Oct. 21, 1952 H. H. HILLMER ET AL 2,614,470

LAMPHOUSE FOR PRINTING APPARATUS

Filed Feb. 5, 1949 4 Sheets-Sheet 1

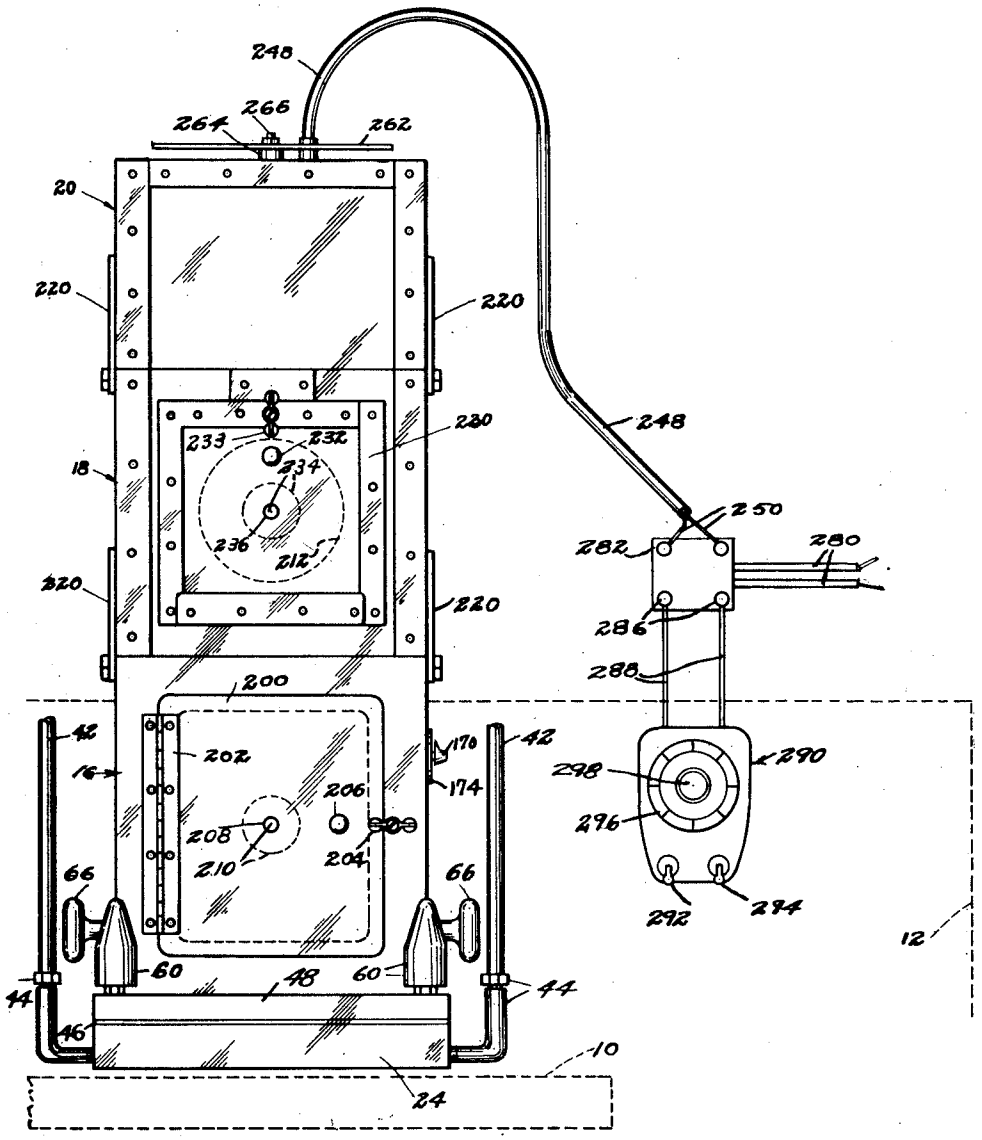



*Fig. 1.*

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