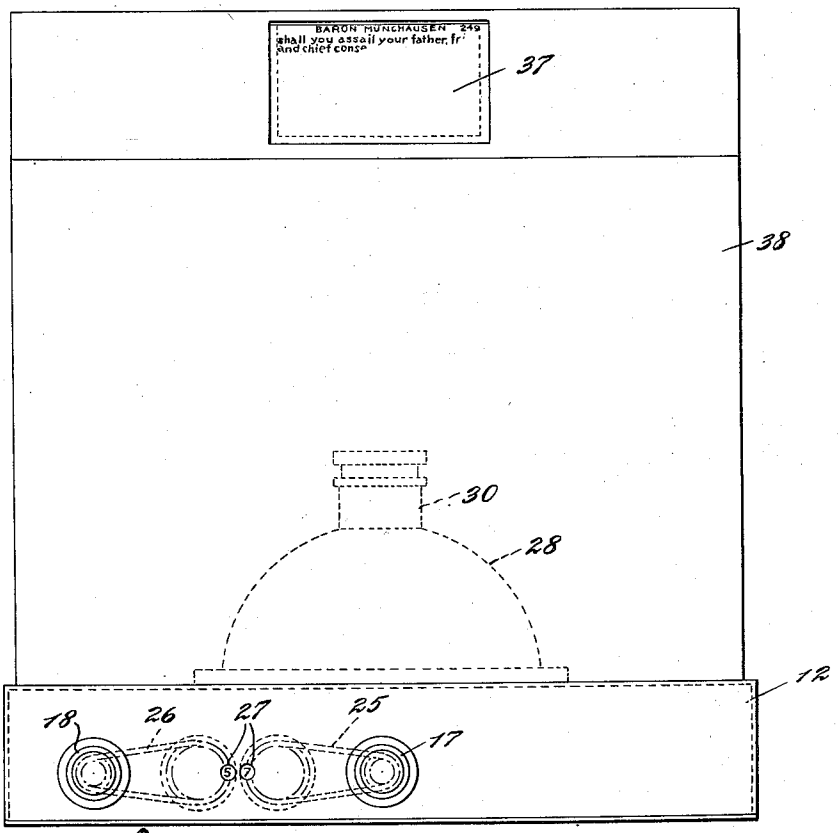
Oct. 28, 1941. A. BONI ET AL 2,260,551

PROJECTION APPARATUS

Filed Oct. 28, 1939 2 Sheets-Sheet 1

Fig. 1.



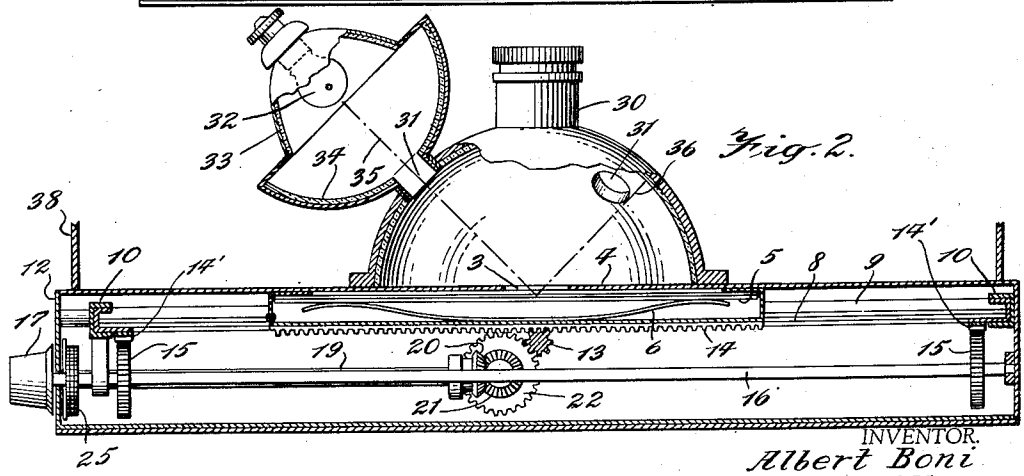


Fig. 2.

