

PATENT SPECIFICATION

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(54) COMBINED READING AND ENLARGING APPARATUS FOR MICROFILM

(71) We, AGFA-GEVAERT AK-TIENGESELLSCHAFT, a Body Corporate recognised, under German Law, of Leverkusen, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 The present invention relates to a combined reading and enlarging apparatus for microfilm in which a display screen is arranged substantially vertically at the front of the apparatus and a duplicator in which a printing material is exposed while lying in a substantially horizontal position, is arranged in an upper position of the apparatus.

15 The above described arrangement which has a projection section forming the base of the apparatus enables the construction of a very compact housing while allowing the user unimpeded access to the microfilm container as well as to the transport and guide mechanisms for the microfilm.

20 Normally in apparatus of this type, newly exposed printing material is passed through a developing tank in which it is subjected to the action of a developing fluid. A disadvantage of this arrangement is that the sensitive surface of the printing material comes into contact with at least part of the outer wall of the tank so that the coating can be damaged or its developing process can be affected detrimentally. When an electrostatic copying method is used contact with the wall may also result in partial destruction of the latent image due to uneven clearing of the electrostatic charges and to blurring of insufficiently fixed colour particles.

40 The present invention provides combined

reading and enlarging apparatus for microfilm which comprises means for transporting a photo-sensitive copy support to an exposure position in which the copy support is arranged to be held in a substantially horizontal plane, means for trans-illuminating the microfilm and so projecting the light passing through the microfilm that, when there is a copy support in the exposure position, an image of the microfilm is formed on the copy support to expose the copy support, means for directing a proportion of the light from the projection means onto a substantially vertical display screen to form an image of the microfilm, means for transporting the copy support from the exposure position through a developing tank, the copy support being in sheet form at least during passage through the tank, and means for so guiding sheets of copy support through the tank in a looped path that the path taken by the copy support after it leaves the tank crosses the path taken by the copy support before it enters the tank, the length of the looped path being greater than the length of a sheet of copy support.

Advantageously, there is provided, in the tank, a developing electrode. Preferably, the tank and developing electrode are, in cross section taken in a plane at right angles to the plane of the copy support, semi-circular sectors, the copy support being so guided through the tank that the unexposed surface of the copy support rests against the inner surface of the tank and there is provided an inlet arranged to introduce developer fluid into the space formed between the copy support and the electrode. In this way, the photo-sensitive surface of the copy support is prevented, by the action of the developer

[Price 25p]

Price 33p

fluid, from making contact with the electrode and the developing process is enhanced. These effects are further added if the centre of the curvature of the developing electrode is arranged nearer the point of entry of the copy support to the tank than is the centre of curvature of the developing tank so that the separation of the electrode and the copy support increases from the entry point to the exit point.

There is advantageously, provided, alongside the path taken by the copy support after it has left the developing tank, means for drying the copy support.

Preferably, there is provided a discharge surface for developed copy support and which slopes from the path taken by the developed copy support towards one side of the apparatus and which communicates with the exterior of the apparatus. In this way a fully processed and finished print is delivered into a position in which it can be gripped, while keeping the dimensions of the apparatus as small as possible.

With this arrangement, the copy support, which is preferably zinc oxide paper, is guided through the developing tank with the exposed surface facing the centre of curvature of the path. Due to the fact that the looped section of the path is at least as long as a sheet of copy support measured in the transport direction, the leading end of the copy support does not interfere with its trailing end. The whole developing device is of very compact, space-saving construction, and the approximately circular shape of the path taken by the copy support contributes to the stabilisation of the copy support during its passage through the tank and prevents it from deviating from the desired path.

One form of combined microfilm reader and enlarger constructed in accordance with the invention will now be described by way of example, with reference to the accompanying drawing, in which:

Figure 1 is a sectional elevation of the apparatus, and

Figure 2 shows a section through the developing device.

Referring to Figure 1 of the accompanying drawings, there is provided, in the housing 1 of a combined microfilm reader and printing apparatus, a picture platform 2 which is pivotable through at least 90° in a known manner in order to enable rectangular frames to be viewed in either position. The picture platform 2 carries a supply reel 3 and a take-up reel 4 for the microfilm strips 5 which are to be viewed. The microfilm image in question is illuminated by light from a projection lamp 9 having a reflector 10. The light passes through a condenser arrangement 11 and by way of a mirror 12 to the picture platform 2.

The microfilm image is then projected by means of an objective 6 and by way of a semi-silvered mirror 7 onto a display screen 8.

The microfilm image, in addition to being projected by means of the semi-silvered mirror 7 onto the display screen 8, is also projected onto an exposure plane 13. Copy support 18, which is coated with zinc oxide is transported into the exposure plane 13 by rollers 14, 15, 16 and 17. The copy support 18 is drawn from a supply reel 19 and is cut to the required sheet length by a cutting device 20. Before entering the exposure plane 13 the copy support 18 passes through a double corona discharge device 21/22 which provides the surface of the copy support with the necessary charge for the electrostatic copying process.

The exposure process, may, for example, be controlled in a manner which is not shown in greater detail, the projection lamp 9, which is switched off during the entry of the copy support 18 into the exposure plane 13, being briefly switched on when the copy support is at a standstill.

After being exposed the copy support 18 passes through a developing device which is shown in greater detail in Figure 2. The copy support 18 is led between guide surfaces 23 and 23a to a pair of transport rollers 24 and 25 and thence between further curved guide surfaces 26 and 27 to a pair of inlet rollers 28 and 29. Adjacent to the end of the path formed by the guide surfaces 26 and 27, which is substantially quadrant shaped, there is a substantially semicircular developing tank 30. Formed on the base of the developing tank 30 are guide ribs 30a and 30b which prevent the outer surface of the copy support 18 from resting directly on the base of the tank 30.