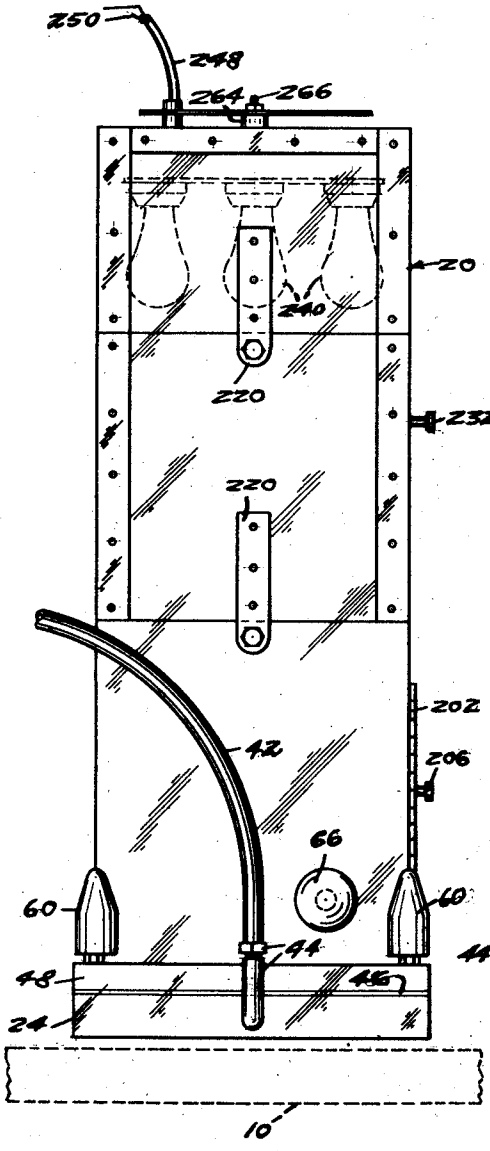



Fig. 2.

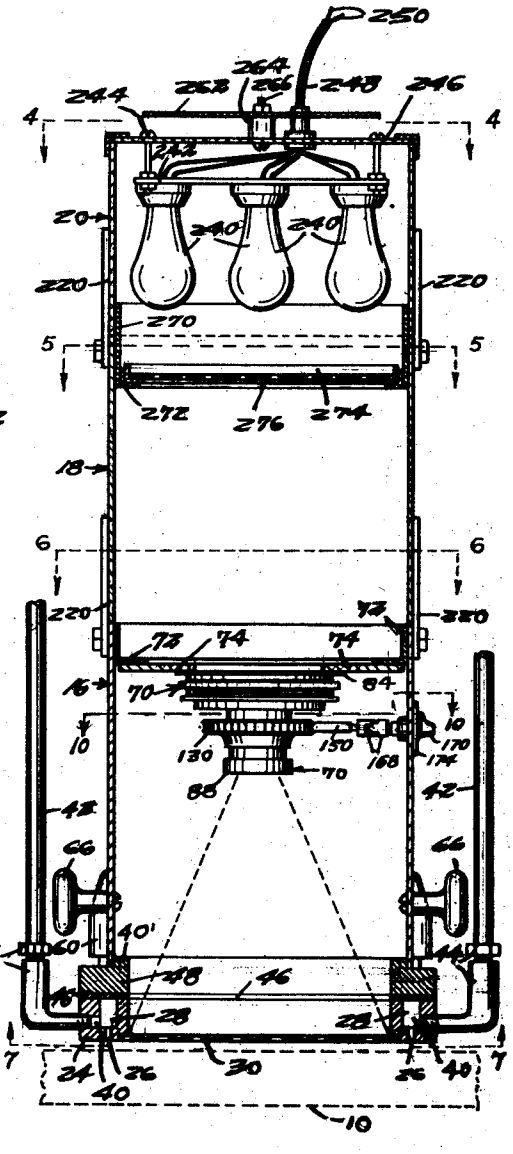



Fig. 3.

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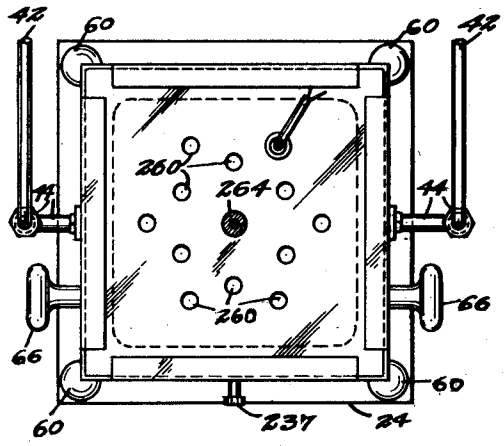



Fig. 4.

