

[54] **PHOTO-COMPOSING MACHINES**

[75] Inventor: **Daniel Camille Cornelius Dewaele**,
Beselare, Belgium

[73] Assignee: **Lamson Paragon Limited**, London,
England

[22] Filed: **Oct. 15, 1971**

[21] Appl. No.: **189,504**

[52] U.S. Cl. **355/43, 355/45**

[51] Int. Cl. **G03b 27/52, G03b 27/70**

[58] Field of Search **355/40, 42, 43, 45;
95/4.5**

[56] **References Cited**

UNITED STATES PATENTS

3,576,365	4/1971	Callum	355/45 X
3,604,326	9/1971	James	95/4.5 R
3,631,774	1/1972	Tidd	95/4.5 R

Primary Examiner—John M. Horan

Assistant Examiner—Richard A. Wintercorn

Attorney—Watson, Cole, Grindle & Watson

[57]

ABSTRACT

This invention is concerned with a photocomposing machine and is more particularly concerned with a photocomposing machine for use in preparing printing plates for use in a machine for printing business forms. In such a machine text matter is prepared on a master sheet which is mounted on a carrier which moves through the machine in such a way that the matter to be projected is correctly positioned in the photocomposing machine Mask mechanisms and also provided in the photocomposing machine and these Mask mechanisms have to be moved at the same time as the carrier. The present invention provides a memory system to record a predetermined position of the carrier and masks and hence record a position of reproduction of the representation on the sensitized material.

7 Claims, 9 Drawing Figures

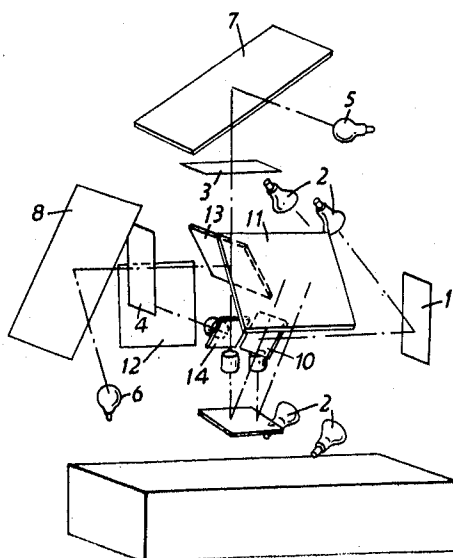
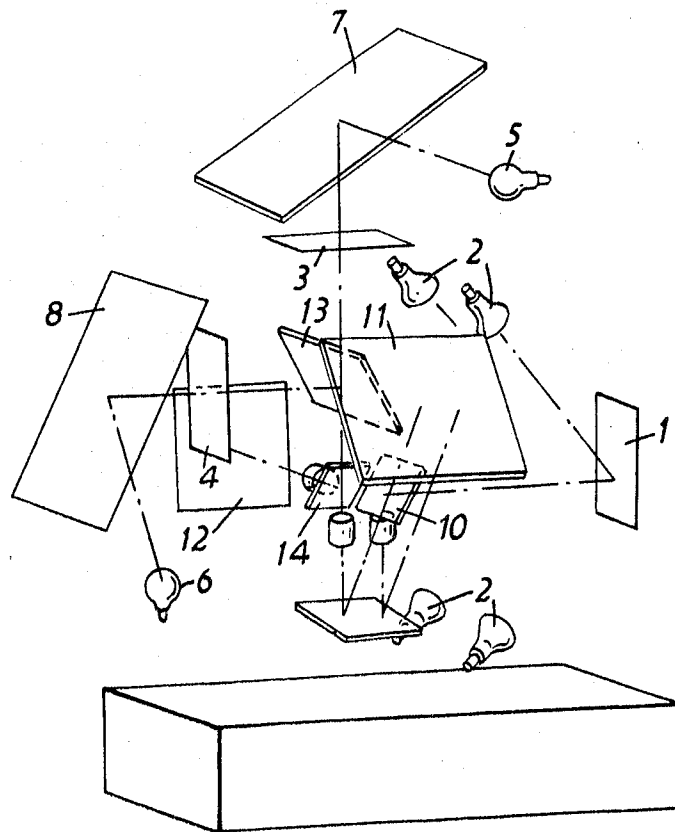


FIG. 1.



