

Dec. 21, 1965

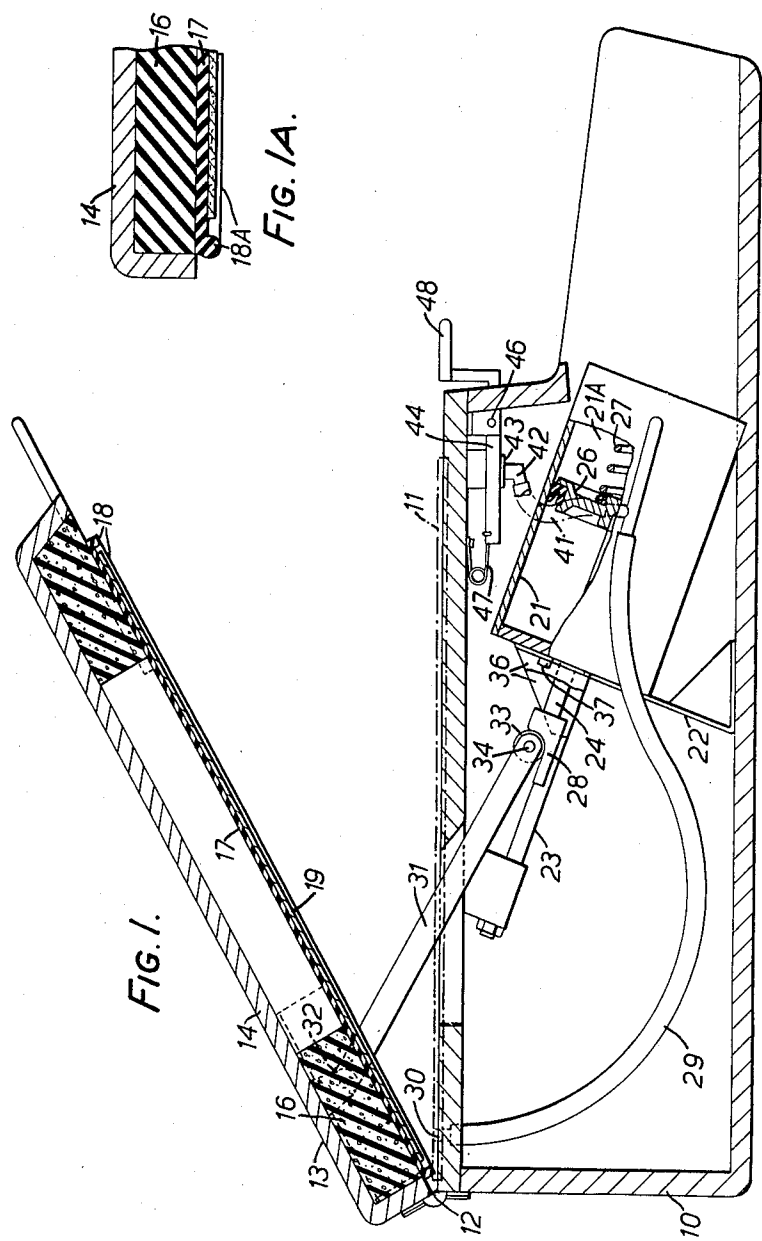
H. G. JONES

3,224,353

PHOTOGRAPHIC CONTACT PRINTING APPARATUS

Filed Sept. 30, 1963

4 Sheets-Sheet 1



Dec. 21, 1965

H. G. JONES

3,224,353

PHOTOGRAPHIC CONTACT PRINTING APPARATUS

Filed Sept. 30, 1963

4 Sheets-Sheet 2