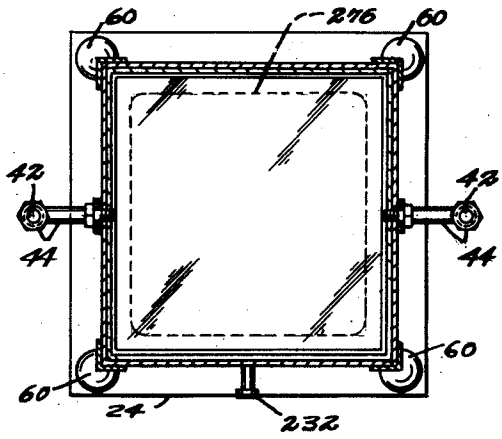



Fig. 5.

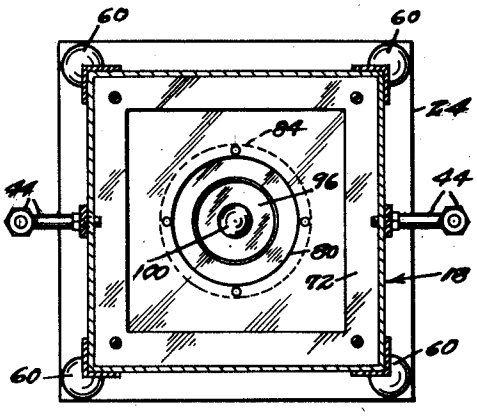



Fig. 6.

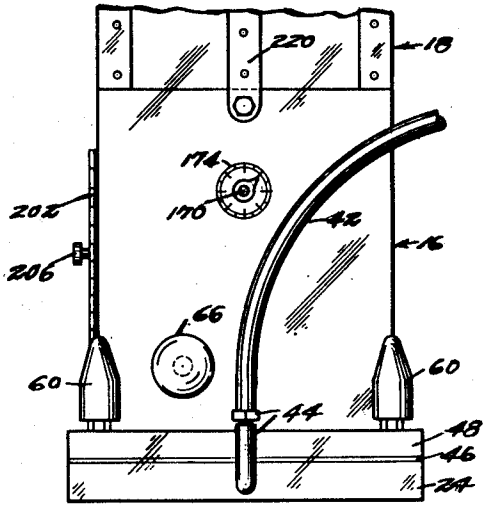



Fig. 8.

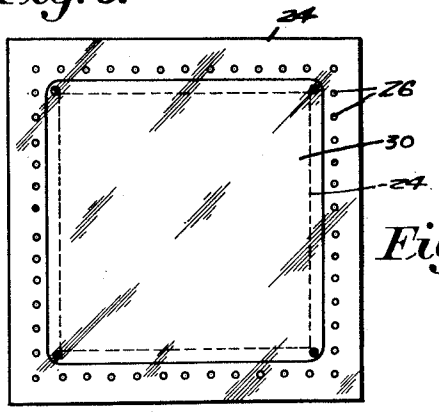



Fig. 7.

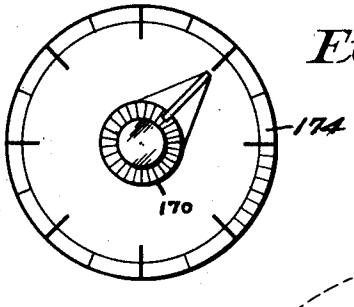
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LAMPHOUSE FOR PRINTING APPARATUS