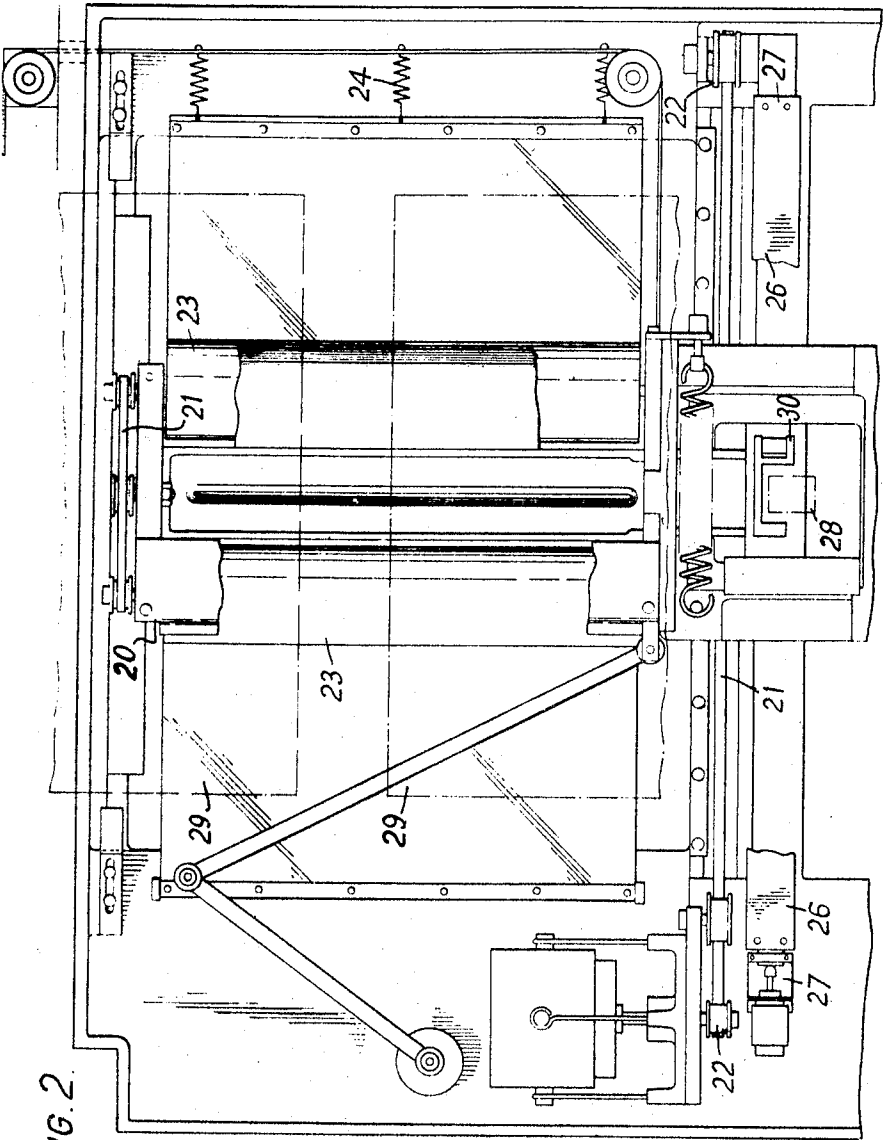


FIG. 2

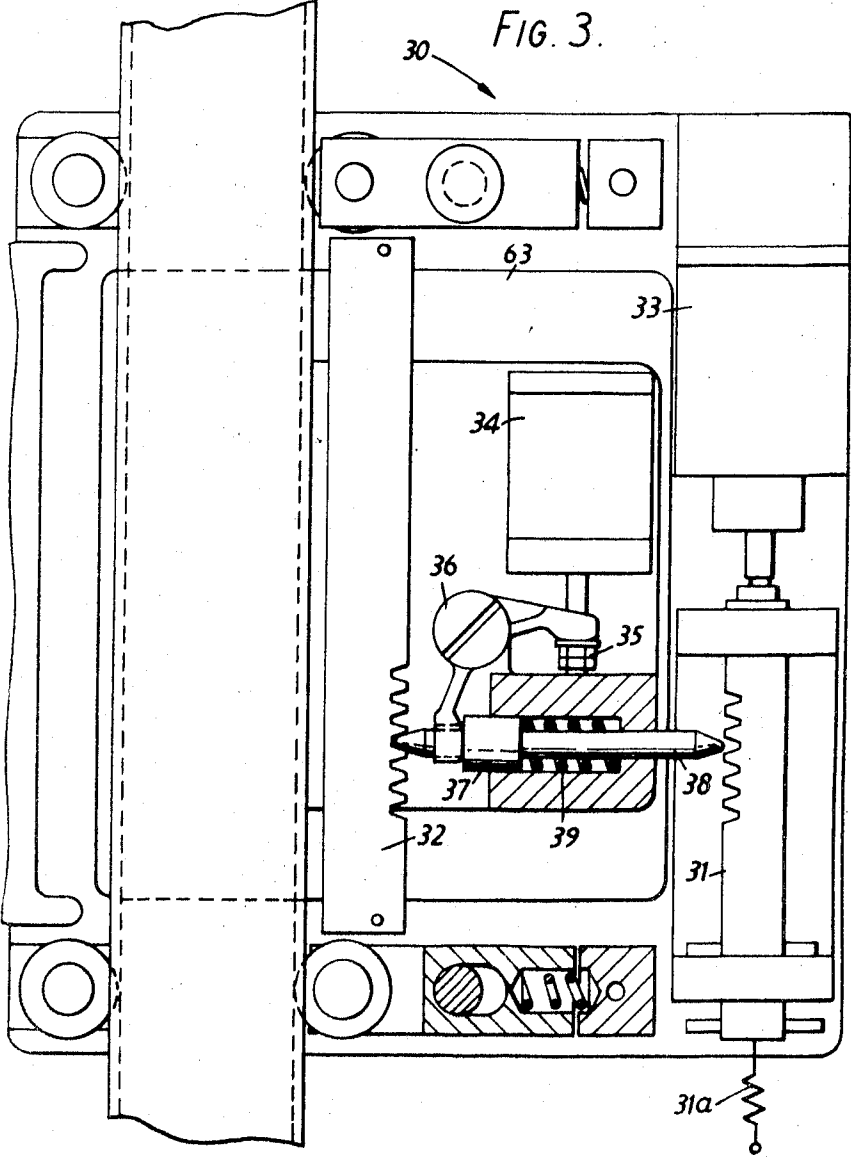
