

Aug. 2, 1966

H. MEY ETAL

3,263,587

HOLDER FOR ORIGINALS TO BE PRINTED, PARTICULARLY
IN AUTOMATIC PHOTOGRAPHIC PRINTING MACHINES

Filed March 13, 1964

2 Sheets-Sheet 1

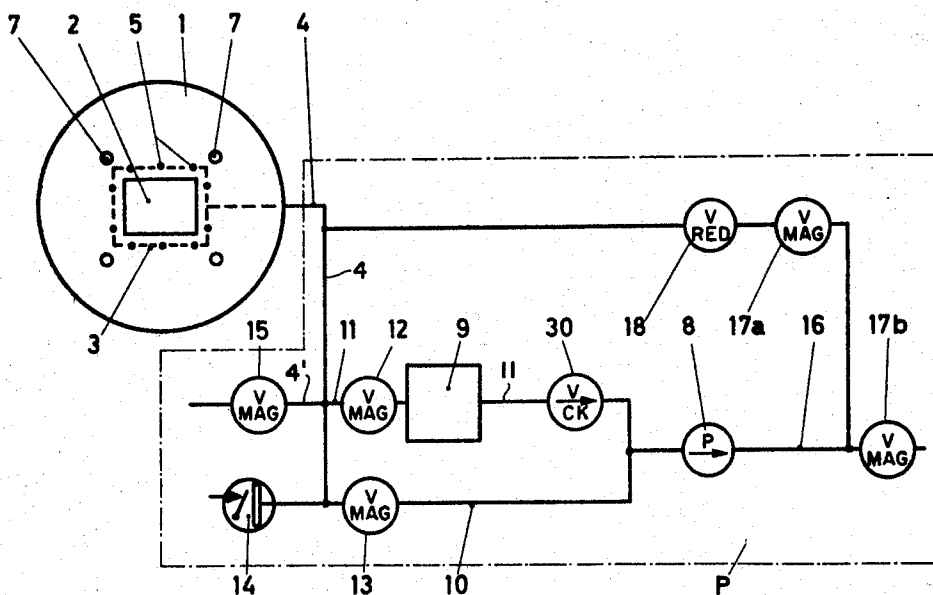
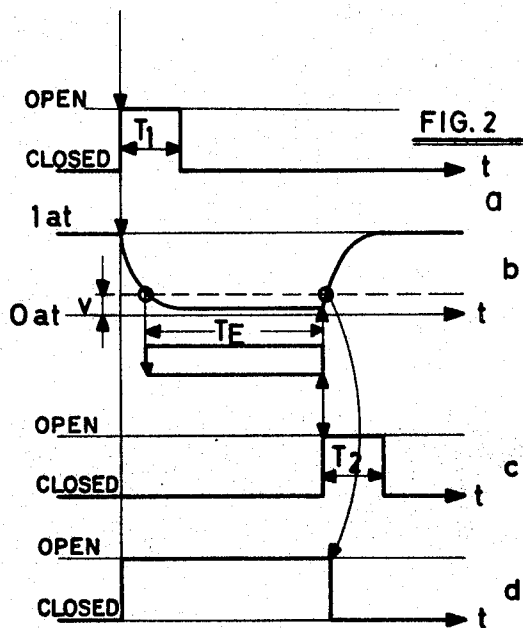