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*Fig. 9.*



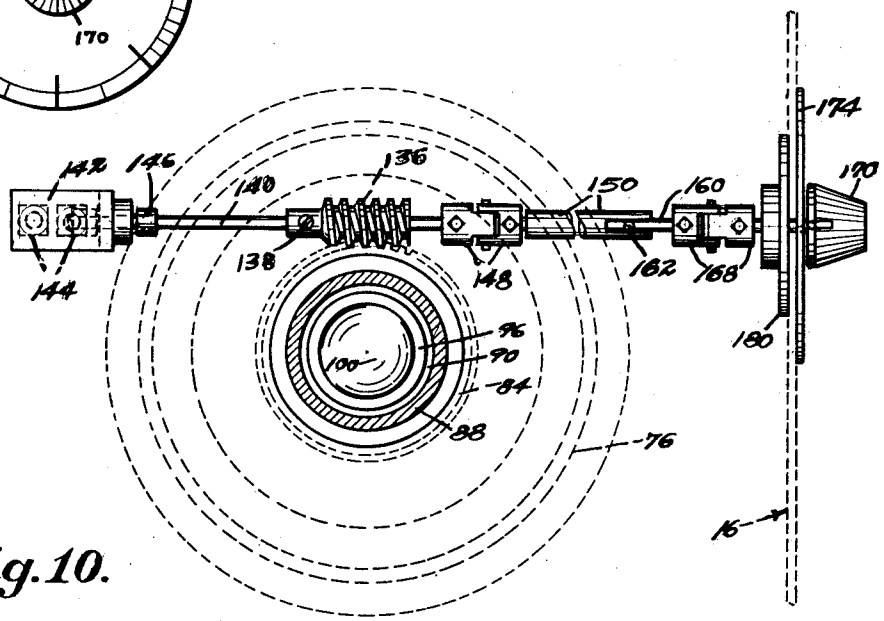




*Fig. 10.*

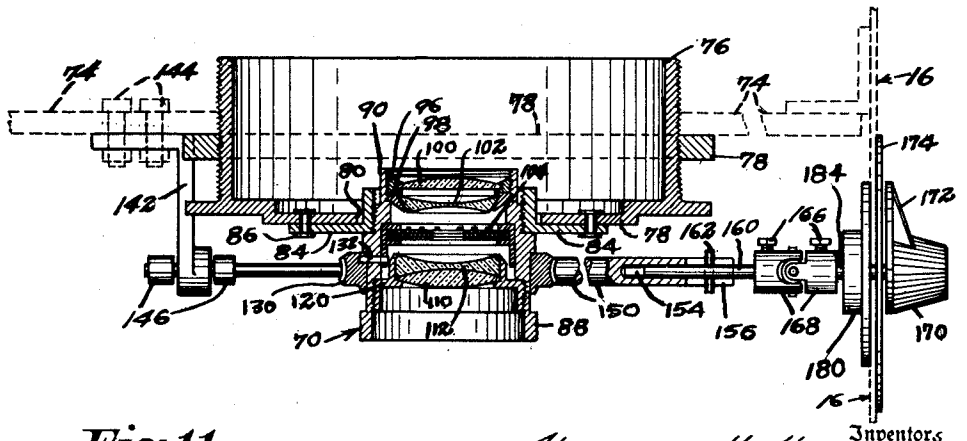



*Fig. 11.*

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# UNITED STATES PATENT OFFICE

2,614,470

## LAMPHOUSE FOR PRINTING APPARATUS

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Application February 5, 1949, Serial No. 74,810

2 Claims. (Cl. 95—76)

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This invention relates to photographic reproduction and more particularly it is an object of the invention to provide an improved lamphouse for photographic reproduction machines.

"Step-and-repeat" machines for the purpose of reproducing photographic images from negative to positive material are well known. A machine of this type is described in the applicant's co-pending application titled Printing Apparatus filed August 1, 1947, Serial No. 765,400, now Patent Number 2,588,385, issued March 11, 1952. It is an object of this invention to provide a lamphouse or photographic negative holder for such a machine which is provided with means for focusing the light from lamps therein onto the photographic negative in a selected manner.

With this thought in mind, this invention contemplates a lamp housing for photo printing machines having a translucent plate in the end of a frame removably attached to one end of the housing with a continuous cavity extended around the frame connected to vacuum producing means and with a thin slit extended through the end of the frame and communicating with the cavity for retaining a film or the like against the translucent plate.

Another object of the invention resides in the provision of a focusing mechanism for a lamphouse as described, which is adjustable from the outside of the lamphouse.

Yet a further object of the invention is to provide a lamphouse as described having in combination a timing mechanism for more accurately timing the exposure of positive photographic material to the negative photographic material.