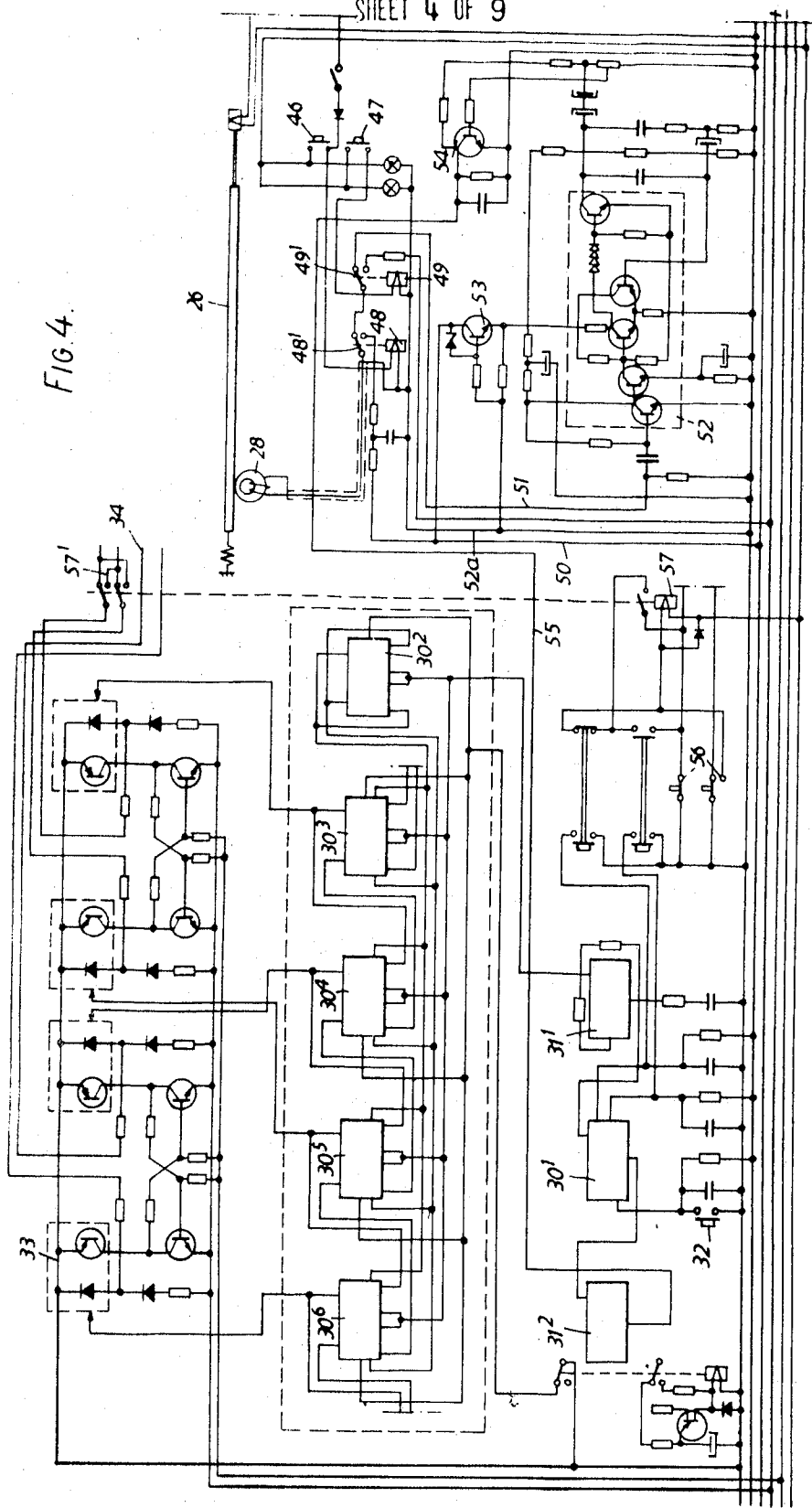


FIG. 4.