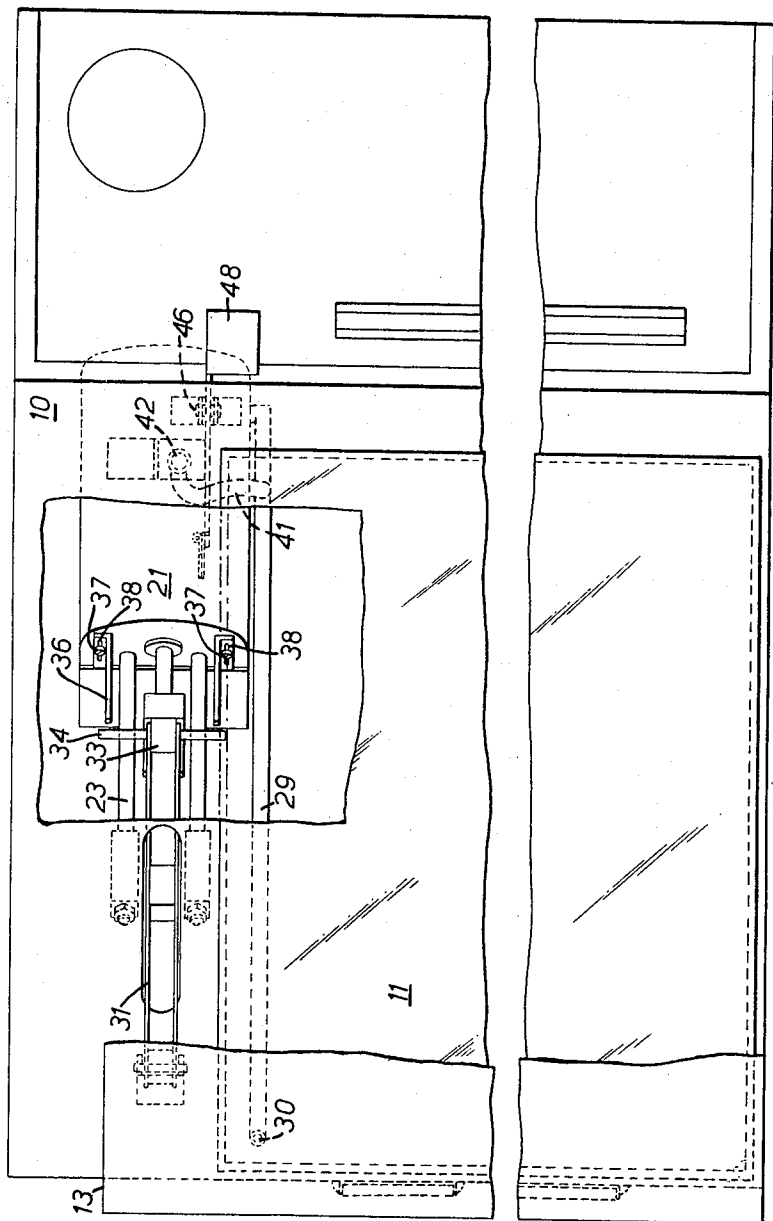


FIG. 2.

Dec. 21, 1965

H. G. JONES

3,224,353

PHOTOGRAPHIC CONTACT PRINTING APPARATUS

Filed Sept. 30, 1963

4 Sheets-Sheet 3

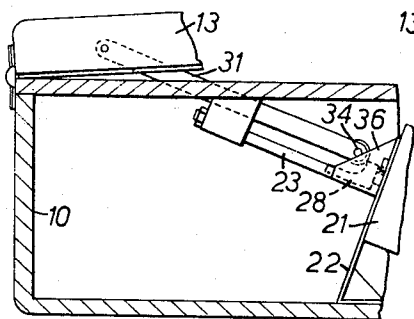


FIG. 3.

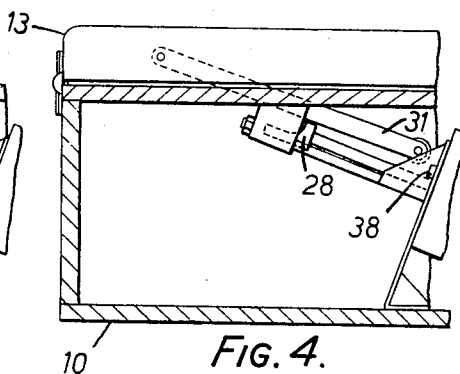


FIG. 4.

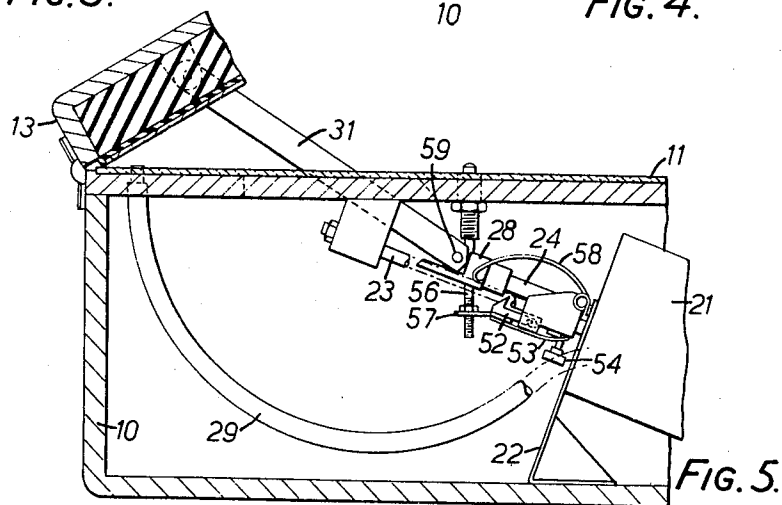


FIG. 5.

