Sept. 8, 1936. N. P. BILLING 2,053,317

PHOTOGRAPHIC PRINTING OR ENLARGING APPARATUS

Filed Oct. 23, 1934 2 Sheets-Sheet 1

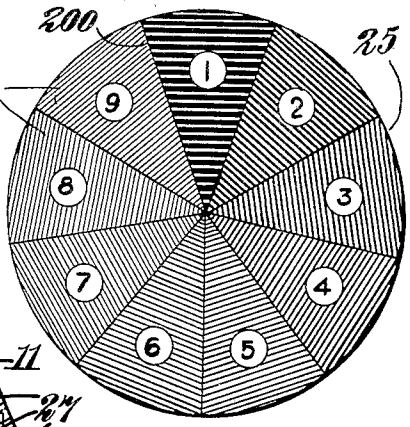


Fig.5.

Fig.1.

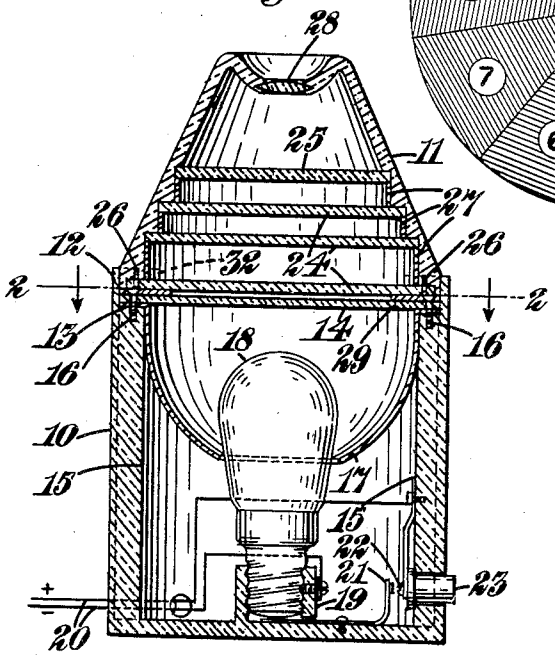
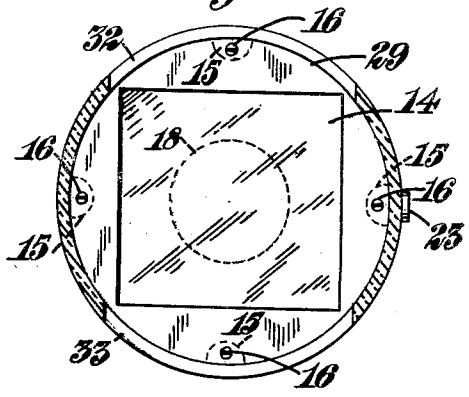


Fig.2.



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Fig. 4.

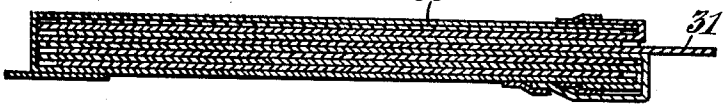
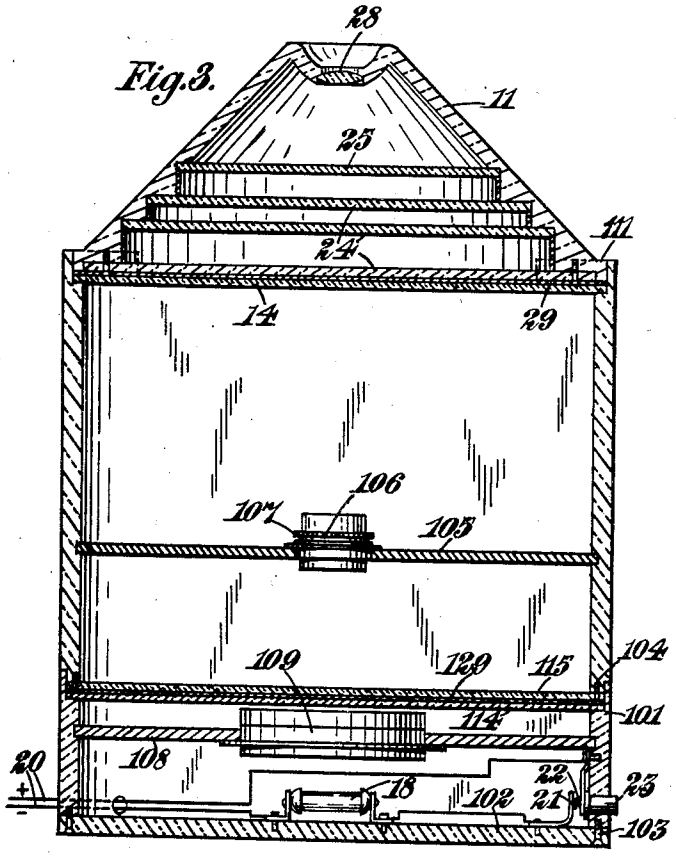


