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2,591,449

CONTACT PRINTING APPARATUS

Filed Nov. 2, 1948

2 SHEETS—SHEET 1

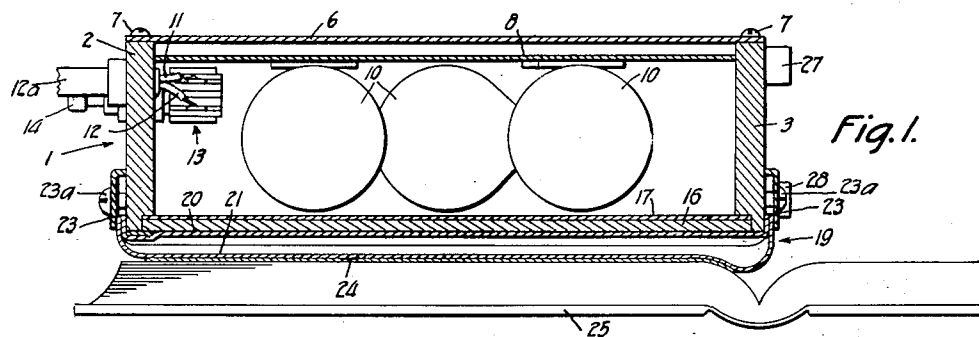


Fig. 1.