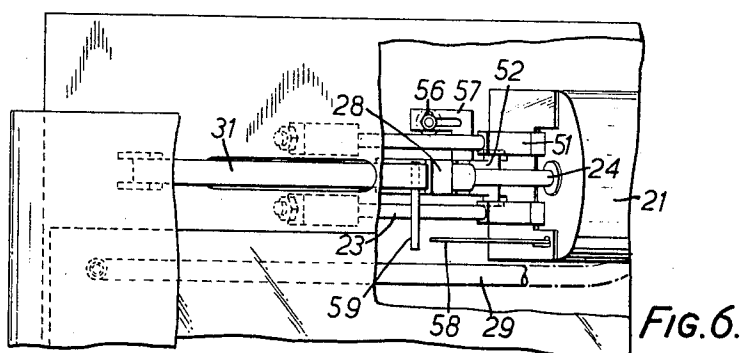


FIG. 6.

Dec. 21, 1965

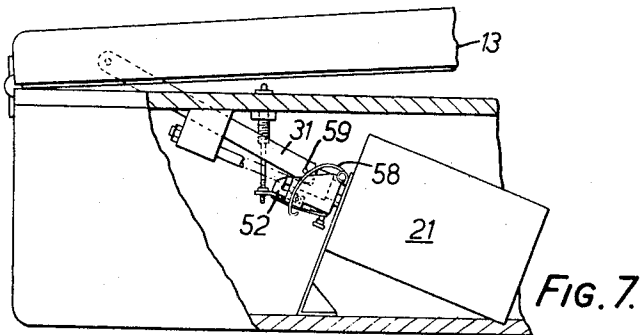
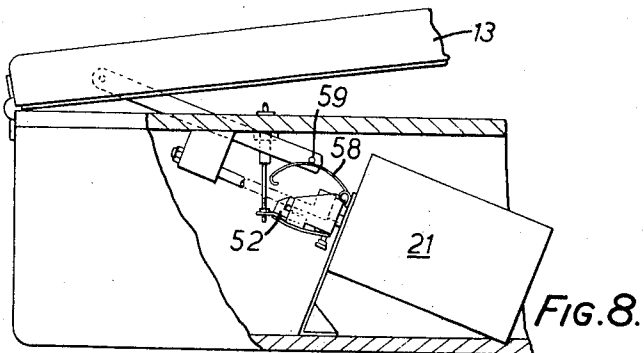
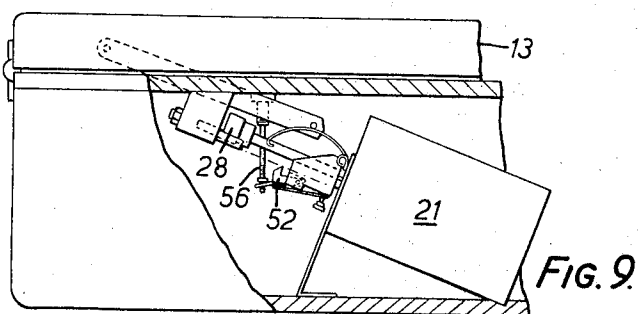
H. G. JONES

3,224,353

PHOTOGRAPHIC CONTACT PRINTING APPARATUS

Filed Sept. 30, 1963

4 Sheets-Sheet 4



1

2

3,224,353 PHOTOGRAPHIC CONTACT PRINTING APPARATUS

Harold G. Jones, Bon Accord, Sea Road,
Littlehampton, England

Filed Sept. 30, 1963, Ser. No. 312,402

Claims priority, application Great Britain, Oct. 1, 1962,
37,066/62

5 Claims. (Cl. 95-76)

This invention relates to flat bed photographic printing machines in which close contact between the original to be copied and the sensitised paper is ensured by the production of a partial vacuum. In such a machine the original and the sensitised paper may be laid one on top of the other on a flat glass plate which forms the top of a box containing the source of printing light. A lid hinged to the box carries on its underside a rubber sheet, or other flexible blanket, which makes sealing engagement with the glass plate at its edges when the lid is lowered. On evacuating air from the trapped space between the rubber sheet and the glass plate, atmospheric pressure presses the rubber sheet towards the glass plate, thus holding the photographic materials in firm contact over their whole area.