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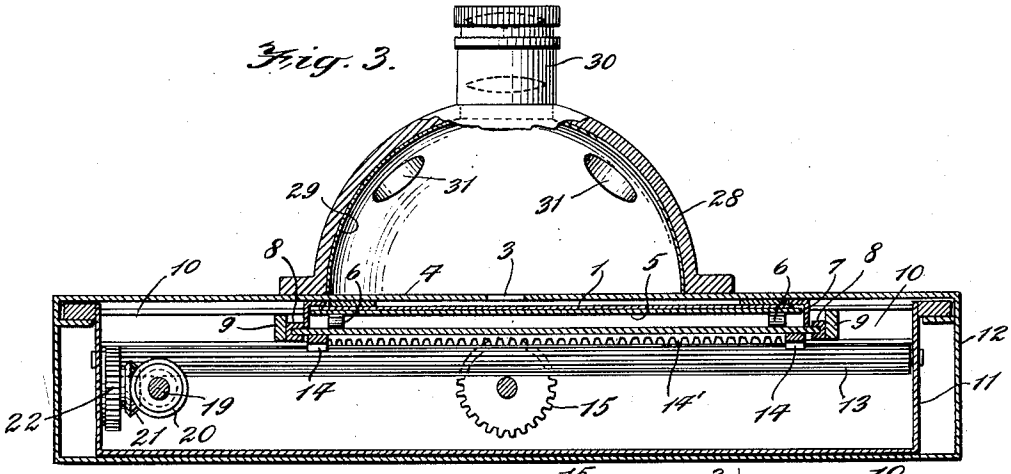
Fig. 3.



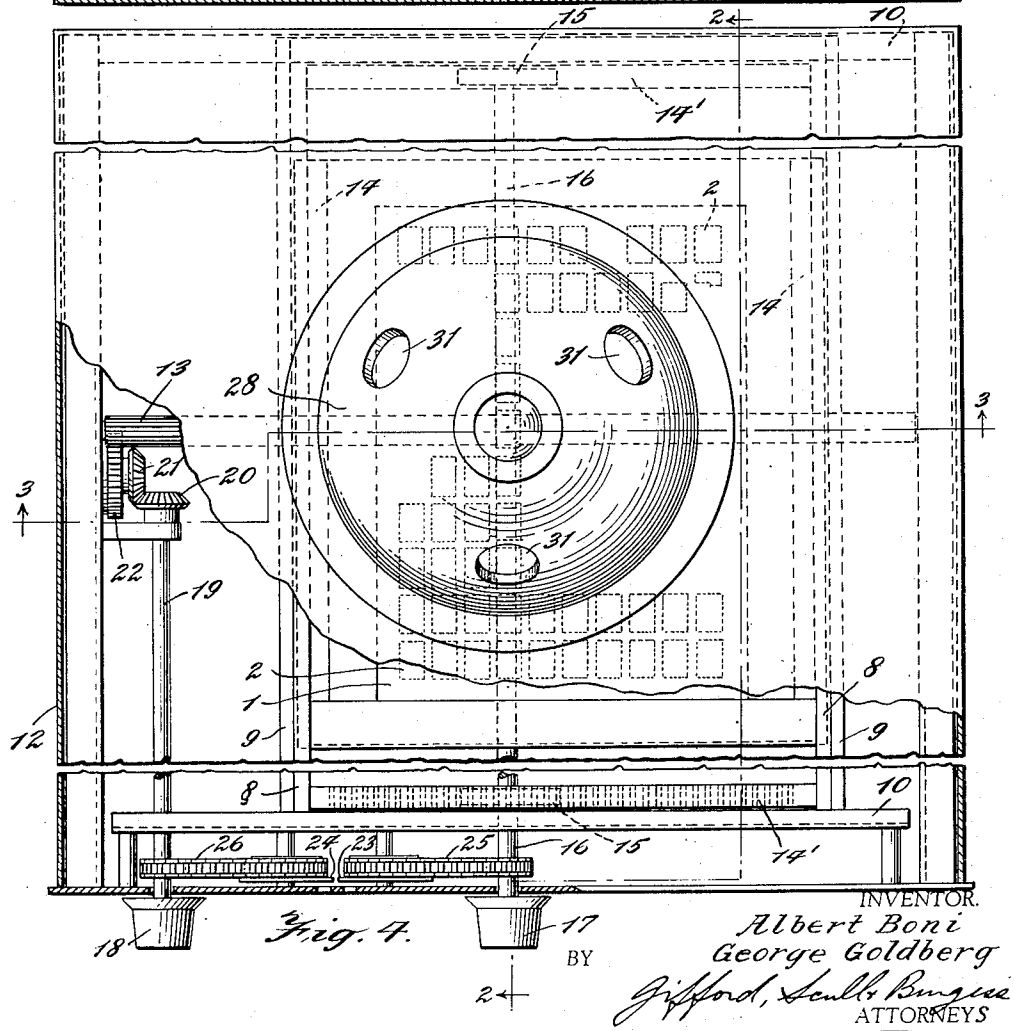


Fig. 4.

