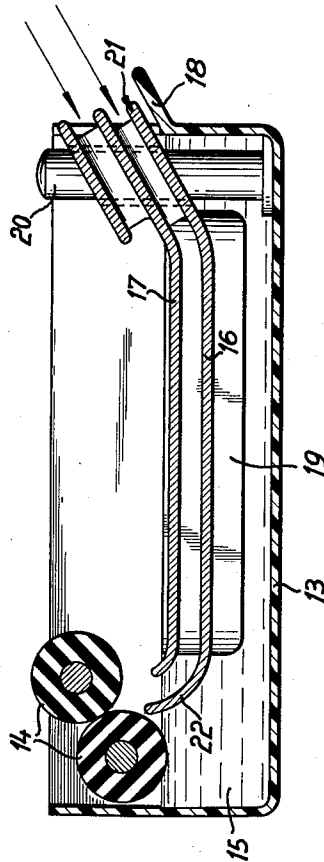
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2 Sheets-Sheet 2

FIG. 2



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DEVELOPING DEVICE FOR MAKING COPIES

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4 Claims. (Cl. 95—89)

The invention relates to a developing device for making copies according to the diffusion process by means of positive and negative layer carriers having guide elements arranged in the bath container, the parts of which guiding one of the layer carriers lying within the range of the surface of the bath liquid kept at a certain level in such a way that the layer carrier advancing over the guide elements is wetted on the total surface facing the bath liquid, as a result of the affinity between the bath liquid and the carrier.

When compared with other known devices with which both layer carriers have to be guided through the bath liquid to a pressure roller pair, the proposed devices have the advantage that the time for making copies is considerably shortened because the drying time is reduced.

Often, however, it will be necessary, in order to solve the developing substances in the layer of the negative layer carrier, to wet the same more with bath liquid than the positive layer carrier; by this it is possible to obtain best possible qualities in a minimum of working time.

According to the invention, guiding elements for guiding the positive layer carrier are arranged in the surface of the bath liquid wetting one side of the surface only, and the guide for the negative layer carrier extends through the bath liquid.

In an advantageous embodiment of the invention, the guide for the negative layer carrier is arranged below the guide elements for the positive layer carrier. By making the guide elements for instance of wire it is possible to keep the space between the layer carriers entering the liquid extremely small.

The major part of the guide for the negative layer carrier extends parallel to the surface of the bath liquid. The guide for the positive layer carrier is open towards its upper side.

In an advantageous embodiment, both ends of the guide elements are bent upwardly in a direction towards the pressure roller pair. According to another particularly preferred embodiment, the guide elements terminate in the straight-lined zone above the guide for the negative layer carrier. The distance between the ends of the guide elements and the end zone of the guide path for the negative layer carrier may differ in size.

According to an especially preferred embodiment, the guide elements are arranged on a float, the emerging power of which being selected to be such that the parts guiding the layer carrier are kept within the range of the surface of the bath liquid. Preferably, the float simultaneously carries the guide path for the negative layer carrier.

According to another embodiment, the guide elements and the parts defining the guide path for the negative layer carrier are detachably secured in a known manner to the edge of the bath container or some other part of the device, and the surface of the bath liquid is kept on a certain level by means of a known chicken watering device. With this arrangement, a pivotable fastening at least for the guiding elements may be provided in order to adapt them to the surface of the bath liquid when perhaps the device is turned into an oblique position.

The invention relates further to a certain bearing of at least a part of the guide elements belonging to developing devices having guide elements extending through a liquid bath for a positive layer carrier and a negative layer

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carrier. According to the invention at least a part of the guide elements is designed to float, so that they automatically adjust themselves to a certain height with regard to the liquid surface. If guide elements for only one layer carrier are arranged on a float, the invention includes an embodiment in which guide elements for another layer carrier are fixed at the housing.

Further advantages and features of the invention will be seen from the following specification referring to embodiments shown in the drawings.

In the drawings:

FIG. 1 shows a sectional side view of a device according to the invention,

FIG. 2 shows a sectional side view of another device according to the invention.

For the sake of better understanding only these parts are shown in the drawings that are essential for the performance of the invention.

In FIG. 1, the container 1 is filled with developing liquid 2 up to a liquid level 3. This liquid level is maintained exactly to the adjusted height by means of a known chicken watering device 4. This chicken watering device, by way of example, consists of a container 23 closed on all sides with two tubes 24, 25 terminating in its bottom surface. The tube 25 ends above the bottom of the container 1, while the other tube 24 has its orifice situated exactly at the same height with the predetermined liquid level 3. The container 23 is filled with liquid 5. If the liquid level in the container 1 decreases, the orifice of the tube 24 is exposed and air is admitted into the container 23, thereby causing liquid to be fed through the tube 25 into the container 1 until the level of the liquid again closes the tube 24.