Arranged within the tank 30 is a substantially semi-circular developing electrode 31. The electrode 31 is arranged eccentrically with respect to the tank 30 so that the space between the inner surface of the tank and the electrode increases from the inlet to the outlet in a funnel shape for the passage of the copy support 18. At the inlet end of this space there is provided a spray nozzle 32 which sprays developer fluid 33, which is pumped round by means of a recirculating pump device, which is not shown in greater detail, onto an oblique surface 31a of the developing electrode 31. From there the developer fluid 33 is led into the space between the copy support 18 and the developing electrode 31. The developer fluid flowing in this space effectively prevents the sensitive coated side of the copy support 18 from making contact with the developing electrode 31. The recirculated developer fluid is drawn off through an outlet aperture 34 fitted on the

side wall of the developing tank 30. The funnel-like shape of the space offers the advantage that the first deposit of toner on the copy support 18 takes place in the immediate vicinity of the developing electrode 31 so that the so-called edge effect is eliminated to a great extent, whilst a greater volume of developing fluid is available for developing out. The widening of the space also prevents jamming of the copy support 18.

At the outlet end of the developing tank 30 the copy support 18 is led in a substantially vertical direction to a pair of squeegee rollers 35 and 36. The vertical position of the copy support 18 facilitates the return of developer fluid to the tank 30. Adjacent to the pair of squeegee rollers 35 and 36 there is a guide path for the copy support 18 formed by guide surfaces 37 and 38 which crosses the guide path formed by the guide surfaces 23, 24a, 26 and 27. The length of the path through the curved inlet path 26 and 27, the developing tank 30 and the guide path 37 and 38 is so matched to the length of a sheet of copy support that the trailing end of a sheet has already passed the crossing point 39 when its leading end reaches the crossing point.

From the crossing point 39 the copy support 18 is taken past a hot air blower 40 which effects the further drying of the copy support 18. As soon as it has passed through this short drying section the copy support 18 is deflected by means of a further guide plate 41 to a discharge surface 42. The discharge surface 42 is inclined downwards towards one side of the apparatus, so that the copy support 18 can slide from it under the force of gravity to a discharge surface which is not shown in greater detail and is laterally arranged on the apparatus. This lateral discharge surface is very easily accessible to the operator from the operating side of the apparatus.

As shown in Figure 2, the developing tank 30 is also surrounded by a safety tank 43 which collects any developing fluid which splashes over and leads it to the recirculation circuit by way of an outflow pipe 43a.

WHAT WE CLAIM IS:—

1. Combined reading and enlarging apparatus for microfilm which comprises means for transporting a photo-sensitive copy support to an exposure position in which the copy support is arranged to be held in a substantially horizontal plane, means for transilluminating the microfilm and so projecting the light passing through the microfilm that, when there is a copy support in the exposure position, an image of the microfilm is formed on the copy

support to expose the copy support, means for directing a proportion of the light from the projection means onto a substantially vertical display screen to form an image of the microfilm, means for transporting the copy support from the exposure position through a developing tank, the copy support being in sheet form at least during passage through the tank, and means for so guiding sheets of copy support through the tank in a looped path that the path by the copy support after it leaves the tank crosses the path taken by the copy support before it enters the tank, the length of the looped path being greater than the length of a sheet of copy support.

2. An apparatus as claimed in claim 1, wherein there is provided a supply reel for a web of copy support and, between the reel and the tank, means for severing sheets from the web.

3. An apparatus as claimed in claim 1 or claim 2, for use with a sensitized copy support, wherein there is provided, before the exposure position, means for charging the copy support and, in the developing tank, a developing electrode.

4. An apparatus as claimed in claim 3, wherein the tank and developing electrode are, in cross section taken in a plane at right angles to the place of the copy support semi-circular sectors, the copy support being so guided through the tank that the unexposed surface of the copy support rests against the inner surface of the tank and there is provided an inlet arranged to introduce developer fluid into the space formed between the copy support and the electrode.

5. An apparatus as claimed in claim 4, wherein the centre of curvature of the developing electrode is arranged nearer the point of entry of the copy support into the tank than is the centre of curvature of the developing tank so that the separation of the electrode and the copy support increases from the entry point to the exit point.

6. An apparatus as claimed in any one of claims 3 to 5, wherein there is provided, alongside the path taken by the copy support after it has left the developing tank, means for drying the copy support.

7. An apparatus as claimed in any one of claims 1 to 6, wherein there is provided a discharge surface for developed copy support which slopes from the path taken by the developed copy support towards one side of the apparatus and which communicates with the exterior of the apparatus.

8. Combined reading and enlarging apparatus for microfilm substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.



side wall of the developing tank 30. The funnel-like shape of the space offers the advantage that the first deposit of toner on the copy support 18 takes place in the immediate vicinity of the developing electrode 31 so that the so-called edge effect is eliminated to a great extent, whilst a greater volume of developing fluid is available for developing out. The widening of the space also prevents jamming of the copy support 18.

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5. An apparatus as claimed in claim 4, wherein the centre of curvature of the developing electrode is arranged nearer the point of entry of the copy support into the tank than is the centre of curvature of the developing tank so that the separation of the electrode and the copy support increases from the entry point to the exit point.

6. An apparatus as claimed in any one of claims 3 to 5, wherein there is provided, alongside the path taken by the copy support after it has left the developing tank, means for drying the copy support.

7. An apparatus as claimed in any one of claims 1 to 6, wherein there is provided a discharge surface for developed copy support which slopes from the path taken by the developed copy support towards one side of the apparatus and which communicates with the exterior of the apparatus.

8. Combined reading and enlarging apparatus for microfilm substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.



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