July 12, 1966 W. LIMBERGER 3,260,185

DEVELOPING DEVICE FOR MAKING COPIES

Original Filed April 2, 1959 2 Sheets-Sheet 1

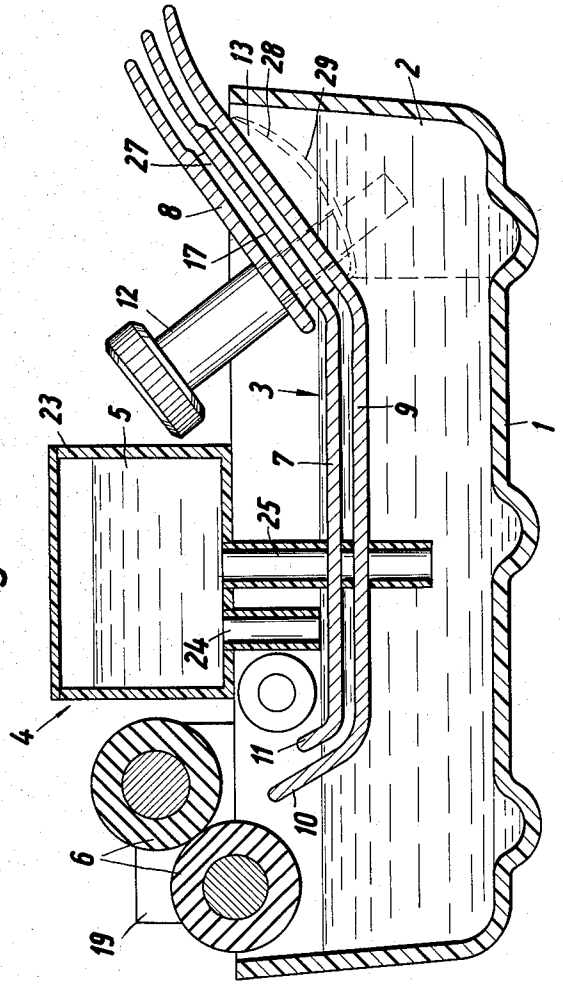


Fig. 1

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Fig. 2

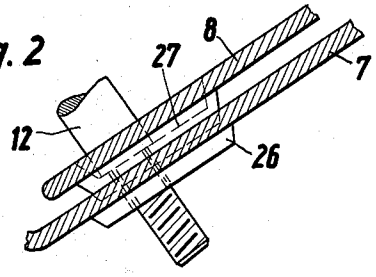
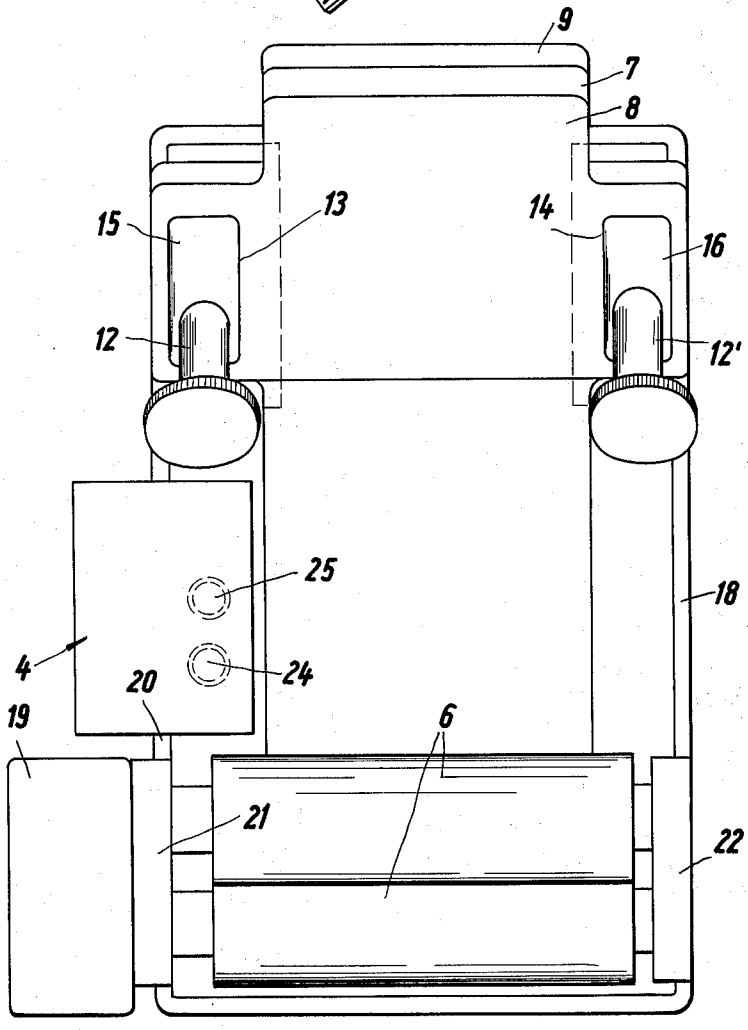


Fig. 3



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DEVELOPING DEVICE FOR MAKING COPIES

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Original application Apr. 2, 1959, Ser. No. 803,719, now Patent No. 3,103,153, dated Sept. 10, 1963. Divided and this application July 18, 1963, Ser. No. 296,059
Claims priority, application Germany, Apr. 28, 1958, L 30,301
5 Claims. (Cl. 95—89)

This invention is a divisional application of U.S. Patent 3,103,153 issued September 10, 1963, and relates to a 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 guide for one of the layer carriers lies within the range of the surface of the bath liquid which is 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 pair of pressure rollers, 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 dissolve 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 for wetting one side of the carrier surface only, and the guide for the negative layer carrier extends through the bath liquid, and means are provided to maintain the liquid level in an exactly defined adjusted height relative to the position of the guide elements.