Fig. 3.



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UNITED STATES PATENT OFFICE

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PHOTOGRAPHIC PRINTING OR ENLARGING APPARATUS

Noel Pemberton Billing, London, England

Application October 23, 1934, Serial No. 749,657
In Great Britain November 3, 1933

7 Claims. (Cl. 88—24)

This invention consists in improvements in or relating to photographic printing or enlarging apparatus and has for its object to provide means whereby printing or enlarging can be carried out with ease and with accuracy as to the time of exposure. The invention is particularly suitable for use with printing paper that is packeted in an envelope in the manner described in British application No. 20,968/34, but it is not limited to this specific use.

Apparatus according to the present invention comprises in combination an exposure chamber having means to support a negative film or plate, a source of light within the chamber on one side of the negative, a density wedge or its equivalent on the opposite side of the negative, a viewing aperture in a wall of the chamber through which the wedge can be viewed on that side of it remote from the negative, and means to receive above the latter a sheet of sensitized paper.

In order that the invention may be more clearly understood, two preferred examples will now be described in detail with the aid of the accompanying drawings in which—

Figure 1 is a central sectional elevation of apparatus intended for contact printing,

Figure 2 is a section on the line 2—2 of Figure 1, looking in the direction of the arrows,

Figure 3 is a section similar to Figure 1 of a form of apparatus intended for enlarging or non-contact printing, and

Figure 4 is a section in a plane normal to the sensitized surfaces of a pack of sheets of sensitized paper contained within an envelope as described in British application No. 20,968/34, and

Figure 5 is a plan of the density wedge 25.

Like reference numerals indicate like parts where they apply in the several figures of the drawings.

The exposure chamber comprises a cylindrical hollow body portion 10 and a tubular and preferably conical cover 11. The upper end of the chamber has a flange 12 projecting above a shoulder 13 and a sheet of plain glass or, if preferred, a sheet of ground glass 14 or other light-diffusing translucent material fits within the flange 12 and is secured in position resting on the shoulder 13.

The shoulder 13 may be of annular form although it is preferred to substitute an annular shoulder by a plurality of discontinuous shouldered portions afforded by internal ribs 15 and secured to these ribs by screws 16 is a reflector 17 projecting downwardly into the body portion 10. An aperture at the bottom of the reflector allows entry through it of the upper portion of an electric incandescent lamp 18 which is received in a socket 19 secured to the bottom of the chamber. The lamp is energized from electric current mains 20 and is controlled by a switch having a fixed contact 21 and a movable contact 22 under the control of a finger-piece 23.

The cover 11 is formed with a plurality of shouldered annular recesses to receive in them light-diffusing translucent screens 24, for instance, of ground glass, and above them a density wedge 25. The lowermost screen 24 is secured in position by screws 26 and the other screens and the density wedge are held on their annular seatings with the aid of marginal rings 27 so that by securing the lowermost screen 24 in position the rings 27 serve to retain the upper screens 24 and the density wedge 25 in place. At the upper end of the cover there is a viewing aperture in which is situated a lens 28.