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UNITED STATES PATENT OFFICE

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PROJECTION APPARATUS

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Application October 28, 1939, Serial No. 301,687

8 Claims. (Cl. 88—24)

This invention relates to a novel and improved form of projection apparatus, the novel features of which will be best understood from the following description and the annexed drawings, in which we have shown a selected embodiment of the invention and in which:

Fig. 1 is a front view of an apparatus as it appears to the user;

Fig. 2 is a vertical sectional view through the lower portion of the apparatus shown in Fig. 1, this view being taken on the line 2—2 of Fig. 4;

Fig. 3 is a view taken on the line 3—3 of Fig. 4;

Fig. 4 is a plan view of the lower part of the apparatus shown in Figs. 2 and 3.

In each one of the figures certain parts have been omitted for the sake of clearness of illustration of other parts.

The invention finds particular utility in connection with the opaque projection of microprints. In Fig. 4, I have shown a sheet 1 having thereon microprints 2 of a large number of pages from a book. For example, it may be assumed that there are 100 pages thus reproduced and that these pages are arranged in columns extending perpendicular to each other, ten pages in a column. For the sake of convenience, I shall refer to the columns extending vertically in Fig. 4 as the vertical columns and those extending horizontally in that figure as the horizontal columns. By means to be described presently, the sheet may be moved horizontally and vertically, as viewed in Fig. 4, so that any microprint of a page 2 may be brought into position to be read. For the sake of convenience hereinafter, the microprints 2 will be referred to as pages.

The pages may be exposed at a projection position exemplified by an aperture 3 in a plate 4, where they may be illuminated and projected by means to be described later. The sheet 1 is shown as being supported on a plate 5 which is urged by springs 6 upwardly against the flanges of a holder 7. This holder is slidably supported in tracks 8 of a carriage 9, which in turn is slidably supported on tracks on a suitable support, here shown as a drawer 11 slidable into and out of a casing 12 of which the plate 4 forms the top.

Rotatably supported in side walls of the drawer or support is an elongated pinion 13 engaging racks 14 on the bottom of the holder. Because of the elongated construction of the pinion, the holder may slide lengthwise of the pinion, but may be operated by rotation of the pinion, no matter what may be its position lengthwise of the pinion.

The carriage may be moved on the tracks 10 by means of racks 14' engaged by pinions 15 on a shaft 16 which also is rotatably mounted in the support formed by the drawer 11. The shaft 16 may extend through the front wall of the drawer, as plainly shown in Figs. 2 and 3, and may be provided with a handle 17 for rotating it. The pinion 13 may be rotated by another handle 18 on a shaft 19 which extends through the front wall of the drawer and which may be rotatably supported on the drawer by any suitable means. This shaft is shown as having on its end a bevel pinion 20 engaging with another bevel pinion 21 secured to a gear 22 which engages the pinion 13 adjacent one end thereof.

By the arrangement described above, it will be seen that the turning of the handle 18 will bring the desired horizontal column beneath the aperture 3, and then turning of the handle 17 will cause the desired vertical column to register with the aperture, thus bringing the desired page into such registry. As an aid for positioning the correct page beneath the aperture, I may provide indicators, here shown as disks 23 and 24 mounted upon stub shafts and rotated from the shafts 16 and 19, respectively, by means of chain drives 25 and 26. Each disk has numbers thereon which may be seen through holes 27 in the front wall of the drawer and it will be understood that these numbers will correspond to the numbers of the columns of pages. Since the pages are assumed to be arranged 100 on a sheet, ordinarily the two numbers appearing at the holes 27 will indicate the number of the page at the aperture.

Extending over the aperture 3 is a spherical hood 28, on the inner surface 29 of which is a spherical reflector, and the center of this surface 29 is approximately at the center of the aperture 3. Directly above the aperture is shown an objective 30 which of course extends through an opening in the hood, and the axis of this objective passes through the center of the aperture.