FIG. 1



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2 Sheets-Sheet 2

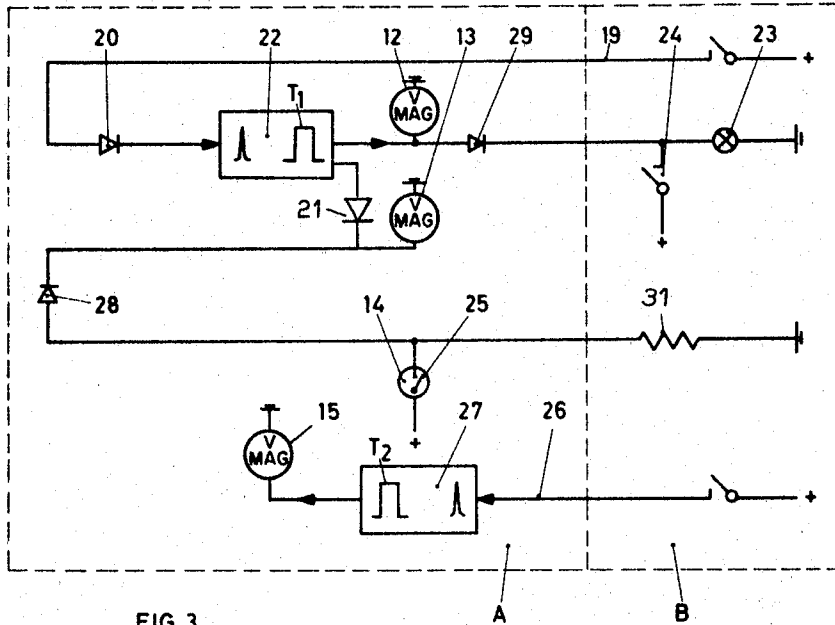


FIG. 3

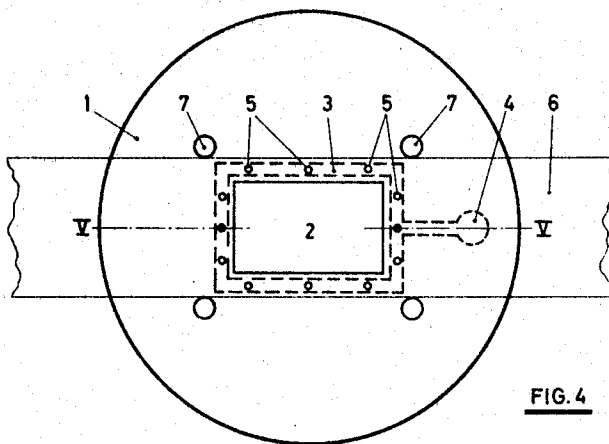


FIG. 4

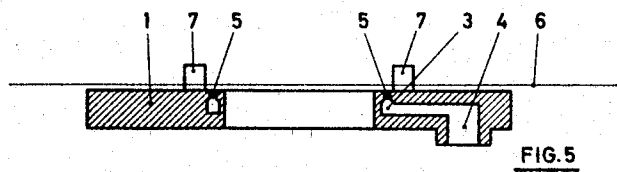


FIG. 5

1

3,263,587

HOLDER FOR ORIGINALS TO BE PRINTED, PARTICULARLY IN AUTOMATIC PHOTOGRAPHIC PRINTING MACHINES

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7 Claims. (Cl. 95-76)

This invention relates to a holder for originals to be printed, particularly in automatic photographic printing machines.

Holders for this purpose should be so constructed that the original to be printed can be changed as rapidly as possible and that there is no risk of damage to the original. The first of these two requirements is of particularly great importance because in modern automatic machines the exposure times are very short and therefore the total printing time depends to a very great extent on the time required for changing the negative.

Hitherto proposed negative holders generally consist of a clamping device including a plate adapted to be pressed against the film gate, the latter and the plate being provided with mask apertures which coincide in the closed position. It is a relatively complicated and lengthy procedure to insert the originals into these known clamping devices. In addition, there is always a danger that the original will be damaged.

It is an object of the invention to provide a holder which meets the above indicated requirements and thus obviates the disadvantages of known clamping devices. According to the present invention there is provided a holder for a photographic original suitable for holding the original to be printed in an automatic photographic printing machine, wherein the holder is in the form of a plate with a window corresponding in size to the original, there being means for locating the original in register with the window, and wherein the plate is formed with internal passages having outlets adjacent said window and an inlet or inlets connectable to a source of suction, whereby the application of suction to said inlet(s) will serve to hold an original to be printed against the plate. Preferably the plate is formed with a manifold for said passages and a common inlet to the manifold so that the application of suction to the plate is simplified.

Since the present film gate is constructed as a suction plate, the changing of the originals is substantially simplified and the risk of damage during the operations of insertion, clamping, and removal is practically eliminated. The original need merely be placed between the guides of the film gate, thus covering all the passage outlets. When the suction is switched on, the original is then sucked flat against the film gate, whereby the upper surface of the original lies completely free.

In the case of an original which is very curved, the suction operation requires a relatively great suction power. The pump can nevertheless be kept small if a vessel is incorporated in the connection between the suction side of the pump and the passages. This vessel acts as a buffer and supplies the necessary shock power for the first phase of the suction operation.