Between the translucent screen 14 and the lowermost screen 24 is situated a mask 29, preferably of thin sheet metal and of such a thickness as to be substantially equivalent to the thickness of the negative. The aperture in the mask is of a size to accommodate the negative snugly within it.

The apparatus is intended to be used in the following manner:

A negative is first inserted within the aperture in the mask and the cover, the lower portion of which fits within the flange 12, is placed over the mask into the position shown in Figure 1. The lamp 18 is then energized and the negative is viewed through the lens 28. The density wedge is preferably formed, as shown in Figure 5, to afford a succession of segmental portions 100 of gradually increasing density. This gradual increase is diagrammatically indicated by the increasing density of the shading in the various segments and commences from any position radially of the element 25 as, for example, the position 200 thereon. Each segment will be marked, for instance, with a number, and in the diagrammatic example given these segments are numbered 1 to 9, although the numbers may be replaced by any other means serving to designate an appropriate time of exposure or any other indication by which the exposure can be correctly estimated. Thus, the exposure can be judged from observing the marking visible through the most dense of the segments through which light can be seen to pass.

Having thus ascertained the correct time of exposure a sheet of sensitized paper is inserted as,

for example, from a package, such as 30, Figure 4. This package is formed as described in British application No. 20,968/34, and in order to extract and leave a sheet in position the entire package is first inserted above the negative by removal of the cover and the cover is then replaced. A tab 31 of the sheet to be withdrawn is allowed to protrude through a slot 32 provided for that purpose at the lower margin of the cover 11; the tab is held and the remainder of the package is withdrawn through an opposite slot 33. The sheet of sensitized paper or other material is thus left in position above the negative and in register therewith, and during its insertion in the manner above described the sensitized sheet is protected from exposure to light. During the insertion of the sheet the lamp 18 will remain unenergized and as soon as the sheet is in position the switch 23 will be closed for a period of time corresponding to that ascertained with the aid of the density wedge. After exposure the sheet may be drawn by means of its tab 31, quickly into a bath of treating liquid for the usual treatment.

For a fuller understanding of the construction and use of the package 30 reference may be made to the above-numbered British application.

The apparatus shown in Figure 3 is similar in the main to that already described. The body portion is now, however, in two sections 100 and 101. The lower end of the upper portion is reduced in diameter to fit within a flange in the lower portion and the latter is secured to a base 102 by means of screws 103. Secured marginally between the upper and lower portions at their junction are light-diffusing screens 114 and 115 of which the latter is secured to the lower end of the upper portion 100 by screws 104. The screen 114 may be dropped into the flanged upper end of the lower portion 101 and the upper portion 100 with its screen may then be inserted into position with a mask 129 introduced between the two light-diffusing screens.

A transverse diaphragm 105 secured in and extending across the upper portion 100 is centrally apertured to accommodate an object lens 106, the focus of which may be adjusted if desired with the aid of a knurled ring 107. A similar diaphragm 108 is provided in the lower portion 101 and is centrally apertured to accommodate a condenser lens 109.

An electrically energized lamp 18 is provided as before and supplied with current from mains 20 under the control of a switch 21, 22 and a finger-piece 23.

The cover 11 is as in the previous construction, fitted with light-diffusing screens 24 and a density wedge 25 above which is a viewing lens 28. The upper end of the portion 100 is recessed to accommodate the lower end of the cover 11 and also a light-diffusing screen 14 and a mask 29.

In this form of apparatus the cover 11 is provided with a flange 111 so that, for compact packing purposes, the cover and a screen 14 (referred to later) can be removed whereafter the cover can be reinserted into the body portion 100 in an inverted position.

The mask 129 has an aperture of a size to accommodate the negative from which an enlargement is to be made. The mask 29 is now provided with an aperture of a size to accommodate the sheet of sensitized paper required for the enlargement.

In use upper and lower portions of the body are assembled with the negative inserted in the mask 129. The lamp 18 is energized and the time of exposure is ascertained by means of the density wedge 25, as before. The lamp is then de-energized, a sheet of sensitized paper or other material is inserted in the mask 29, for example, from a package such as 30, and the switch 21, 22 is then closed again for the requisite exposure period.