Preferably, a pressure roller pair 6 is also fastened to the container 1, this pressure roller pair lying above the liquid level 2 with at least the zone of contact between the rollers. The rollers 6 are driven and transport the layer carrier out of the bath while at the same time pressing off the liquid which is still on them.

For guiding the layer carriers, leading or guiding elements are used. Guide elements 7 are provided for the positive layer carrier which from an insert zone extend towards the liquid 2 and are aligned in parallel relation to the liquid surface 3 in such a manner that the guide elements supporting the layer carrier are lying either in one plane with the surface or only so much above it that the layer of the positive layer carrier facing the liquid is wetted by the affinity between the layer and the bath liquid. The guide elements designated with reference numeral 7 may consist of wire or of a flat corrugated part or the like, the elements supporting the layer carrier being suitably arranged in such a way that all surface regions of the layer are wetted during passage. For instance, the elements supporting the layer carrier are extending obliquely to the feed direction of the layer carrier.

In the region of the guide elements coinciding with the surface of the bath liquid, the layer carrier running over the guide elements 7 is kept close to the guide elements by affinity, so that no special pressing or guide elements are necessary. For instance, a guide element 8 extending preferably only to the surface of the bath liquid only may be arranged above the inserting zone of the guide elements 7, in order to guide the layer carrier onto the path extending in the surface of the liquid. Instead of the guide elements 8 which may have the form of a strip or a flat surface, also rolls or other known devices may be arranged.

Below the guide element 7, guide elements 9 are disposed for the negative layer carrier. In the embodiment shown, these guide elements extend substantially in parallel relation to the guide elements 7. By means of this

the zone lying underneath the region of the guide elements 7 coinciding with the liquid level extends through the liquid in such a manner that the negative layer carrier moving along the guide elements fully merges into the liquid and at least for some distance is guided through the liquid. With this arrangement, the guide elements 7 at the same time may serve as leading elements for the negative layer carrier to keep it on its path. As the provided guide for the positive layer carrier in the surface of the liquid 2 requires the use of this guide elements only, e.g. wire, the distance between the layer carrier is extremely small in the region where the guide elements 7 are extending. In addition, the guide elements 9 for the negative layer carrier extend over a considerable portion of their length in parallel relation to the surface of the liquid, so that both layer carriers practically have the same length of way.

The guide elements 9 for the negative layer carrier show an end region 10 which is directed towards the pressure roller pair 6. Along this end region, which may be curved or may also have substantially straight lines at its ends, the layer carriers or the negative layer carrier, respectively, are guided to the pressure roller pair lying above the bath liquid.

The ends of the guide elements 7 facing the pressure roller pair 6, in the embodiment shown, are provided with a corresponding end section 11 bent upwardly on which the positive layer carrier is lifted from the surface of the bath liquid, said end region directing the motion of this layer carrier to the pressure roller pair 6. It is pointed out that the end portions 10, 11 preferably do not extend exactly in parallel relation to each other, so that the layer supports may meet in front of the slot of the pressure roller pair 6.

The invention also includes an embodiment in which the guide elements 7 do not contain the region 11 but terminate in that section which is extending along the liquid level. This section for instance may be extended to a point shortly before the region 10 of the guide elements 9, so that the positive layer carrier moves into contact with the negative layer carrier which is moving out of the liquid onto this section. However, another embodiment of the invention is included, in which the guide elements 7 terminate a considerable distance in front of the region 10, the positive layer carrier by means of its feed swims to the region 10 of the guide elements 9.

The guide elements 7, 9 and perhaps the leading element 8, are detachably fastened in the region of the side wall of the container 1 for instance by means of one or several holding screws 12. It is pointed out that the fastening means preferably should allow adjustment in height and also adjustment of the direction of the guide elements 7, 9 in such a manner, that for instance a pivotable movement is possible to adapt them to the surface when the container 1 stands obliquely.

In the device shown the negative layer carrier is applied to the guide elements 9 with the layer facing upwardly and the positive layer carrier is applied to the guide elements 7 with the layer facing downwardly, and both are manually advanced through the insert slots, until the leading edges are seized by the pressure roller pair 6 which effects the transport of the layer carriers out of the device.

The device shown in FIG. 2 comprises a container 13, a pair of pressure rollers 14 at the exit side for the layer carriers, and guiding elements 16 for the negative layer carrier and 17 for the positive layer carrier which are extending through the liquid in the container. The last-mentioned guide elements are extending adjacent the surface of the bath liquid in such a way that the positive layer carrier guided on them is wetted only on that side facing the liquid. Furthermore the bath container 13 is provided with a recess in the side wall at the entry side and with an obliquely extending feed surface 18.

The guide elements 16, 17 are arranged on a float 19.