SHEET 5 OF 9

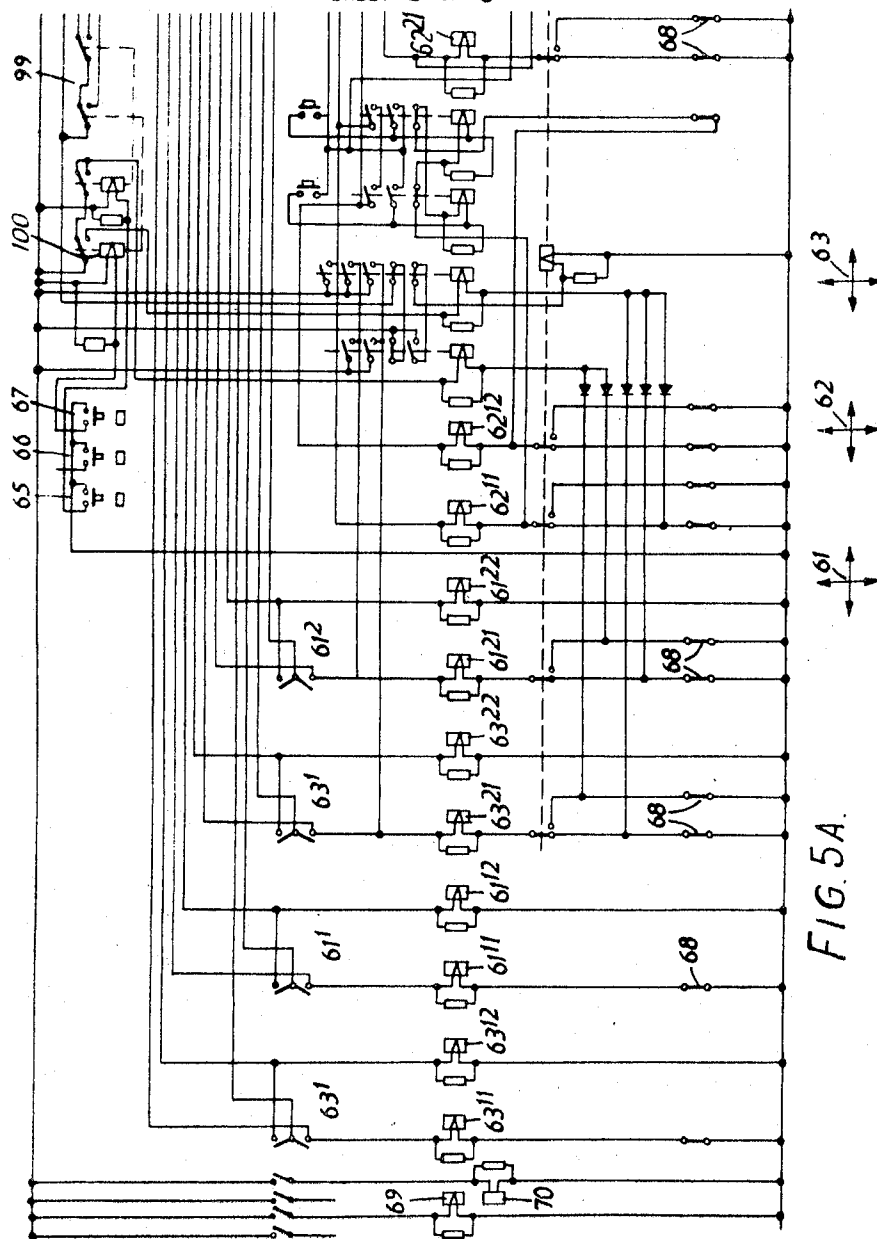
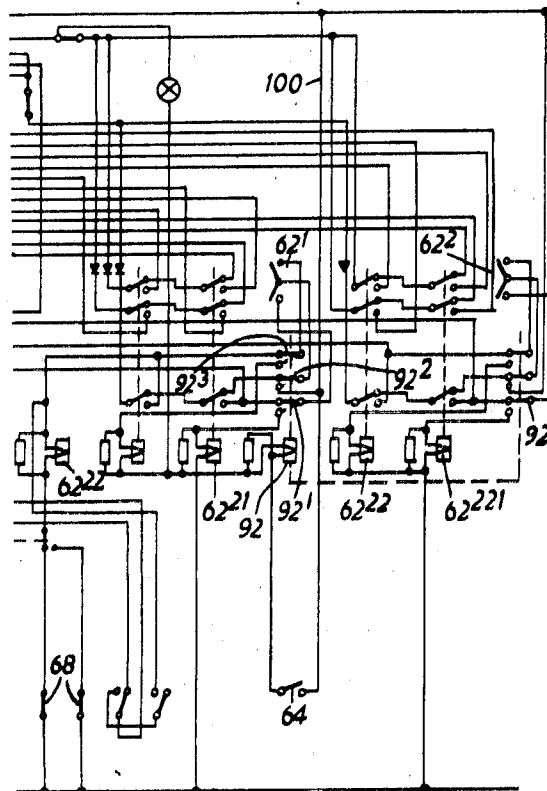


FIG. 5A.