Another object of the invention is to provide a lamphouse having a member for diffusing light disposed between the bottom translucent plate of the lamphouse and the source of light therein.

Another object of the invention is to provide a lamphouse having a plurality of spaced apart apertures surrounding the lower end thereof through which a vacuum is drawn to secure the positive photographic material to the bottom of the lamphouse.

Still another object of the invention is to provide a lamphouse having access doors in the front thereof for the repair and adjustment of the above mentioned focusing mechanism and other parts.

Yet a further object of the invention is to provide a lamphouse as described having a plurality of sections which are removably secured together for convenience in the maintenance thereof.

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A particular object of the invention is to provide a lamphouse having a square lower surface so that positive photographic material disposed thereon in operation can be rotated for reproducing images at a right angle to reproductions made before the rotation for facilitating the conservation of photographic material.

A further object of the invention is to provide a lamphouse as described which is further provided with ventilation apertures in the upper end thereof and above the said lamps.

Yet a further object of the invention is to provide a lamphouse having ventilation apertures which is further provided with a shield for preventing dust from entering the apertures and interfering with the passage of light therethrough.

Yet another object of the invention is to provide a device for the purpose described which is sturdy and durable in construction, reliable and efficient in operation, and relatively simple and inexpensive to manufacture, assemble and utilize.

Other and still further objects and advantages of the invention will become apparent from the following detailed description of a preferred embodiment thereof.

In the drawings:

Figure 1 is a frontal elevation of the lamphouse of a step-and-repeat photographic reproduction machine constructed in accordance with this invention, portions of the vacuum supply line being broken away, the frame of the machine being indicated in dotted lines, at the center of the view, and the bed plate of the machine is partially shown in dotted lines disposed beneath the bottom thereof.

Figure 2 is a left-hand side elevation of the lamphouse of Figure 1.

Figure 3 is a vertical cross-sectional view taken downwardly through the center of the lamphouse, the path of light rays downwardly from a focusing lens being indicated in dotted lines.

Figure 4 is a view-in-section taken along the line 4—4 of Figure 3.

Figure 5 is a view-in-section taken along the line 5—5 of Figure 3.

Figure 6 is a view-in-section taken along the line 6—6 of Figure 3.

Figure 7 is a view-in-section taken along the line 7—7 of Figure 3.

Figure 8 is a right-hand detailed view of the bottom of the lamphouse as it is viewed from the right-hand side thereof as shown in Figure 1.

Figure 9 is a detailed view of an indicator and a graduated scale dial used in conjunction with

the adjusting knobs of the lens adjusting mechanism of the invention.

Figure 10 is a view-in-section taken along the line 10—10 of Figure 3, portions of the lamphouse other than the parts of the lens mechanism and lens adjusting mechanism shown being illustrated in dotted lines; and

Figure 11 is a vertical cross-section taken through the lens mechanism through the lens and focusing mechanism of the invention, together with the controls therefor, other portions of the lamphouse shown being in dotted lines, portions of a shaft inter-connecting a control knob and a lens rotating worm gear being broken away and other portions thereof being shown in section.

The lamphouse of this invention is adapted for use with step-and-repeat machines, the bed plate of one of which is indicated in dotted lines at 10 in Figure 1, the control panel portion of the frame of the same machine being indicated in dotted lines at 12 in Figure 1.

The lamphouse of the invention preferably includes three sections generally indicated at 16, 18 and 20. The sections are disposed one above the other in the succession mentioned. The lowermost section 16 is provided with a frame rectangular-shaped in plan and rectangular-shaped in cross section and having a continuous cavity extended longitudinally through side and end sections thereof, as indicated by the numeral 24, and which is best shown in Figure 7. The bottom piece 24 is preferably square in outline and is provided with a square row of spaced apart apertures 26 extending upwardly thereinto, the apertures 26 opening upon the lower surface of the bottom member 24 for drawing a vacuum on a piece of negative photographic material, not shown, during operation.

The apertures 26 extend upwardly through the bottom piece 24. The bottom piece 24 is of annular shape and is provided with a hollow interrior. A slot or cavity 28 is provided extending into the piece 24 from the upper side thereof and surrounding the upper side thereof. The slot 28 is disposed in communication with the apertures 26.