The pneumatic construction of the present holder also affords the advantage that a control mechanism for the holder can be inserted in a very simple manner in the complete automatic system of a photographic printing machine. This will be explained more fully hereinafter with reference to the accompanying drawings, which

2

illustrate diagrammatically and by way of example an embodiment of the present invention, and in which:

FIGURE 1 shows diagrammatically a holder for a photographic original to be printed and a control mechanism for operating the holder,

FIGURE 2 shows the time plan of the control mechanism,

FIGURE 3 is a circuit diagram of an electrical control device,

FIGURE 4 is a plan view of the holder, and

FIGURE 5 a section on the line V-V in FIGURE 4.

The holder and control mechanism of the present invention may be incorporated in automatic photographic printing machines of the most diverse construction, or may be added to such machines without any considerable expense. Machines of this type are known in themselves. In this connection reference is for example made to the machine described in French patent specification No. 1,253,479. The drawing and the description below are therefore restricted to the holder, its pneumatic system, and an electrical control device, while features of the actual automatic photographic printing machine are mentioned only where this is necessary for the understanding of the present invention.

Referring now to the drawings, a film gate is formed by a plate 1 and a film guide is formed by bolts 7 let into the plate, which has a rectangular window 2, forming a mask aperture. The plate is formed with a manifold 3 from which passages 5 have their outlets around the window 2. The manifold 3 is connected to a pneumatic system, which in FIGURE 1 is designated generally by P, through an inlet pipe 4.

As shown in FIGURE 1, the pneumatic system P includes a vacuum vessel 9 incorporated in a branch pipe 11 connecting the suction side of a pump 8 and the passages 5 or manifold 3 by way of pipe 4. The volume of this vessel 9 is so designed that at a given vacuum it can absorb at least the quantity of air which is required for a first phase of the suction operation. The connecting pipe between the pump 8 and the vessel 9 is provided with a check valve 30.

A pipe 10 by-passes the vacuum vessel 9 whereby the pump 8 can be directly connected to the suction plate 1 through the pipes 10 and 4. Magnetic valves 12 and 13 or the like are provided both in the branch pipe 11 between the vessel 9 and the plate 1 and in the by-pass pipe 10. These valves can be controlled by a pressure switch 14 on the plate side thereof in such a manner that when a negative pressure, which can be adjusted previously on said pressure switch, is reached, the valve 12 in the branch pipe 11 is closed and the valve 13 in the by-pass pipe 10 is opened. The opening time of the valve 12 disposed in the branch pipe 11 can be at least additionally limited by a time impulse generator.

In addition, a vent valve 15 is connected to the pipe 4' leading to the inlet 4. This vent valve is also constructed as a magnetic valve or the like having an opening time limited by a time impulse generator. Monostable multivibrators which are known in themselves may for example be used as time pulse generators.

The function of the apparatus will be described more fully below with reference to the time diagrams shown in FIGURE 2.

FIGURE 2 shows in the section marked a the switching timing (open-closed) of the magnetic valve 12 disposed in the branch pipe 11. The section marked b shows the corresponding time-pressure relationship in the suction passages 5 and at the pressure switch 14 respectively. The section marked c shows the appertaining timing of the position of the vent valve 15. Finally, the section

3

marked *d* shows the switching condition (open-closed) of the magnetic valve 13 contained in the by-pass pipe 10.

The arrows shown in FIGURE 2 symbolise the direction of the functioning.

In the position of rest, all the magnetic valves 12, 13 and 15 are closed. When the pump 8 is switched on, the vessel 9 is therefore evacuated. After an original to be printed has been placed on the suction plate 1, the valve 12 in the branch pipe 11 is opened for a period of time T_1 . The suction force stored in the vessel is therefore brought into action. The original is sucked on to the plate 1. As soon as the original is in a flat position, it closes the apertures 5. The pressure in the pneumatic system consequently drops. As soon as the pressure valve preadjusted on the pressure switch 14 is reached, the pressure switch responds.

Simultaneously with the opening of the valve 12 the valve 13 in the by-pass pipe 10 is opened and remains open as long as the pressure is below the threshold V stipulated by the pressure switch.

Alternatively, valve 13 may be made to open only when the pressure switch responds shortly before valve 12 closes again.

Between the end of the suction impulse T_1 and the exceeding of the pressure threshold, the film is thus held directly by the vacuum supplied by the pump 8.

If for any reason the film should not hold (for example it does not cover the entire mask aperture), the two magnetic valves 12 and 13 are automatically closed after the period of time T_1 . The full operation of the vacuum vessel 9 is thereby avoided.

After the exposure has been made, the vent valve 15 is opened. The original can be removed or replaced by another original, whereupon the above-described operation can be repeated.