In accordance with the present invention the required partial vacuum is produced by a pump driven through suitable mechanical connections by the movement of the lid, the arrangement being such that the vacuum is automatically applied by the action of closing the lid.

In order that the invention may be well understood, there will now be described, by way of example only, two photographic printing machines in accordance therewith, the machines being illustrated in the accompanying drawings, in which:

FIGURE 1 is a sectional elevation of one machine;

FIGURE 1A is a scrap view showing a modified detail;

FIGURE 2 is a plan view of the machine shown in FIGURE 1, partly broken away for clarity;

FIGURES 3 and 4 are partial sectional elevations showing successive stages in the operation of the machine;

FIGURES 5 and 6 are scrap elevation and plan views showing the second machine; and

FIGURES 7, 8 and 9 are partial elevational views showing successive stages in the operation of the machine.

The machine illustrated in FIGURES 1 to 4 comprises a box structure 10 which houses a source of printing light (not shown). A flat glass plate 11 constitutes a flat bed upon which papers to be exposed can be laid. Hinged to the rear of the box for movement about a horizontal hinge axis 12 is a lid 13 including a rigid shell 14 and a packing of sponge material 16 across which is applied a flexible rubber blanket 17 which is moulded to have a peripheral sealing lip 18 of generally rectangular cross section. In FIGURE 1A there is shown, on a larger scale an alternative form of moulded lip 18A, which is of part cylindrical cross section. The lip 18 is adapted to make sealing engagement with the bed 11 when the lid 13 is closed so as to form a trapped space between the bed and the blanket. To the lower face of the blanket 17 there is applied a felt pad 19.

Located within the light box 10, towards one side thereof, is a vacuum pump whose cylinder 21 has its axis inclined rearwardly and upwardly, in a direction transverse to the hinge axis 12. The pump cylinder is supported on a bracket 22 secured to the floor of the box 10, and is steadied by a pair of rods or stays 23. A piston 26 working in the cylinder and urged rearwardly by a compression spring 27 carries a piston rod 24 which projects rearwardly and upwardly from the cylinder and carries at its rear end an abutment 28. The working space 21A of the

pump is connected by a pipe 29 to a nozzle 30 which opens onto the upper surface of the bed 11 within the bounds of the sealing rim 18 of the blanket 17, so that when the lid is closed the pump space 21A is connected to the trapped space between the bed and the blanket. A strut link 31, pivotally connected at its rear end 32 to the hinged lid 13, projects forwardly and downwardly, through a slot in the top wall of the box 10, above the piston rod 24 and at its front end carries a roller 33 having a projection axle 34. This axle is arranged to engage, in operation, against the sloping surfaces of a pair of cam plates 36 which are adjustably secured to the bracket 22 by means of screws 37 passing with clearance through elongated slots 38 in flanges 39 formed integrally with the cam plates 36.

When the lid 13 is raised the roller 33 on the link 31 is drawn rearwardly past the abutment 28. When the lid is lowered, the roller 33 engages the abutment 28 and forces the piston 26 forwardly against its spring 27, expelling air from the working space 21A of the cylinder through the pipe 29 and nozzle 30. During the final closing movement of the lid, as illustrated in FIGURE 3, the axle 34 of roller 33 engages the sloping surfaces of cam plates 36 and is deflected upwardly thereby, until, as illustrated in FIGURE 4, the roller is lifted clear of the abutment 28, so that the pump spring 27 is able to drive the piston 26 rearwardly, drawing air into the cylinder space 21A through the pipe 29 and nozzle 30. The cam plates 36 are so adjusted on the bracket 22 that this working stroke of the piston takes place just before the lid is fully closed, but after an airtight seal has been formed between the sealing rim 18 of the rubber blanket 17 and the glass bed 11, so that air is extracted by the pump from the trapped space between the bed and the blanket, and a partial vacuum is formed under the blanket, which is therefore pressed, by atmospheric pressure, against the bed and any papers located thereon.