FIG. 5B



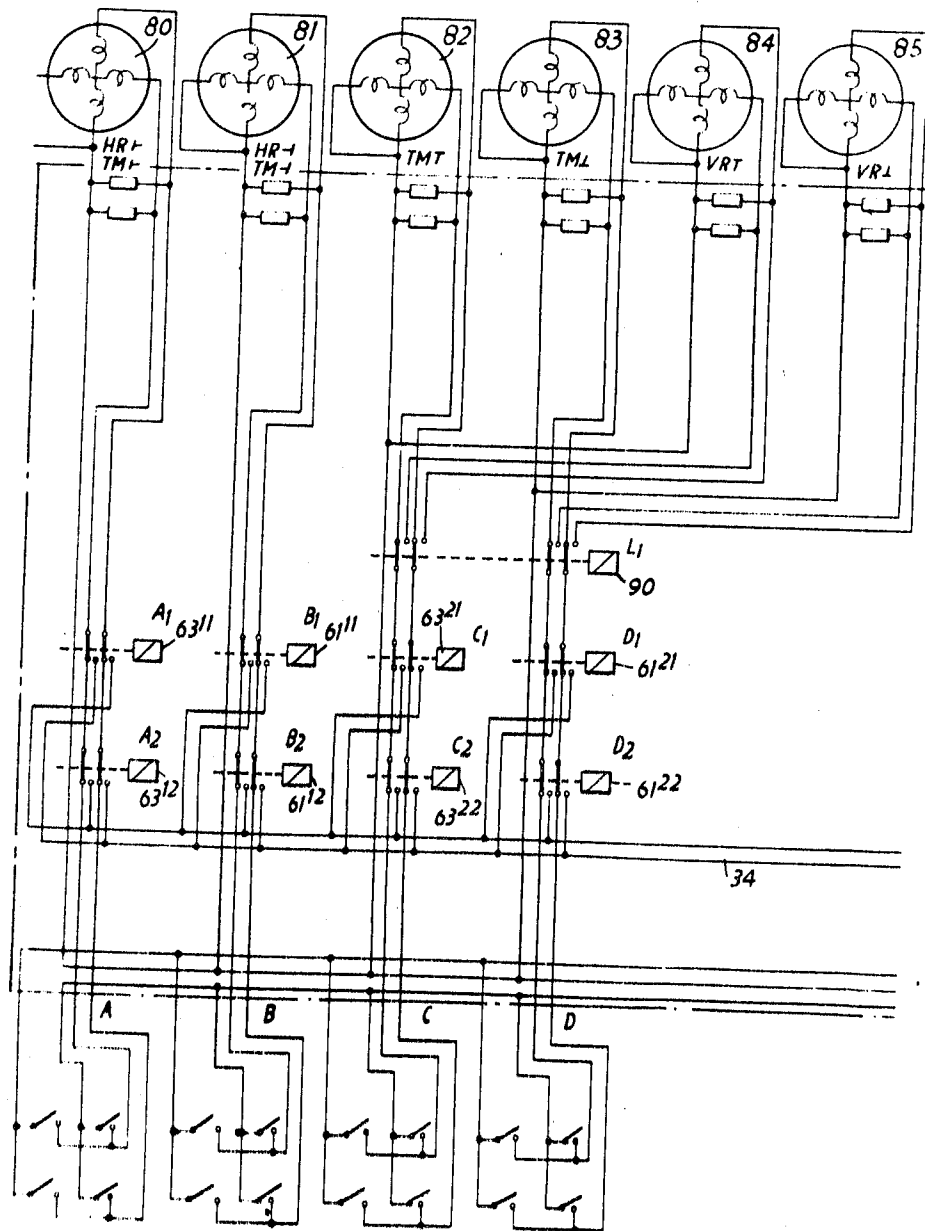


FIG. 6A

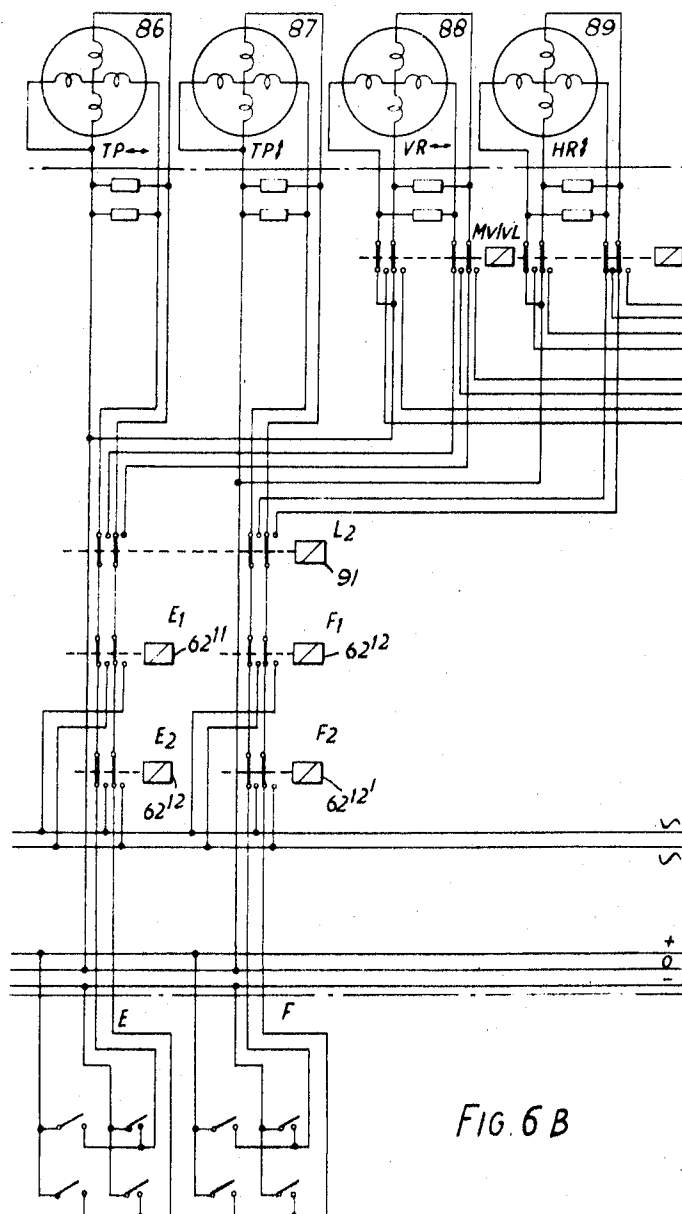


FIG. 6B

FIG. 7

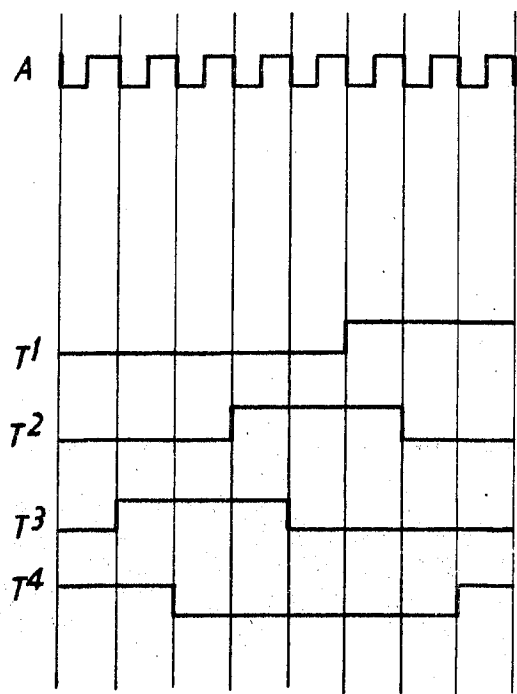


PHOTO-COMPOSING MACHINES

This invention has reference to photocomposing machines.

In the specification of U.S. Pat. No. 3,576,365 there is described a photocomposing machine for use more particularly in connection with the exposure of light sensitive material to produce an exposed sheet capable of being developed and used in the production of printing plates. The invention has particular application to the preparation of printing plates to be used in the manufacture of business forms.

In such a machine there is provided a mounting for a copy sheet which is to be illuminated by lamps in such a way that an image of the copy sheet is reproduced on a viewing screen. In addition a representation of a line (whose width and length can be varied) is also reproduced on the viewing screen. The position of the line can be adjusted and the width and length as well as the position of the line can be adjusted so that an image of the required line is reproduced on the viewing screen. When the position and size of the line on the viewing screen has been adjusted to provide the required line an image of the line is also projected on to the light sensitized material at a corresponding position whereby the representation of the required line is exposed on the sensitized sheet.

It is an object of the present invention to provide an improved photocomposing machine.

It is another object of the present invention to provide a photocomposing machine embodying mechanism moved in such a way as to carry a representation of a line corresponding to the position of a line on a copy sheet so that record may be made of the position of such a line. It is also an object of the invention to provide means whereby the details of the position of the carrying mechanism can be recorded whereby the carrying mechanism when removed from such recorded position can be returned to such recorded position in a simple and convenient manner.