One purpose of the light-diffusing screen 24 retained within the cover is to diffuse the light passing to the density wedge so that the latter may be uniformly illuminated to enable an accurate and efficient reading to be obtained.

The invention is capable of many modifications in construction. For instance, the body of the apparatus in either of the forms described, and particularly in the form according to Figure 3, may be constituted by two or more coaxial and telescopically assembled sections. The lens 106 may be replaced by a camera, preferably of comparatively small compass, received in a locating recess provided on the partition 105.

A slot may be provided in the wall of the body through which may be inserted, in company, screens 114 and 115 together with mask 129 and a negative inserted between the screens.

The body may be of circular, square, or of any other preferred cross-sectional form.

I claim:—

1. Photographic printing apparatus comprising in combination an exposure chamber, means therein to support a photographic negative, a source of light within the chamber and disposed on one side of said support, a density wedge on the opposite side of said support, a viewing aperture on the wall of the chamber through which the wedge can be viewed from that side of it remote from the negative, means to receive a sheet of sensitized printing material between the negative and the density wedge, and at least one light-diffusing screen interposed between the density wedge and the means to receive the sensitized paper.

2. Photographic printing apparatus comprising in combination an exposure chamber, means therein to support a photographic negative, a source of light within the chamber and disposed on one side of said support, a density wedge on the opposite side of said support, a viewing aperture on the wall of the chamber through which the wedge can be viewed from that side of it remote from the negative, means to receive a sheet of sensitized printing material between the negative and the density wedge, light-diffusing screens interposed between the density wedge and the means to receive the sensitized paper, an exposure chamber comprising in combination a body portion, and a removable cover therefor, whereof the body portion accommodates the support for the negative and the support for a sheet of sensitized printing material, and the cover contains the density wedge and all the light-diffusing screens.

3. Photographic printing apparatus comprising in combination an exposure chamber, means therein to support a photographic negative, a source of light within the chamber and disposed on one side of said support, a density wedge on the opposite side of said support, a viewing aperture on the wa ' of the chamber through which the wedge can be viewed from that side of it remote from the negative, means to receive a sheet of sensitized printing material between the negative and the density wedge, an exposure chamber comprising in combination a body portion, and a removable cover therefor, whereof the body por-

tion accommodates the support for the negative and the support for a sheet of sensitized printing material, and the cover contains the density wedge together with light-diffusing screens.

4. Photographic printing apparatus comprising in combination an exposure chamber, means therein to support a photographic negative, a source of light within the chamber and disposed on one side of said support, a density wedge on the opposite side of said support, a viewing aperture on the wall of the chamber through which the wedge can be viewed from that side of it remote from the negative, means to receive a sheet of sensitized printing material between the negative and the density wedge, said exposure chamber comprising in combination a body portion and a removable cover therefor, whereof the cover and body portions are interconnected by a light-excluding joint affording a telescopic sliding fit between them, the body portion accommodates the support for the negative and the support for the sensitized printing material, and the cover contains the density wedge.

5. Photographic printing apparatus comprising in combination an exposure chamber, means therein to support a photographic negative, a source of light within the chamber and disposed on one side of said support, a density wedge on the opposite side of said support, a viewing aperture on the wall of the chamber through which the wedge can be viewed from that side of it remote from the negative, means to receive a sheet of sensitized printing material between the negative and the density wedge, said exposure chamber, when the negative and printing material are in position, being completely closed except for the viewing aperture.

6. Apparatus according to claim 1 constructed as an enlarger in which the exposure chamber comprises a body portion combined with a cover therefor and in which the body portion is in two separable parts having, in the region of separation, the support for the photographic negative.

7. Apparatus according to claim 1 constructed as an enlarger in which the exposure chamber comprises a body portion in combination with a cover therefor, and the body portion is in two separable parts interconnected by a light-excluding joint affording a telescopic sliding fit between the two parts, and in the region of separation and within the exposure chamber there is provided the support for the photographic negative.

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