

SPECIFICATION Improvements in and Relating to Optical Copying Apparatus

The invention relates to optical copying apparatus, and especially to such apparatus having a transparent support plate for an original and at least one positioning edge for the original, which positioning edge forms a part of a means defining the image area, in which apparatus there is provided a masking strip that projects beyond the positioning edge into the image area and thereby masks the contact point of the edge of the original with the positioning edge.

Such copying apparatus is the subject of German Utility Model No. 6 916 869. In that apparatus, when an original is inaccurately positioned against the positioning edge, the masking strip, which on its underside has approximately the reflectivity of an average original, prevents a dark stripe spoiling the appearance of the finished copy in the region corresponding to this edge. This strip which is arranged on the upper side of the transparent support plate, however, slightly impedes the positioning of originals and could also in the course of time become damaged or worn away by these originals. In addition, and above all in those cases in which the masking strip is especially thin, for example when it is constructed as a varnished strip in order to hinder the positioning operation as little as possible, it is difficult to match the reflectivity of the masking strip accurately enough to the reflectivity of the original to ensure that there is not still an intrusive mark visible along the margin with many originals.

Furthermore, marks along the margin frequently appear also along the other edges of the image, when the original does not completely fill the object field, and the underside of the copying cover is not sufficiently accurately matched to the reflectivity of the original or the copying cover has not been closed, or, as is the case when, for example, books are the originals being copied, there is a relatively large spacing between the copying cover and the plane of the original during the copying process.

The invention provides optical copying apparatus having a transparent support plate for an original, at least one positioning edge for the original, which edge defines one edge of the object field of a means for projecting an image of the original onto an image support, and a diffusing strip that is at least partially transparent and tends to scatter light passing through it and that is so positioned in the optical path between the object plate and the image support as to prevent an image of the positioning edge and of the adjacent edge portion of the object field from being projected onto the image support, and as not to be sharply projected itself.

With this arrangement there appears, largely regardless of the reflectivity of the particular original, an unnoticeable optical transition between the images of the edge of the original

and of the positioning edge. The positioning of the original is in no way hindered by this diffusing strip. Further, the positioning of the original does not require to be carried out with particular care because the edge portion of the original that is covered by the diffusing strip can safely be arranged to be as much as about 5 mm wide. The risk that any of the information to be copied will be lost is very slight because, especially at the left hand margin of, for example, type-written or printed originals or other documents intended for storage in a file, there is normally left blank a binding margin of at least approximately 5 mm. The part of other originals covered with lines of writing or drawings is also hardly ever less than the 5 mm mentioned away from the edge.

Advantageously, there is arranged in the focal plane of the apparatus nearer the support for an original a frame defining the object field, which on its underside has a reflectivity similar to the reflectivity of an average original and in addition to a positioning edge for the original constructed on the frame and forming part of this means defining the object field, there is associated with at least one other field-defining edge of this frame a diffusing strip not lying in either of the focal planes of the projection system. Advantageously, the ends of a slot diaphragm serving for the strip-by-strip copying of an original onto a record support moved relative to the original are masked by a diffusing strip.

Thus, the appearance of intrusive marks at the edge of the copy is also reliably prevented along the sides of the object field not adjacent to the positioning edge, even if the copying cover is not closed, without special measures having to be taken to align the original with the object field of the copying apparatus.

One form of copying apparatus constructed in accordance with the invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a semi-schematic section through part of the apparatus in side elevation view; and

Figure 2 is a section along the line II—II in Figure 1.

Referring to Figure 1 of the accompanying drawings, a support 2 for an optical projection system 3 is arranged in an apparatus housing 1. On the upper side of the apparatus housing 1 there is guided horizontally, in the direction of arrows A and B, a movable slide 4. In a recess 4a of the slide 4 there is fitted a transparent plate 5 for supporting an original 6, for example a book, which is to be copied. The transparent support plate 5 is held in the slide 4 by a frame 7 which defines the area of the object field and on which there is provided a positioning edge 7a for one edge of the original 6. The underside 7b of the frame 7 has a reflectivity as similar as possible to the reflectivity of an average original. It may, for example, be coated with a satin-frosted white lacquer.

Two fluorescent tubes 8 and 9 are provided to illuminate the original 6 and are arranged in

reflectors 10 and 11, respectively. The projection system 3 projects an image of the original 6, which is moved by the slide 4 in the direction of arrow B and is illuminated by the fluorescent tubes 8 and 9, onto the photoconductive surface 12a of a cylindrical intermediate copy support 12 rotating counter-clockwise, as seen in the drawing, as shown by the arrow C. The projection is restricted in known manner by means of an image field stop 13 which has a slot-shaped opening 13a extending parallel to the axis of rotation of the cylinder 12, to a portion of the photoconductive surface 12a that is sufficiently nearly planar for a sharp image to be produced by the projection system 3. During projection, the slide 4 and the intermediate copy support 12 are driven in the directions of the arrows B and C, respectively, in known manner by means of a drive system (not shown) at speeds which are in a ratio corresponding to the scale of the image. After each copying cycle, the slide 4 returns in the direction of the arrow A to its initial position under the influence of a restoring spring (not shown).