The bottom piece 24 is provided with a piece of translucent material, preferably glass, 30 secured thereto and disposed across the central opening thereof providing a film backing plate. The glass plate 30 is provided with a lower surface disposed flush with the lower surface 24.

The bottom piece 24 is formed with a flange 40' on the upper section and is further provided with a passageway 40 on either side thereof and extending outwardly therethrough. The passageways 40 are disposed in communication with vacuum lines 42 through suitable couplings 44. The vacuum lines 42 lead to a vacuum tank, not shown.

The member 24 is held in place by a plurality of bolts, not shown, and which latter extend upwardly through the member 24, through a gasket 46 sealing the top of the slot 23, through an annular closure member 48, and into suitable bolt receiving portions 60 which are respectively disposed on the four corners of the lower lamphouse housing portion 16.

If desired, the door holding member 24 may be composed of two sections, a lower and an upper section, as shown in Figure 3 and the two sections may be divided by a resilient gasket 46 which latter is of utility in insuring a good fit between the negative and positive photographic material disposed in operation against the lower surface of the glass plate 30 in the lower end of the bottom piece of the lamphouse and upon the bedplate 10.

The lower portion 16 of the lamphouse is further provided with two knobs 66 disposed respectively on the right and left-hand sides thereof for facilitating upward pivoting movements of the lamphouse during operation.

The lamphouse housing portions 16, 18 and 20 are all provided with hollow interiors, the lower section 62 having raising knobs 66, and the upper portion of the interior of the lower lamphouse section 16 being provided with a focusing mechanism generally indicated at 70. The focusing mechanism 70 is secured by means of a right angle bracket 72 and a normally horizontally disposed member 74 providing a partition, to the inner upper surface of the lower lamphouse housing 16.

The focusing mechanism 70 is best shown in detail in Figure 11 and comprises an annular cylindrical housing 76 which latter extends upwardly through the horizontally disposed member 74. The annular cylindrical housing member 76 is rigidly secured to a ring 78 which latter is provided with a threaded inner surface for engaging threads disposed on the outer side of the annular housing member 76. The ring 78 is itself secured in any suitable manner to the horizontal supporting member 74.

The lower side of the cylindrical member 76 is closed by means of a flange portion 78 with the exception of a circular opening 80 at the center thereof. An annular connecting member 84 is secured by means of rivets 86 to the under side of the inwardly disposed flange portion 78 of the member 76. The connecting member 84 is of right angle shape in cross section through one of the sides thereof, and the annular interior wall thereof is threaded for receiving the normally vertically disposed annular side jacket 88 of a lens mechanism now to be described.

The jacket 88 is provided adjacent its upper end with a threaded surface for engaging the threads of the connecting member 84 and for upholding the jacket 88.

Upwardly of the said thread portions of the member 83 the latter is provided with an upwardly extending flange portion 90 which is provided with a threaded interior into which two rings 96 and 98 are placed. The rings 96 and 98 are provided with threaded exteriors for engaging the threads of the flange 90 and are further provided with recesses in the interior surfaces thereof for supporting two lenses.

The upper lens 100, disposed in the ring 96, is preferably provided with a convex upper surface and a plat, normally horizontal, lower surface. The lens 100 is spaced apart from a lens 102 which latter is disposed therebeneath and is secured in a suitable recess in the lower ring 98. The lens 102 is provided with a concave upper surface and a concave lower surface.

Downwardly disposed from the lens 102, a light baffle 104 is provided. Disposed downwardly from the lens 102 and on the other side of the baffle 104 from the lens 102, two further lenses are provided. The said two further lenses comprise a lower set of lenses 110 and 112 whereas the lenses 100 and 102 will be referred to as the upper set of lenses.

The uppermost lens 112 of the lower set is provided with a concave upper surface and a concave lower surface. The lower lens 110 is provided

with a convex upper surface and a convex lower surface.

The lenses 110 and 112 are disposed with their opposing faces in engagement with each other and are held in this position by means of a suitable annular fitting 120.

An annular gear 130, having teeth disposed around its outer circumference, is secured by means of pins 132 to the jacket 88. The gear 130 is disposed with its teeth in engagement with a worm gear 136 which latter is secured rigidly and by means of a screw 138 to a normally horizontally disposed shaft 140.