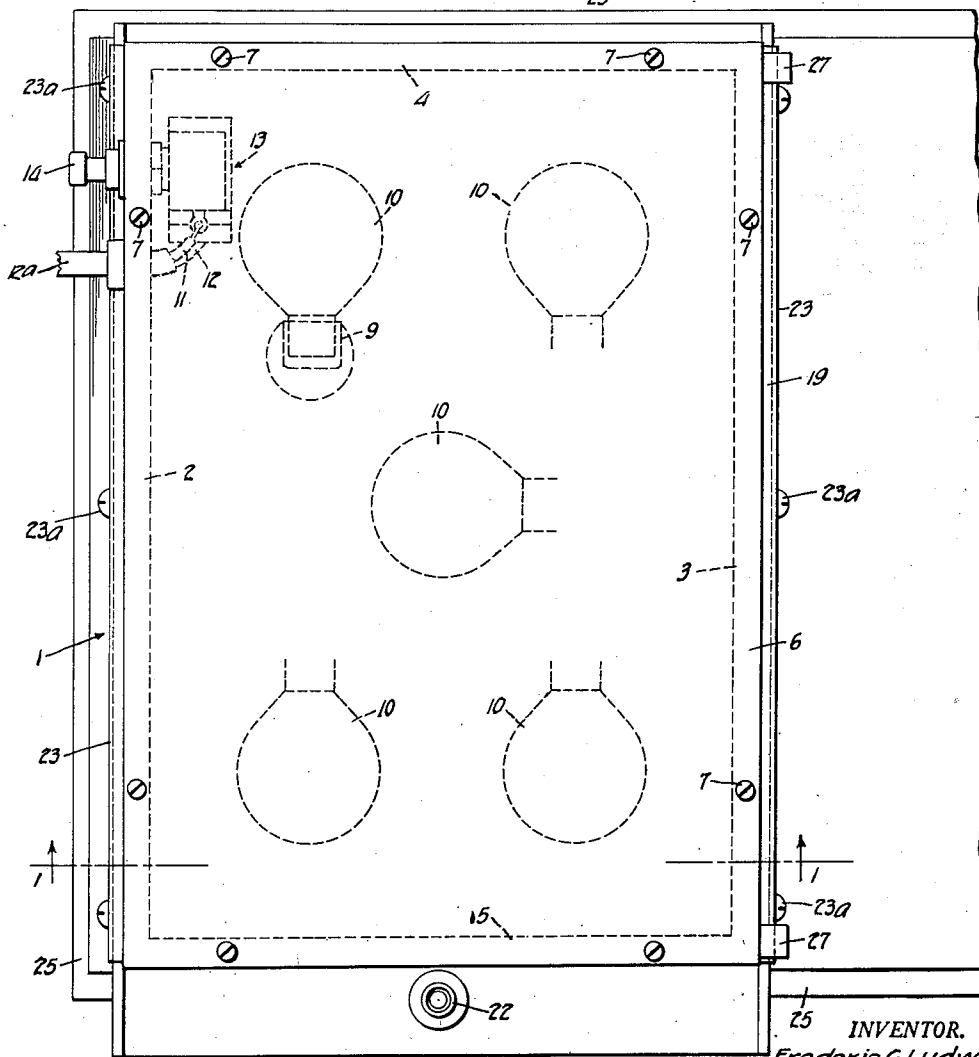


Fig. 2.

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2 SHEETS—SHEET 2

Fig. 3.

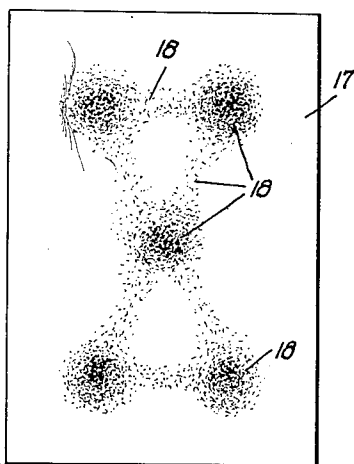
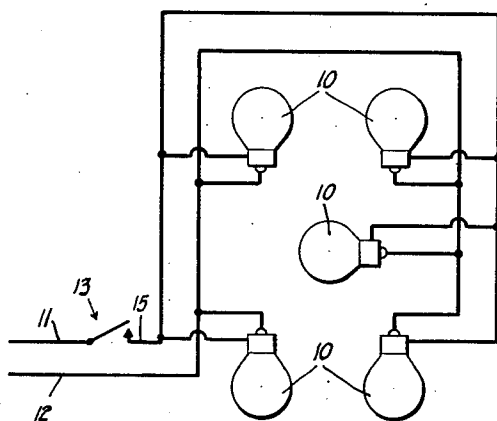


Fig. 4.



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UNITED STATES PATENT OFFICE

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CONTACT PRINTING APPARATUS

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5 Claims. (Cl. 95-76)

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This invention relates to a photographic apparatus for making photocopy prints by contact, either with light reflected back from the original copy, or with light transmitted through the original copy.

An important intended use of the apparatus is the making of copies from printed books. For that purpose printing by transmitted light is not generally feasible because the sheets of the book are ordinarily printed on both sides.

The first object of the present invention is to provide an extremely compact, light weight, portable apparatus for making contact photocopies, the construction being useful for securing reproductions from letters, writings, drawings, and particularly from bound books and other material which cannot be readily conformed to a contact surface of predetermined contour. The conventional practice is to make the object to be copied fit into a plane or conform to a cylindrical surface. The present practice conforms the sensitized photocopy paper to the contour of the material to be copied.

A further object of the invention is to provide a device of the foregoing character which is so constituted that photocopies of excellent quality may be secured without the exercise of any special knowledge or skill on the part of the operator.

Another object of the invention resides in the general construction and arrangement of the parts constituting the novel device, whereby a contact photocopying apparatus of unusual simplicity is achieved, and one which may be manufactured at a relatively low cost.

A still further object of the invention is to furnish as an integral part of the photocopy apparatus a means of reading or readily inspecting photocopies made by reflected light without first making a positive copy. This feature saves time and photographic material and is of great assistance in connection with research work.

Other objects and advantages will hereinafter appear.