In order to facilitate opening of the lid after exposure of the photographic papers has been effected, means are provided for relieving the partial vacuum prior to opening the lid. The vacuum relieving means comprises a branch pipe 41 connected at one end to the vacuum pipe 29, and provides its other end with a nozzle 42 normally closed by a valve cap 43. The cap 43 is carried by a lever 44 pivoted at 46 and biased by a spring 47 in a sense to press the valve cap 43 against the nozzle 42. A projecting end of the lever affords a handle 48 by which the lever can be rocked against its spring to lift the cap 43 and allow air to enter the nozzle 42, branch pipe 41, vacuum pipe 29, nozzle 40 and so into the trapped space, releasing the partial vacuum therein.

A second embodiment of the invention is illustrated in FIGURES 5 to 9, in which numerals corresponding to those in FIGURES 1 to 4 are used to denote like parts. The machine shown in FIGURES 5 to 9 is similar to that described above, except that the mechanical linkage for operating the vacuum pump is modified.

The end of the strut link 31 bears directly against the abutment 28 carried by the piston rod 24. Mounted slidably on the stays 23 is a carrier 51 upon which there is pivotally mounted a latch 52 which is biased to swing upwardly by means of a spring 53. The carrier 51 is adjustably secured to the stays 23 by means of a thumb screw 54. A plunger 56 is supported from the top wall of the box 10 for vertical movement, the lower end of the plunger being adjustably attached to a bracket 57 secured to the latch 52, while the upper end of the plunger projects through the top wall of the box and is engageable by the edge of the lid 13.

In operation, closing movement of the lid 13 causes the strut link 31 to press against the abutment 28 to

move the piston rod 24 and the piston 26 rearwardly against the pump spring 27. This movement is arrested when the lid is within 5° of its fully closed position, when the abutment 28 meets a mechanical stop formed on the bracket 22, and at this position the latch 52 is moved, by its spring 53 into engagement with the abutment. This position of the parts is illustrated in FIGURE 7. The lid is then lifted through about 5° to disengage the forward end of the link 31 from the abutment 28, and a rod spring 58, which was deformed during the initial closing movement by a laterally projecting pin 59 carried by the link, lifts the link clear of the abutment, to the position shown in FIGURE 9. In the final stage of the operation, the lid is lowered to its fully closed position, and depresses the plunger 56 to trip the latch 52, whereupon the pump spring is able to recoil and effect a working stroke of the pump, this stroke taking place, as in the first embodiment, after a seal has been made between the blanket 17 and the glass bed 11.

What is claimed is:

1. Photographic contact printing apparatus comprising a box containing a source of printing light, a bed on top of the box for the location thereon of photographic papers to be exposed, a lid hingedly connected to the box, a flexible blanket carried by the lid, sealing means which border a trapped space between the blanket and the box when the lid is in a closed position, a vacuum pump having its working space connected to said trapped space, and a mechanical linkage connecting the lid and the pump for actuating the pump to create a partial vacuum in said trapped space in response to closing movement of the lid.

2. Photographic contact printing apparatus comprising a box containing a source of printing light, a bed on top of the box for the location thereon of photographic papers to be exposed, a lid hingedly connected to the box about a horizontal hinge axis, a flexible blanket carried by the lid, sealing means which border a trapped space between the blanket and the bed when the lid is in a closed position, a vacuum pump having a piston, a pis-

ton rod which extends rearwardly and upwardly in a direction transverse to said hinge axis, and a pump spring urging the piston and piston rod rearwardly, the working space of the pump being connected to said trapped space, an abutment on said piston rod, a strut connected at its rear end to the lid and extending downwardly and forwardly, said strut engaging said abutment when said lid is in an open position, initial closing movement of said lid causing said strut to move said piston against the action of said spring to expel air from the working space of said pump, and releasing means responsive to subsequent closing movement of said lid to release the spring whereby said spring returns said piston to draw air into said cylinder from said trapped space, said releasing means becoming operative after said sealing means has completed a seal about said trapped space.

3. Apparatus in accordance with claim 2, wherein said releasing means comprising stationary cam means and cam engaging means on said strut, said cam engaging means being adapted to be deflected by engagement with the stationary cam means to carry said strut out of engagement with said abutment.

4. Apparatus in accordance with claim 2 comprising latch means automatically operable in response to arrival of said lid in one position of intermediate open and closed positions of said lid to latch said piston to hold said spring compressed, said releasing means including latch tripping means responsive to movement of said lid between said one position and said closed position to trip said latch.

5. Apparatus in accordance with claim 4 comprising mechanical stop means for checking closing movement of said lid at said one position, and means responsive to a partial opening movement of said lid to clear said stop means.

No reference cited.

EVON C. BLUNK, *Primary Examiner*.