The removal of the film during the opening of the vent valve 15 is particularly effective if the negative is inserted so that its emulsion side is facing the suction plate. In this case, a mirror or similar reversing means must be provided in the path of the illuminating rays of the printing machine. Through the tension inherent in the emulsion coating in conjunction with the film base, the film is bent upwards along its centre axis without the application of an external force, so that it lies in contact at its two side edges. The emulsion side of the film is thus also very effectively protected during the transport of the film.

The lifting of the original off the suction plate (after the exposure has been made) can be improved if the passages 5 or 3 can be connected optionally to the pressure side of the air suction pump 8. Such an arrangement is shown in FIGURE 1. In this arrangement two further magnetic valves 17a and 17b and a pressure reduction valve 18 are disposed on the pressure branch 16 of the pump 8. These two valves 17a and 17b are so controlled that in the event of exposure not occurring and/or in the event of suction not being effected, the pressure in branch 16 of the pump 8 will act on the suction plate 1. Through the air under pressure passing out of the passages 5 an air cushion will be formed which will lift the original off the film gate and hold it suspended to a certain extent.

The pneumatic system outlined in FIGURE 1 is best controlled by a corresponding electrical control arrangement, which in turn is connected to the automatic system of the photographic printing machine. An electrical control system for obtaining the time diagrams illustrated in FIGURE 2 is illustrated as an example in FIGURE 3. The part designated by A is the actual control device for the pneumatic system of the holder, while in part B, the elements of the automatic photographic printing machine which are necessary for the understanding of the present invention are shown.

The electrical control illustrated in FIGURE 3 is carried out as follows.

4

A switch-on order arriving through a line 19 in the form of an impulse of positive current (of any desired magnitude and form) is conducted through the diode 20 to a monostable multivibrator 22 (time impulse generator) which is thereby operated.

In consequence of the input pulse of positive current, an impulse of the time duration T_1 (FIGURE 2) occurs at the output of the multivibrator 22. This impulse passes directly to the control winding of the magnetic valve 12 in the branch pipe 11 (FIGURE 1) and to the control winding of the magnetic valve 13 in the by-pass pipe 10 (FIGURE 1) through a diode 21, and furthermore feeds an exposure lamp 23 of the automatic photographic printing machine through a diode 29. The valves 12 and 13 are thereby opened at the same time and the exposure lamp 23 is switched on. The current supply to the lamp 23 is maintained through a contact 24.

When the pressure is below the pressure threshold V (FIGURE 2), adjusted on the pressure switch 14 a contact 25 of the pressure switch closes. A positive voltage then passes through a diode 28 to the winding of the magnetic valve 13 and to the control winding 31 of the exposure shutter of the machine. The original remains held in contact by the suction applied through the lines 10 and 11, the shutter is opened and the exposure begins. The exposure time is indicated in FIGURE 2 by the distance arrow T_E .

A switch-off order, arriving through a line 26 likewise in the form of a positive voltage, passes to a second monostable multivibrator 27, which transmits an impulse of the time duration T_2 (FIGURE 2) to the control winding of the vent valve 15 and opens the latter for the impulse duration T_2 . The original is freed again.

FIGURES 4 and 5 show a preferred form of construction of the suction plate. The passages 5 and manifold 3 are here formed by corresponding apertures or bores. An original to be printed is indicated by 6.

The suction plate is preferably made of transparent or matt white material (such as that known under the Registered trade mark "Plexiglas"), so that with the aid of suitable illuminating means not only the negative to be printed but also the surrounding film areas can be made visible. This is important not only when the negative number corresponding to the image has to be read, but also when the negative to be printed next must be examined in advance in order to make the necessary adjustments.

If the plate 1 is constructed in the form of a circular disc and mounted rotatably (ideal axis of rotation at right-angles to the plate and through its centre), the negative can in a simple manner be placed either lengthwise or crosswise as desired, depending on the position corresponding to the particular positive format.

In the case of large size masks, the passage mouths are preferably distributed over all (four) sides of the mask aperture boundary. In the case of small size masks (film size $\leq 24 \times 36$ mm.), it is generally sufficient to provide suction points only on the mask edges lying transversely to the direction of the film.