According to the present invention a photocomposing machine includes a carrier capable of supporting representation to be produced, means to reproduce an image of the representation and to enable the image to be exposed on sensitized material, the position of such carrier being adjustable to permit an alteration of the position of the image on the sensitized material, and position recording mechanism and position recording material, one mounted on the framework of the machine and the other on the carrier to record a predetermined position of the carrier and hence record a position of reproduction of the representation on the sensitized material.

A photocomposing in accordance with the present invention will now be described by way of example with reference to the accompanying drawings wherein:

FIG. 1 is a diagrammatic representation of the photocomposing machine

FIG. 2 is a plan view of the carrier mounted in the photocomposing machine;

FIG. 3 is a view of the mechanism for adjusting the position of the line sheet on the carrier;

FIG. 4, 5A, 5B and 6A and 6B are circuit diagrams of part of the electric circuit of the photocomposing machine and

FIG. 7 is a diagram showing the pulse sequences.

Referring to FIG. 1 of the drawings a copy sheet 1 is irradiated by two lamps 2. Line selecting mechanism 3, 4 (one providing horizontal lines the other providing vertical lines) are irradiated by lamps 5, 6 the light from these lamps being deflected by respective mirrors 7, 8 onto the respective line mechanism 3, 4. The characteristics of the representation to be reproduced can be changed. Thus the sizes of the lines may be varied by mechanism as will be herein after described. Thus each line mechanism may embody two flexible masking mechanisms to vary the length of the line and mechanisms for adjusting the thickness of the line. The image of the copy sheet 1 is reflected by a mirror 10 on a viewing screen 11 and the image is also reproduced on the sensitized material 12 through a semi-transparent mirror 13. A mirror 14 is located in the path of the light to the sensitized material 12 to prevent the light passing to the sensitized material until it is ready for exposure. When the position of the images of the line have been correctly positioned on the viewing screen 11 the mirror 14 is removed and the sensitized sheet 12 is exposed with an image of the line located in a required predetermined position. A mechanism of this type is more fully described in U.S. Pat. No. 3,576,365.

Referring to FIG. 2 of the drawings there is shown a carrier mechanism 20 movable on rollers on a framework across the photocomposing machine being driven by endless belt 21. These endless belts pass around a pair of pulleys 22 one of which is driven by a motor (not shown). As the belt is driven the carrier moves across the machine carrying a sheet bearing reproducible matter such as a text or line whereby the position of the text or line on the viewing screen 11 is varied.

The carrier 20 has mounted on it a pair of roller blind mechanisms 23. The end of each blind mechanism is secured through springs 24 to the framework of the machine and the blind is urged by springs to be rolled up. By this means the roller blind mechanism covers the carrier to prevent the passage of unnecessary light on to the viewing screen and sensitized material.

Mounted on the carrier is a means for adjusting the length of the line to be reproduced and the thickness of the line to be reproduced. These lines are positioned beneath a slot 20b in a cover member 20a so that an image of a selected line may be projected on to the viewing screen. The length of the line is determined by the positioning of two steel plates of masks (shown in chain dotted lines in FIG. 2 at 29). These plates are moved towards and away from each other by drive motors (not shown) under the control of switches which control the supply of voltage pulses to drive the motor in the forward or reverse direction as required to determine the length and position of the line. The thickness of the line is derived from an opaque sheet on which a plurality of slots of different widths are cut out. Thus the slots at one side of the sheet are wide and adjacent slots are of gradually decreasing thickness until the slots on the other side are narrow. The sheet is mounted in a framework connected to a movable carrier 63. Mechanism is provided for moving the movable carrier and slotted sheet across the carrier 20. This slot moving mechanism 30 embodies a pair of toothed plates 31, 32 (FIG. 3). One toothed plate 31 is connected to the armature of a solenoid 33 so as to be movable therewith whereas the other toothed plate 32 is fixed to the framework of the main carrier 20. A further solenoid 34 mounted on the carrier has a sleeve 35

on its armature and this sleeve is engaged by a bell crank lever 36. The end of one arm of the bell crank lever is engaged by the sleeve 35 and the end of the other arm of the bell crank lever engages a sleeve 37 on a rod 38. The opposite ends of the rod 38 are of conical shape i.e., with pointed ends and these pointed ends engage alternately in the teeth in the toothed plates 31,32. It is arranged that the solenoids 33, 34 are energized alternately. Thus solenoid 34 is energized first when it is required to move the sheet carrier in one direction and the solenoid 33 is energized first when the sheet carrier is to be moved in the other direction. Energization of the solenoid 34 causes the bell crank lever to pivot counterclockwise (FIG. 3) and causes the rod 38 to move to the right as shown in FIG. 3 whereby the end of the rod engages the toothed plate 31. Movement of the toothed plate 31 on energization of the solenoid 33 causes the plate 31 to move longitudinally against the action of the spring 31a carrying with it the rod 38 to move the carrier carrying the line mechanism by one increment. De-energization of the solenoid 34 causes the pointed rod 38 to retract under the action of the spring 39 so that the other end of the pointed rod engages the next tooth in the toothed plate 32. When the solenoid 33 is energized before the solenoid 34 is energized the toothed plate 31 is moved by the armature of the solenoid 33. When the solenoid 34 is energized after the plate has moved towards the solenoid the rod moves into the next tooth on the toothed plate 31. However, when the solenoid 33 is de-energized the spring 31a pulls the tooth plate 31 in the downward direction with the pointed rod still engaged in a tooth in the plate 31. This moves the sheet carrier by one increment in the reverse direction. By this means the line mechanism is moved by one increment in one direction or the other at each energization of the solenoids. This movement is continued until the desired thickness of line is selected.