In the drawing forming part of this specification

Fig. 1 is a fragmentary sectional view of the novel apparatus in use in connection with an open book, the section being taken upon the line 1-1 of Fig. 2 looking in the direction of the arrows;

Fig. 2 is a plan view of the structure illustrated in Fig. 1;

Fig. 3 is a plan view of a novel light screen employed for equalizing the distribution of light

which originates from a source of illumination of uneven intensity; and

Fig. 4 is an electrical diagram showing the electrical circuit employed with the lights.

The copying apparatus comprises a light, shallow frame 1 which consists of side members 2 and 3 and end members 4 and 5. A mirror 6 forms a back wall secured to the walls 2, 3, 4 and 5 by screws 7, so that a shallow tray or casing is provided. The wall 6 is desirably composed of sheet metal which is polished on the outer face to provide the reflecting surface. This mirror is provided in order to facilitate the reading of mirror printing, as will be more fully explained.

A false back is provided for the frame by a plate 8 which is secured in fixed position at a short distance in front of the mirror 6. The plate 8 is made of insulating material and is coated on the front with aluminum paint to make it light reflecting. Upon the plate 8 sockets 9 are provided for light bulbs 10, there being five of the sockets and five of the bulbs in the illustrative apparatus. The light bulbs desirably have frosted bulbs which serve as secondary light sources to distribute the light more evenly. Electric current is supplied through conductors 11 and 12 which are bound together in a common sheath 12a, that enters the casing through the wall 2. The conductor 11 is connected to a push-button switch 13 through which the lights can be turned on at will by operation of a plunger 14. The conductor 12 and a conductor 15 extending from the switch 13 are passed into the space between the plates 6 and 8 and the various sockets 9 are connected in parallel to them.

Lights are purposely chosen which employ a low wattage, even though this necessitates a somewhat extended exposure for photocopying. By holding down the generation of heat, the danger of melting or scorching the more delicate parts of the apparatus which are to be described is avoided. When five fifteen watt, 110 volt lights are employed, as illustrated, an exposure of about four seconds is required. This can be measured with a practical degree of accuracy by counting.

The front of the frame is rabbeted to receive a cover glass 16. The cover glass has secured to it a light diffusing sheet 17 of translucent paper which constitutes a screen for equalizing the intensity of the light which emerges from the frame throughout the illuminated area. The screen 17 is a sheet of paper which has been coated on one face with a photographic emulsion, and then exposed directly to the lights 10.

After exposure for a suitable length of time the sheet is developed as a negative, with the result that dark areas 18 are formed in the regions where the light was most intense, while relatively clear areas are formed in the regions where the light was weakest. The density of the screen changes gradually and substantially in accordance with the requirements for light equalizing purposes from areas of greatest density to the areas of least density.

There is secured upon the face of the frame or casing, and in a position to cover the entire glass cover 16, a pneumatic cushion 19 which is composed of translucent plastic material. The cushion 19 includes upper and lower walls 20 and 21 which are integrally united throughout their marginal areas. The cushion is made wider and longer than the frame 1. At one end the cushion is substantially coterminous with the outer face of the end member 4, but at the other end a valve 22 is attached to the wall 20 and the cushion is extended far enough beyond the end member 5 to make the valve 22 conveniently accessible. The side margins of the cushion are folded up around the sides of the frame 1, and are clamped firmly to it by metallic bars 23 which extend over the upturned side margins of the cushion and which are attached to the sides of the frame by screws 23a.

The cushion 19 is provided to bear against the back of a sheet of photocopy paper 24 and press it into conformity with the sheet which is to be copied, for example, a page of an open book 25. The sheet 24 is disposed with its sensitized surface in contact with the book, so that the light reaching the sensitized surface must first pass through the body of the sheet 24, while the light reflected back from the page of the book is not required to pass through the body of the sheet in order to reach the sensitized surface. This arrangement results in the production of mirror printing upon the sheet 24—that is to say, printing which can only be read conveniently with the aid of a mirror because it is laterally inverted. It is for the purpose of facilitating the reading of printing of this kind that the mirror 6 is provided. In order to facilitate the use of the mirror 6 when reading such photoprinting, the frame is provided with feet 27 for opposite ends of one side thereof, while the strap 23 is provided with corresponding feet 28. The four feet support the frame stably in an upright position. The feet are located far enough apart to permit a photoprint to be slid along a table between the feet at opposite ends of the frame when the frame is supported on the feet.