Below the positioning edge 7a and parallel to this edge there is fastened to the underside of the transparent support plate 5 a strip 14 that is likewise transparent or at least semi-transparent, and overlaps by an amount a the edge of the image field. This strip 14 has a light-diffusing surface, indicated in Figure 1 by a wavy line. The strip 14, in the example illustrated, is a matt, self-adhesive piece of film. Alternatively, however, the same effect may be achieved by rendering a strip of the underside of the transparent plate 5 matt by etching or sandblasting, or by means of a suitable varnishing process. The essential point is that the strip or strip-shaped zone 14 is at least partially translucent and has the ability to scatter diffusely light passing through it, and that the strip is not located in either of the focal planes of the recording system, that is to say, it is not located in the plane of the original or in the plane of the copy, or in the plane of any field-defining edges. These edges are then no longer projected through the matt finish as sharp lines onto the copy support 12a and are also unable to cast heavy shadows. The matt finish appears to the projection system as a substantially uniform, white area so that its projection onto the photosensitive layer during the recording process leads to a uniform discharging of this layer. The areas discharged in that way not only no longer form undesirable dark stripes on the finished copy; they also do not cause any deposits of superfluous toner, which would burden the cleaning unit unnecessarily and contribute to a premature depletion of the toner supply.

As may be seen more clearly in Figure 2, there are provided above the ends of the image field slot 13a transparent strips 15 the upper surfaces of which are provided with a matt finish 16. The strips 15 and 16 overlap the ends of the slot 13a by a distance b . If the end of the slot 13a corresponds to the lateral format limit set by an edge of the frame 7, the light impinging on a

marginal area of the image of width b is laterally scattered. One result of this is that the marginal area of the intermediate image cylinder 12a is illuminated right out to the edge even if the cylinder projects, as is shown in the drawing by a distance c , beyond the lateral edges of the image field or the image field is displaced laterally with respect to the cylinder as a result of manufacturing tolerances or the like, and the cylinder can therefore have at least the full width required for recording of the whole area of the original, without the fear of undesirable toner deposits, which are caused by unsatisfactory exposure, forming on the lateral edges of the cylinder if these extend beyond the image field stops, the ends of the slot 13a, as a result of variations in tolerances or the like. The strip 16 will also then prevent a dark stripe from appearing in the image if there is a gap between the lateral limit edge of the frame 7 and the edge of the object 6, since such a dark stripe would be projected only onto the diffusing strip 16. The strip 16, which extends parallel to the directions of motion B and C of the object and the image support at the point of projection could be replaced by a corresponding strip running the length of the lateral format limit in the plane of the bottom of the transparent plate 5, provided that the apparatus is so arranged that the image of the strip on the cylinder 12a extends right to the ends of the cylinder, and the strip could then be made in the same way as the strip 14.

Of course, in the case of a copying apparatus with the original stationary during the exposure, the transparent support plate 5, the frame 7 defining the exposure area for the original and the light-diffusing strip 14 would be fixed to the apparatus.

Claims

105 1. Optical copying apparatus having a transparent support plate for an original, at least one positioning edge for the original, which edge defines one edge of the object field of a means for projecting an image of the original onto an image support, and a diffusing strip that is at least partially transparent and tends to scatter light passing through it and that is so positioned in the optical path between the object plate and the image support as to prevent an image of the positioning edge and of the adjacent edge portion of the object field from being projected onto the image support, and as not to be sharply projected itself.

120 2. Optical copying apparatus as claimed in claim 1, wherein the diffusing strip comprises a portion of the underside of the transparent support plate that is provided with a matt finish.

125 3. Optical copying apparatus as claimed in claim 1, wherein the diffusing strip comprises a strip of material attached to the underside of the transparent support plate.

4. Optical copying apparatus as claimed in any one of claims 1 to 3, wherein the width of the



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reflectors 10 and 11, respectively. The projection system 3 projects an image of the original 6, which is moved by the slide 4 in the direction of arrow B and is illuminated by the fluorescent tubes 8 and 9, onto the photoconductive surface 12a of a cylindrical intermediate copy support 12 rotating counter-clockwise, as seen in the drawing, as shown by the arrow C. The projection is restricted in known manner by means of an image field stop 13 which has a slot-shaped opening 13a extending parallel to the axis of rotation of the cylinder 12, to a portion of the photoconductive surface 12a that is sufficiently nearly planar for a sharp image to be produced by the projection system 3. During projection, the slide 4 and the intermediate copy support 12 are driven in the directions of the arrows B and C, respectively, in known manner by means of a drive system (not shown) at speeds which are in a ratio corresponding to the scale of the image. After each copying cycle, the slide 4 returns in the direction of the arrow A to its initial position under the influence of a restoring spring (not shown).

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4. Optical copying apparatus as claimed in any one of claims 1 to 3, wherein the width of the



areas of the object field covered by the diffusing strip is approximately from 1 to 5 mm.

5 5. Optical copying apparatus as claimed in any one of claims 1 to 4, wherein the positioning edge is an edge of a member which has on its underside of reflectivity similar to the reflectivity of an average original.

10 6. Optical copying apparatus as claimed in any one of claims 1 to 4, wherein in the region of the focal plane of the apparatus nearer the support for the original there is arranged a frame defining the object field.

15 7. Optical copying apparatus as claimed in claim 6, wherein the frame has on its underside a reflectivity similar to the reflectivity of an average original.

20 8. Optical copying apparatus as claimed in claim 6 or claim 7, wherein there is a diffusing masking-strip not lying in either of the focal planes of the projection system associated with at least one edge of the frame other than the said

positioning edge.

25 9. Optical copying apparatus as claimed in any one of claims 1 to 8, wherein there is provided near the image support light transmitting and diffusing means for scattering light from the image support, and as not to be sharply projected support which would otherwise have been outside the image area.

30 10. Optical copying apparatus as claimed in claim 9, wherein the said diffusing means masks an end of a slot-shaped image field stop serving for the strip-by-strip recording of an original onto an image support that during the copying process is moved relative to the original.

35 11. Optical copying apparatus as claimed both in claim 8 and also in either claim 9 or claim 10, wherein the said masking-strip is the said diffusing means.

40 12. Optical copying apparatus substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.