The shaft 140 is itself rotatably mounted at one end in a suitable right-angle bracket 142 having a cylindrical bearing portion at its lower end. The bracket 142 is secured by means of suitable bolts 144 to the member 74 and two collars 146 are provided for maintaining the shaft 140 in place with respect to the bracket 142.

On the other side of the worm gear 146 the shaft 140 is secured by means of a universal joint 148 to a shaft 150. Shaft 150 is provided with a longitudinally disposed bore 154 extending axially therein from an outer end thereof. The said outer end is further provided with a slot 156 extending therein a distance less than the bore 154.

A toggle rod 160 is provided extending slidably into the bore 154 and a cross pin 162 is secured transversely of the toggle rod 160, the cross pin 162 being disposed in the slot 156 so that at times when the toggle rod 160 is rotated, the pin 162 will engage the sides of the slot 156 for causing the shaft 150 to rotate.

The outer end of the toggle rod 160 is secured by means of set screws 166 and by means of a universal joint 168 to a control knob 170 which is disposed on the outside of the side wall of the housing section 16 from the universal joint 168.

The control knob 170 is provided with an indicator arm 172, and a graduated dial or scale 174 is provided and secured to the outer surface of the housing section 16 for cooperation with the indicator arm 172 to indicate the position of the lens mechanism 70 to an operator and from the outside of the lamphouse.

Inwardly of the housing section 16 a bearing member 180 is provided and is secured to the inner side of the section 16 for rotatably upholding the outer ends of a stub-shaft 184 which interconnects the universal joint 168 with the control knob 170.

The lower housing section 16 is further provided with a door 200 for providing access to the focusing mechanism 70 for repair and adjustment thereof. The door 200 is mounted on a hinge 202 at one side thereof and is provided with a lock 204 on its opposite side. The door 200 is provided with a knob 206 for facilitating the opening thereof, and with an opening 208 therethrough for seeing a red glass 210 on the inside of the door.

The sections 16, 18 and 20 are removably secured together by means of overlapping straps 220 each of which is riveted to one of the sections and bolted to an adjacent one of the sections.

The center section 18 is also provided with a door 230 for providing access thereto to service the interior thereof. The door 230 is similarly provided with a knob 232 and a lock 233. The door 230 has a red glass 234 secured on the inside thereof with a mounting 212 and the glass 234 is visible through an opening 236 in the door.

The uppermost section 20 is provided with a plurality of lamps 240 which latter are mounted



in sockets secured by a frame 242 and bolts 244 to the upper side of the top 246 of the upper lamp housing section 20. The lamps 240 are provided with lead wires which latter are secured to a power of supply cable 248.

The power supply wire 248 is provided with two inner wires 250 which are adapted to be attached to a conventional wiring circuit of the 115 volt type.

The top 246 of the upper lamp house section 20 is provided with a plurality of ventilation openings 260 therethrough. A dust shield 262 is disposed above the ventilation openings 260 and spaced apart therefrom by means of a spacer 264 and a bolt 266. The shield 262 is adapted to permit heat to exude upwardly and outwardly of the lamphouse from the lamps 240 and through the openings 260, at the same time shielding the openings 260 for preventing dust from entering therein from above.

The upper housing section 20 is further provided with a rectangular shaped skirt 270 secured to the inner side thereof and overlapping the lower end thereof. The skirt 270 is disposed inside the upper end of the middle section in between an operation and is secured to a ledge providing member 272 which latter preferably extends around the inner side of the skirt 270.

The ledge 272 is provided with an inwardly extending horizontal upper surface for receiving thereon a supporting rim 274 of a diffusing member 276. The supporting rim 274 is preferably of right angle shape in cross section and is adapted to support the diffusing member 276 which latter can be similar in all respects to the diffusing member or plate 30.

The wires 250 of the cable 248 are connected to two of the terminals of a relay 282 as best shown in Figure 1. Two other terminals of the relay 282 are connected to the lead in wires 280 of the conventional supply circuit.

The other two terminals 286 of the relay 282 are connected by means of suitable wires 288 with a timing mechanism 290. The timing mechanism 290 is provided with control switches 292 and 294. One of the switches is for turning the timer off and on, the other switch is for manual control of the exposure made by the lamps 240.