The hood and the reflecting surface are provided with a plurality of other openings 31, here shown as three in number. Each one of these openings is provided with illuminating means, although, in order to avoid confusion in the drawing and obscuring of other features, we have shown only one such illuminating means, this appearing in Fig. 2.

This illuminating means is disposed on the outside of the hood and comprises a lamp 32, on the back of which is an elliptical reflector 33. The filament of the lamp is disposed substantially at one focus of the ellipse of which the reflector forms a part, and the other focus is adjacent the

aperture 3, preferably slightly above it. Between the lamp and the hood is a spherical reflector 34 so that all light which does not pass through the opening 31 will be reflected back and caught by the elliptical reflecting surface 33 and thus directed through the hole 31.

The axis 35 passing from each lamp 32 through each opening 31 to aperture 3 is on a radius of the spherical hood and it will be seen that each of the openings 31 and consequently its associated illuminating device is on one side of the objective 30, and the portion of the hood on the side of the objective opposite each opening 31 is unbroken. This means that the light directed from each illuminating device to the aperture and which may be reflected from the sheet exposed at that aperture will pass along some such line as that shown at 36 in Fig. 2 and will strike a portion of the reflecting surface 29. In the illustrated embodiment, we have shown three openings 31 and associated illuminating devices spaced apart 60° around the axis of the objective so that substantially all of the light reflected at the aperture from any one illuminating device will be caught by the reflecting surface 29 and reflected back towards the aperture. In other words, the plane passing through the center of the objective and through the center of the projection position or aperture 3 and also through any one of the openings 31 or lamp associated therewith will also pass through a reflecting surface of the reflector on the side of the objective opposite that lamp.

Preferably also it will be seen that one of the openings 31 is in a plane which passes through the axis of the objective and also through one of the vertical columns of pages. This opening and its associated illuminating device is shown in Fig. 2. Preferably it is directed towards the page from the bottom thereof.

By the above arrangement it has been found that the illumination of the page is much more efficient than with other arrangements previously tried. The page is illuminated substantially uniformly by the three lamps arranged as shown, although the lamp shown specifically in Fig. 2 furnishes better illumination than either of the other lamps. However, any one lamp may be used independently of the others and either two or three may be used for increased illumination.

In use, the page illuminated at the aperture 3 may be observed through the objective 30 and for that purpose we have shown the objective as projecting the image of the page on to a screen 37 in a casing 38. The arrangement by which the image is thus reflected to the screen is not necessary to an understanding of the inventions claimed herein and therefore it has not been shown. Such arrangements of course are well known in the art.

It will be seen that the projection position is fixed and that the objective and screen are also fixed with relation to the projection position, although of course minor adjustments may be made for focusing or centering the image of the object on the screen. Such adjusting means have not been shown, as they are common in the art and ordinarily, as shown here, it is feasible to construct an apparatus such that the image is properly centered on the screen at all times and the only adjustment necessary would be the ordinary focusing adjustment of the objective. By operating the carriage and slider as noted above, any selected object, such as a microprint of any particular page, may be brought to the projection position without disturbing the position of the objective or without disturbing the relation of the screen, objective, and projection position. Therefore each object, as it is brought to the projection position, will be imaged on the same part of the screen as every other object. In other words, each object will be properly centered on located on the screen, and, as described above, by observing the indicator any selected object may be projected readily on the screen.

Our device is adapted to project microfilm as well as microprints by merely placing the film on a white surface so that light rays will be reflected therethrough. The device may also be used in the examination of specimens of material such as fabric, paper, liquids or the like.

The apparatus is likewise applicable for a projector using transmitted light as well as reflected light. Where the claims specify microprints, it is intended to include microfilm and any other object which can be conveniently examined with the aid of our device.

We claim:

1. A projection apparatus comprising a casing having an aperture therethrough, a support slidable in a horizontal plane in and out of said casing for the object whose image is to be projected, tracks on said support extending transversely of said object, a carriage slidable on said tracks, tracks on said carriage extending transversely of the tracks on said support, a holder slidably mounted on said carriage tracks, an elongated pinion rotatable on said support, a rack on said holder and engaging said pinion, said rack extending in the direction of movement of said holder, a second rack on said carriage and extending in the direction of movement of said carriage on the support, a pinion rotatable on the support and engaging said last-named rack, and means to rotate said pinions independently of each other, whereby upon rotation of said last-named pinion said first-named rack will slide along said first-named pinion.