What is claimed is:

1. Means for holding a photographic original to enable the latter to be printed in an automatic photographic printing machine, comprising a plate intended to receive the original, portions in said plate defining a window aperture of a size corresponding to that of the original to be printed, means on said plate for locating the original in register with the window, portions in said plate defining an internal manifold surrounding said window, portions in said plate defining outlet passages leading from said manifold to locations adjacent said window, portions in said plate defining an inlet passage leading to said manifold, a suction pump, first conduit means connected to said inlet in said plate, second conduit means connecting said first conduit means with said suction pump, a vacuum vessel inserted in said second conduit means, a first magnetic valve

5

6

also inserted in said second conduit means between said vacuum vessel and said inlet, third conduit means connecting said suction pump and said first conduit means and by-passing said second conduit means, a second magnetic valve in said third conduit means a pressure switch connected to said first conduit means and operable to control said first and second magnetic valves in a manner such that, when a negative pressure which is preadjustable on said pressure switch is reached, said first magnetic valve is closed and said second magnetic valve is opened.

2. Means for holding a photographic original to enable the latter to be printed in an automatic photographic printing machine, comprising a plate intended to receive the original, portions in said plate defining a window aperture of a size corresponding to that of the original to be printed, means on said plate for locating the original in register with the window, portions of said plate defining an internal manifold surrounding said window, portions in said plate defining outlet passages leading from said manifold to locations adjacent said window, portions in said plate defining an inlet passage leading to said manifold, a suction pump, first conduit means connected to said inlet in said plate, second conduit means connecting said first conduit means with said suction pump, a vacuum vessel inserted in said second conduit means, a first magnetic valve also inserted in said second conduit means between said vacuum vessel and said inlet, third conduit means connecting said suction pump and said first conduit means and by-passing said second conduit means, a second magnetic valve in said third conduit means, a pressure switch connected to said first conduit means and operable to control said first and second magnetic valves in a manner such that, when a negative pressure which is preadjustable on said pressure switch is reached, said first magnetic valve is closed and said second magnetic valve is opened, and a time impulse generator for limiting the opening time of said first magnetic valve.

3. The means of claim 2, wherein said time impulse generator is a mono-stable multivibrator.

4. Means for holding a photographic original to enable the latter to be printed in an automatic photographic printing machine, comprising a plate intended to receive the original, portions in said plate defining a window aperture of a size corresponding to that of the original to be printed, means on said plate for locating the original in register with the window, portions in said plate defining an internal manifold surrounding said window, portions in said plate defining outlet passages leading from said manifold to locations adjacent said window, portions in said plate defining an inlet passage leading to said manifold, a suction pump, first conduit means connected to said inlet in said plate, second conduit means connecting said first conduit means with said suction pump, a vacuum vessel inserted in said second conduit means, a first magnetic valve also inserted in said second conduit means between said vacuum vessel and said inlet, third conduit means connecting said suction pump and said first conduit means and by-

passing said second conduit means, a second magnetic valve in said third conduit means, a pressure switch connected to said first conduit means and operable to control said second magnetic valve in a manner such that, when a negative pressure which is preadjustable on said pressure switch is reached, said second magnetic valve is opened, a time impulse generator for limiting the opening time of said first magnetic valve, a vent valve connected to said first conduit means, and a time impulse generator for limiting the opening time of said vent valve.

5. The means of claim 4, wherein said vent valve is a magnetic valve, and wherein said time impulse generators are mono-stable multivibrators.

6. Means for holding a photographic original to enable the latter to be printed in an automatic photographic printing machine, comprising a plate intended to receive the original, portions in said plate defining a window aperture of a size corresponding to that of the original to be printed, means on said plate for locating the original in register with the window, portions in said plate defining an internal manifold surrounding said window, portions in said plate defining outlet passages leading from said manifold to locations adjacent said window, portions in said plate defining an inlet passage leading to said manifold, a suction pump, first conduit means connected to said inlet in said plate, second conduit means connecting said first conduit means with said suction pump, a vacuum vessel inserted in said second conduit means, a first magnetic valve also inserted in said second conduit means between said vacuum vessel and said inlet, third conduit means connecting said suction pump and said first conduit means and by-passing said second conduit means, a second magnetic valve in said third conduit means a pressure switch connected to said first conduit means and operable to control said first and second magnetic valves in a manner such that, when a negative pressure which is preadjustable on said pressure switch is reached, said first magnetic valve is closed and said second magnetic valve is opened, fourth conduit means connecting the pressure side of said suction pump with said inlet, and valve means in said fourth conduit means operable to open and close said fourth conduit means.

7. The means of claim 6, wherein said valve means in said fourth conduit means includes a reduction valve and magnetic valves.

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