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, of wire for instance, 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 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 to an oblique position.

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 partial sectional view of a detail of the device illustrated in FIG. 1;

FIG. 3 shows a top view of the device according to FIG. 1.

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

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

Preferably, a pair of pressure rollers **6** are also mounted on the bath container **1** and are located above the liquid level **3** having a zone of contact between the rollers. The rollers **6** are driven and transport the layer carriers out of the bath while at the same time pressing off the liquid which is still on them.

Referring to FIG. 3 it will be seen that a unit **19** consisting of a drive motor and a gearing is mounted on one side of the bath container **1**, preferably on the same side wall **20** which supports the chicken watering device **4**. The bearings for the pressure roller pair **6** are designated with reference numerals **21** and **22** of which the bearing **22** is mounted on the side wall **18** of the bath container **1**.

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 **7** 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 to the surface of the bath liquid only may be arranged above the inserting zone **17** 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 element **8** which may have the form of a strip or a flat surface, rolls or other known devices may be arranged.

Below the guide elements 7, guide elements 9 are disposed for the negative layer carrier. In the embodiment shown, these guide elements extend equally spaced 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 guide elements 9 fully submerges 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 guide elements 7 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 carrier movement.

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

The ends of the guide elements 7 facing the pressure rollers 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 directs the motion of this layer carrier to the pressure rollers 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 rollers 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 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, and the positive layer carrier by means of its feed floats 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, 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 a pivotable movement is possible to adapt them to the surface when the bath container 1 is tilted with respect to the horizontal.

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 pair of pressure rollers 6 which produce the transport of the layer carriers out of the device.

It will be seen from FIGS. 2 and 3 that the guide elements have cup shaped projections 15, 16 formed at their sides disposed laterally of the guide path proper which projections are provided with apertures through which the holding screws 12, 12' extend. At these locations the side walls 18, 20 of the bath container 1 are provided with correspondingly shaped profiled surfaces 13, 14 the bottoms of which having threaded openings

arranged therein for receiving the holding screws 12, 12'.

The lateral projections have, as may be seen in FIG. 2 with regard to the guide elements 8 and the entrance section of the guide elements 7 a cup-like shape so that always the convex side of the cup 27 of an upper guide element may be placed into the concave side of the cup 26 of a lower guide element. Due to these interengaging fits lateral shifting is avoided and the guide elements 7 and 9 are kept in parallel relation to each other due to the shape, particularly of the cup 26 having a flat bottom. As shown in FIG. 1 the cup 28 of the lower guide elements 9 is arcuately shaped in longitudinal direction of the apparatus, i.e. parallel to the plane of the drawing and fits into a correspondingly profiled cavity 29 provided in the profiled surface 13. A similar arrangement is provided at the other side for the profiled surface 14, whereby the total guiding structure may be adjusted in its angular position after loosening the holding screws 12, 12'.

It is to be understood that the apertures provided for this purpose in the guide element are made larger than the portions of the holding screws 12, 12' extending therethrough. As may be seen in FIG. 1 the holding screws 12, 12' have a stepped threaded portion and the shank, that is the upper part, has a greater diameter thereby forming a radial shoulder engaging the guide elements and urging them into clamping engagement in their adjusted position.

What I claim is:

1. A developing device for positive and negative layer carriers each having a sensitive surface comprising, in combination, a container for a liquid developing agent, a liquid developing agent within said container defining a liquid surface, layer carrier contacting, drying and transporting means disposed adjacent said container and above said liquid surface, layer carrier inlet means disposed adjacent said container above said liquid surface and spaced from said contacting, drying and transporting means, first and second elongated, linear layer carrier guiding means disposed within said container intermediate said inlet means and said contacting, drying and transporting means and related to said inlet means for receiving layer carriers therefrom, said first guiding means being parallel to and disposed in substantial alignment with said liquid surface whereby upon a layer carrier being received upon said first guide means with the sensitive surface thereof disposed toward said first guide means the layer carrier is substantially floated on said liquid surface and only the sensitive surface thereof is wetted by said liquid developing agent, said second layer carrier guiding means being disposed parallel to and slightly below said first guiding means, automatic liquid developing agent supply means sensing the position of said liquid surface and maintaining said liquid surface at a predetermined level, and means within said container guiding the layer carriers from said first and second guiding means toward said contacting, drying and transporting means.

2. In a developing device as in claim 1 wherein said contacting, drying and transporting means comprises a pair of engaging rollers defining a line of roller engagement, means rotating at least one of said rollers, said means guiding said layer carriers from said first and second guiding means being in alignment with said line of roller engagement.

3. In a developing device as in claim 1 wherein said layer carrier inlet means comprises first extensions of said first and second guiding means extending obliquely upward from said liquid surface and away from said contacting, drying and transporting means, and said means guiding said layer carriers from said first and second guiding means comprises second extensions of said first and second guiding means extending upwardly from said liquid surface toward said contacting, drying and transporting means.

4. In a developing device as in claim 1, adjustable support means mounting said first and second guiding means

upon said container whereby said guiding means may be angularly adjusted relative to said container and said liquid surface.

5. In a developing device as in claim 4 wherein said adjustable support means includes a pair of cavities defined on said container, a pair of projections defined on said guiding means received within said cavities, and a clamping screw extending through each of said projections and cavities.

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