This float and its emerging power, respectively, are selected to be such that the guide elements 17 are maintained coinciding with the surface of the bath liquid 15 as required. In order to enable automatic adjustment of the guide elements relative to the liquid surface, the guide elements may be pivoted and their height may be changed. For this purpose, one or several bolts 20 are provided which for instance may extend upwardly from the bottom of the container 13 and out of the bath liquid. These bolts serve to guide the group of structural elements consisting of the float 19, the guide elements 16, 17 and if used the feed-in leading elements 21. At the feed-in region, the guide elements 16, 17 and the leading elements 21 or the frame parts supporting those leading elements are provided with openings through which the bolts 20 are extending. The diameter of the openings is larger than that of the bolts so that a smooth height adjustment and, to a certain degree, a pivoting movement of this group of structural elements is possible. Hereby, a free adjustment in dependence on the emerging power of the float is attained. Preferably at least two bolts are provided, so that especially the end region 22 with its end edge extends in parallel relation to the pressure rollers 14.

It is pointed out that the bolts 20 need not be located at the entry side and that if required also several bolts may be arranged in a line along one side wall of the container. It is important that the feeding surface 18 of the container is arranged so low with regard to the lower feed elements 16, that at normal liquid level in the container 13 as well as admissible deviations from this level no contact is made between this feeding surface and other rigidly arranged parts, respectively, and the group of structural elements carrying the guide elements 16, 17.

It is possible to fix this group of structural elements adjustably in some other way, for instance, by providing a joint-like connection preferably of a flexible foil of plastic material between the guiding surface 18 or a corresponding edge portion and the group of structural elements.

The passage of the layer carriers through the device shown in FIG. 2 takes place in the same way as described in connection with FIG. 1, the positive layer carrier being applied to the guiding elements 17 and the negative layer carrier to the guiding elements 16. It is pointed out that according to FIG. 2 the end region 22 of the guide elements 16 is substantially arcuately curved and at its end forms an angle with the direction of the guide elements 17.

With regard to the floating arrangement of guiding elements, the invention is not limited to the embodiments of the guide elements dealt with in the preceding paragraphs. This feature is also provided with another embodiment and another arrangement of the guide elements. Especially such embodiments are included, in which for instance only one guide element is fastened to a floating member while other guide elements for another layer carrier are rigidly arranged. Furthermore, such embodiments are provided in which the guide elements for one or several layer supports are arranged to float in some sections, while feed-in elements for the containers of the layer carriers are rigid. With this embodiment, a coupling is preferably arranged between the section fastened to the housing and the floating sections, this coupling allowing for a height adjustment and a pivoting movement. It is furthermore possible to guide the floating parts to feed-in elements, correspondingly aligned by using bolts 20.

What I claim is:

1. In a developing apparatus for making copies according to the diffusion method using positive and negative layer carrier sheets, a bath container containing a developing liquid, driven pressure feed means above the liquid, sheet introducing means above the liquid arranged

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oppositely of the pressure means, means defining elongated guide paths between the introducing means and the pressure means, said guide paths defining means including an upper path adjacent and slightly below the level of the liquid for passing the positive layer carrier sheet across the developing liquid on the surface thereof in such a manner that only that side of the layer of the sheet is wetted which faces downwardly and a lower path below said upper path and below the level of the liquid, a floating member floating upon the developing liquid, said means defining said elongated guide paths being supported upon said floating member in order to automatically relate said guide paths to the liquid level in the bath container irrespective of the amount of the bath liquid and the inclination of the container.

2. In a developing apparatus as in claim 1, in which substantially vertical bolts are fixedly arranged in the bath container adjacent the introducing means and said floating member is provided with openings of a larger dimension than the bolts through which the bolts are received.

3. In a developing device for making copies in accordance with the diffusion method using positive and negative layer carrier sheets, a bath container containing a developing liquid, driven pressure rolls above the liquid, introducing means above the liquid arranged oppositely with respect to the pressure roller means, first guide means between the introducing means and the pressure roller means for passing the positive layer carrier sheet across the development liquid on the surface thereof in

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such a manner that only the downwardly facing sensitive side of the positive sheet is wetted, second guide means between the introducing means and the pressure roller means for guiding the negative layer carrier sheet through the liquid of the bath, said guide means having middle portions parallel with respect to one another and parallel to the surface of the developing liquid, a floating member floating upon the developing liquid, said first and second guide means being defined upon said floating member whereby said guide means middle portions will automatically be maintained parallel to the surface of the developing liquid.

4. In a developing device as in claim 3, in which the guide means are rigidly connected to the introducing means, openings defined in said introducing means, and bolts fixedly arranged in the container at the side of the introducing means, the cross sections of said bolts being smaller than the dimensions of the openings, said bolts being received within said openings.

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