The timer 290 is provided with a dial 296 which has a graduated scale imprinted thereon. The timer is also provided with a starter button 298.

In operation the lamphouse as described is placed with its lower surface above the bedplate 10 of the step-and-repeat machine, not shown. The adjustment of the focusing mechanism 70 is made by means of the control knob 170 in conjunction with the adjacent dial or scale 174.

The operator may then use the switch 294 for controlling the exposure time. Optionally he may throw the switch 292 for using the automatic timing mechanism 290. In use of the latter the starting button 298 is pushed at a time when the dial 296 thereof is set for the proper length of exposure. The lamps 240 will then turn on and turn off automatically exactly at the end of the period of time set with the timing mechanism controls.

It will be seen than this invention has provided a lamphouse for step-and-repeat photographic reproduction machines which is provided with means for automatically timing the period of exposure; which is provided with ventilation openings as well as a dust shield; having a square negative-holding face; which is constructed in several sections for convenient assembly and dis-

assembly for servicing; which is provided with doors for convenient servicing; having more efficient use of vacuum for holding the negative photographic material to the bottom thereof than heretofore; and having convenient knobs thereon for grasping the lamphouse for use in disposing the lamphouse in operating position and at times in other positions for placing negative photographic material thereon.

From the foregoing description, it is thought to be obvious that a lamphouse for photographic reproduction machines constructed in accordance with our invention is particularly well adapted for use by reason of the convenience and facility with which it may be assembled and operated, and it will also be obvious that our invention is susceptible of some change and modification including variations in the shape and size of the parts, without departing from the principles and spirit thereof and for this reason, we do not wish to be understood as limiting ourselves to the precise arrangement and formation of the several parts herein shown in carrying out our invention in practice, except as claimed.

We claim:

1. In a photographic printing machine, the combination which comprises an elongated hollow housing rectangular-shape in cross section and comprising three separable sections including an upper section, a center section, and a lower section, lamps mounted in the said upper section, a light diffusing plate mounted in the center section, a focusing lens mounting positioned in the upper part of the lower section, and a frame rectangular-shaped in plan having side and end sections mounted on the lower end of the lower section of the housing, the sections of the said frame being rectangular-shaped in cross section and having a continuous cavity extended longitudinally therethrough with continuous rows of spaced apertures extended from the faces of the sections to the cavity whereby suction in the cavity draws air inwardly in lines perpendicular to the face of the frame, the sections of said frame also having a continuous recess extended along the inner edges and positioned in the face of the frame so that film positioned against a plate in the recess is retained in position by suction applied to the four edges thereof.

2. In a photographic printing machine, the combination which comprises an elongated hollow housing rectangular-shape in cross section and comprising three separable sections including an upper section, a center section, and a lower section, lamps mounted in the said upper section, a light diffusing plate mounted in the center section, a horizontally disposed partition having an opening therein extended across the upper end of the lower section, an internally threaded ring carried by said partition, a cylindrical member having a flange on the lower end threaded in said



ring, a lens mounting carried by the flange of the said cylindrical member, a lens positioned in said lens mounting, a worm gear positioned on the outer surface of said lens mounting, a shaft having spaced flexible couplings therein journaled in the lower section of the housing and having an end extended through a wall of the housing, a worm on the said shaft and positioned to mesh with the worm gear on the lens mounting, a knob on the end of the shaft extended through the wall of the housing and positioned to coact with a dial on the outer surface of the housing for adjusting the position of the lens in focusing the machine, a frame rectangular-shape in plan having side and end sections mounted on the lower end of the lower section of the housing, the sections of the said frame being rectangular-shape in cross section and having a continuous cavity extended longitudinally therethrough providing a vacuum chamber with continuous rows of spaced apertures extended from the faces of the sections to the cavity whereby with the apertures positioned perpendicular to the faces of the sections of the frame suction from the vacuum chamber draws air inwardly in lines perpendicular to the face of the frame, the sections of said frame also having a continuous recess extended along the inner edges and positioned in the face of the frame, and a translucent plate positioned in the said recess with the outer surface of the plate flush with the face of the frame so that film positioned against the plate and face of the frame is retained in position by suction applied to the four edges thereof.

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