The pneumatic cushion 19 constitutes a very important feature of the invention. The cushion serves to conform the photocopy paper to the object to be photographed. In addition to performing this function, however, the cushion material is a translucent, light diffusing material, so that the outer or lower wall 21 of the cushion together with the body of the sensitized sheet serves as the immediate light source for illuminating the sheet to be printed. Thus, although the light bulbs are by no means coextensive with the illuminated area, and can only transmit divergent rays to the illuminated area, the actual printing source of light is coextensive with that area and serves to produce the printing on the sheet 24 without distortion or displacement, and with sharp outlines for the characters reproduced. The light diffusing character of the cushion material works out especially well in the area where the book leaves curve downward to-

ward the binding. This is true not only because of the light diffusing property of the wall 21, but also because the wall 20 absorbs and reradiates the light.

5 The low energy light bulbs, the equalizing screen, and the light diffusing cushion all combine to enable the lights to be located close to the object, and hence to enable a very shallow light, and inexpensive apparatus to be provided.

10 With the lighting and the pressure cushion arranged as described, it is possible to make photocopies from bound books and even from great volumes too large to be conveniently handled in any form of conventional photocopy apparatus. By varying the volume of air in the cushion, the lower surface of the cushion may be made to conform to a great variety of conditions.

I have described what I believe to be the best embodiments of my invention. I do not wish, however, to be confined to the embodiments shown, but what I desire to cover by Letters Patent is set forth in the appended claims.

I claim:

1. A light, portable contact printer adapted to print from books comprising, in combination, a casing having greater width and length than thickness and adapted to be placed flatwise upon the object, light bulbs in the casing for illuminating the object but having the deficiency that the light distribution is of varying intensity, and a translucent compensating screen interposed between the light bulbs and the object side of the casing and directly exposed to the light bulbs, said screen being varied in its light transmitting property substantially inversely with the intensity of the light incident upon it, so that light of more nearly uniform intensity will be transmitted to all illuminated portions of the object.

2. A light, portable contact printer adapted to print from books comprising, in combination, a casing, illuminating means in the casing, and a closed, fluid filled cushion covering the object side of the casing and having walls formed of flexible, translucent, light diffusing material so that the outer wall of the cushion serves throughout the illuminated area as the source of printing illumination.

3. A light, portable contact printer adapted to print from books comprising, in combination, a casing, illuminating means in the casing, a closed, fluid filled cushion covering the object side of the casing and having walls formed of flexible, translucent, light diffusing material so that the outer wall of the cushion serves throughout the illuminated area as the source of printing illumination, the opposite side margins of the cushion being folded against the sides of the casing, and clamps secured to the sides of the casing and overlying said cushion margins to retain the cushion in place.

4. A portable contact printer comprising, in combination, a light, shallow casing, a plurality of electric lights therein for furnishing printing illumination, a light screen of diffusing material disposed in the frame at one side of the lights and of variable translucency to compensate for unevenness of light intensity, and a closed, translucent fluid filled cushion secured upon the casing in position to cover the lights and the screen.

5. In a contact printer adapted for printing by reflection, in combination, a light, shallow frame, illuminating means within the frame, a closed, fluid filled, inflatable cushion of flexible, light-diffusing material covering the face of the

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frame and adapted to engage the back of the printing medium and press it against the object, the opposite side margins of the cushion being folded against opposite side walls of the frame, and clamps secured to said side walls and pressing against said cushion margin, the cushion protruding beyond the frame at one end at least, and having a rearwardly extending valve at the protruding end disposed alongside the adjacent end of the frame.

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15

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