2. A projection apparatus having a casing with an aperture in the top thereof, means slidable in and out of said casing in a horizontal plane for supporting a sheet under said aperture, an inverted spherical reflector having its center adjacent said aperture, an objective extending through said reflector and having its axes passing through said aperture, a plurality of lamps supported outside of said reflector, means to direct light from said lamps through holes in said reflector onto the part of the sheet exposed under said aperture, each lamp being disposed on one side of said objective and opposite a reflecting surface of said reflector on the opposite side of said objective, said sheet having thereon a plurality of prints of pages arranged in columns, and one of said lamps being disposed in a plane passing through said objective and the center line of one of said columns.

3. A projection apparatus comprising a casing having an aperture through the top thereof, a screen supported above said casing, a sheet having thereon a plurality of microprints arranged in vertical and horizontal columns, a holder supporting said sheet in place for one of said microprints to be exposed under said aperture, means for permitting said holder to be moved in and out of said casing in a horizontal plane, means to illuminate a microprint when it is positioned under said aperture, means to project an image

of said microprint on said screen, and means to move said holder in two directions parallel to said vertical and horizontal columns to bring any one of said microprints underneath said aperture when said holder is within said casing.

4. A projection apparatus comprising a casing having an aperture in the top thereof, a screen supported above said casing, a sheet having thereon a plurality of microprints arranged in vertical and horizontal columns, a holder slidable in and out of said casing for supporting said sheet in place for one of said microprints to be exposed underneath said aperture, means to illuminate a microprint when so exposed under said aperture, means to project an image of said microprint onto said screen, means to move said holder in two directions parallel to said vertical and horizontal columns to bring any one of said microprints under said aperture, said microprints being numbered, and an indicator operated by said last-named means showing which of the multiple microprints on the sheet is exposed at said projection position.

5. In a projection apparatus, a casing with an aperture therethrough, an objective and a screen arranged in relation to said aperture so that light rays passing through said aperture will be projected on said screen, an object holder under said aperture adapted to receive a sheet of microprints arranged in ten rows and ten columns, means for moving said holder in relation to said aperture in a direction parallel to the columns of microprints and in a direction parallel to the rows of microprints, indicating means connected to the means for moving said holder to indicate the number of each row, and indicating means to indicate the number of each column, said indicating means arranged in juxtaposition so that the combination of the digits viewed thereon designates the number of the microprint under said aperture.

6. In a projection apparatus, a casing with an aperture therethrough, means for illuminating said aperture, an objective above said aperture and a screen positioned in relation to said objective so that an object under said aperture will be projected on said screen, an object holder comprising a flat plate designed to receive a sheet of microprints arranged in a rectangle of ten columns and ten rows, means for moving said holder in a direction parallel to said rows and parallel to said columns, and indicating means for indicating the number of any row and any column under said aperture and so arranged that the combination of digits indicates the number of any microprint.

7. In a projection apparatus, a casing with an aperture therethrough, an objective and a screen arranged in relation to said aperture so that light rays passing through said aperture will be projected on said screen, an object holder under said aperture adapted to receive a sheet of microprints arranged in ten rows and ten columns, means for moving said holder in relation to said aperture in a direction parallel to the columns of microprints, means for moving said holder in relation to said aperture in a direction parallel to the rows of microprints, indicating means including a dial having digits zero to 9 thereon connected to said first-mentioned means, indicating means including a dial having digits zero to 9 thereon connected to said second-mentioned means, said dials being in such relation to each other that a combination of a digit from one and a digit from the other will serve to form a number designating the number of microprint under said aperture from zero to 99, inclusive.

8. In a projection apparatus, a casing with an aperture therethrough, an objective and a screen arranged in relation to said aperture so that light rays passing through said aperture will be projected on said screen, an object holder under said aperture adapted to receive a sheet of microprints arranged in ten rows and ten columns, means for moving said holder in relation to said aperture in a direction parallel to the columns of microprints, means for moving said holder in relation to said aperture in a direction parallel to the rows of said microprints, indicating means including a dial having ten digits thereon connected to said first-mentioned means, indicating means including a dial having digits thereon connected to said second-mentioned means, said dials being in such relation to each other that a combination of a digit from one and a digit from the other will serve to form a number designating the number of the microprint under said aperture.

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