Referring again to FIG. 2 of the drawings there is shown a length of magnetic tape 26 mounted between a pair of supports 27 at opposite ends of the framework of the photocomposing machine. The carrier 20 has mounted on it a sensing/read/write/erase head 28. This head is mounted on the carrier 20 so as to be movable with the carriage and across the magnetic tape which is fixed in such a way that signals on the magnetic tape can be erased from the tape, signals can be applied to the magnetic tape or signals applied to the tape can be sensed. The magnetic tape is supported in such a way as to be readily removable so that a new tape can replace an old tape. It will be apparent that the magnetic tape may be mounted on the carrier 20 in which case the sensing head will be mounted on the photocomposing machine framework. More, than one tape sensing mechanism may be provided to sense etc. signals recorded in different channels in the tape. Furthermore, more than one tape may be provided each with co-operating sensing heads to record the positions of different devices in the photocomposing machine.

For use in preparing a printing plate to be used for printing business forms in which vertical lines, horizontal lines and text material are included there are included separate carriers 20 for the vertical lines and for the horizontal lines. These carriers either move in directions at right angles to one another or the photocomposing machine includes optical system to turn the image of the projected line through a right angle

whereby vertical and horizontal lines can be projected. If desired the representations of the lines may be replaced by text material. Each of the carriages include mask mechanism 29 to limit the amount of representation projected on to the viewing screen and on to the sensitized material. A stop-switch 32¹ is connected as an input to the first of the flip-flop oscillators 31¹ which serves as a reset switch to start and stop a supply of clock pulses generated by the clock pulse supply 31¹. The output of the oscillator 30¹ is connected to the first Schmitt trigger circuit 31² and the output of this Schmitt trigger circuit is connected to the first oscillator 30² of a train of flip-flop oscillators 30. The flip-flop oscillators 30³,30⁴,30⁵,30⁶ arranged in cascade in such a way that the train A of pulses A (FIG. 7) transferred from the output of the Schmitt trigger circuit 31² is applied to the flip-flop oscillator 30² to control the other flip-flop oscillators 30³,30⁴,30⁵,30⁶ so that these oscillators are operated in sequence so that the output from these oscillators 30³,30⁴,30⁵,30⁶, is as shown in FIG. 7. Thus the train of pulses given off from the Schmitt trigger circuit 31² is as shown in train A of FIG. 7 whereas the outputs of the four remaining oscillators is as shown on T¹,T²,T³,T⁴ (FIG. 7) as transmitted from the oscillators 30³,30⁴,30⁵,30⁶ respectively. The outputs from the oscillators 30³,30⁴,30⁵,30⁶ are transferred to the respective transistor circuits 33 (which circuits serve as amplifier circuits) the outputs of which circuits 33¹ are passed through the lines 34¹ to the respective windings of a stereo motor having four field windings. It will be apparent that on transmission of a single sensing pulse to the field windings of this motor, the motor will be rotated through one quarter of a revolution, namely 90°.

Associated with the drive circuits for the motors is the magnetic tape 26 with the sensing/read/write/erase head 28. The head 28 is operated under the control of set switch 46 and an erase switch 47. These switches are connected to a circuit to cause energization of a set solenoid 48 and an erase solenoid 49. When it is required to erase a signal applied to the magnetic tape 26 the carriage 20 is halted at one end of the carriage and the erase switch 47 is depressed; this operates the solenoid 49 to close the contacts 49¹ whereby a supply of erasing potential is applied to the tape. Thus as the sensing head is passed over the magnetic tape an erasing signal is applied to the length of the tape and any signals previously applied to the tape are erased from it.

When it is required to apply a signal to the tape the switch 46 is depressed. The sensing head is passed over the tape until a position is reached (corresponding for example to the position of the line) when the head is halted. At this time the solenoid 48 is operated which operation closes the associated contact 48¹ whereby a supply of positive potential is applied through the line 50 through the solenoid contacts 48¹ to the sensing head 28 to cause a signal to be applied to the tape at the required position. It is arranged that this position corresponds to a predetermined halting position of the carriage 20 with respect to the framework of the photocomposing machine. When it is required to sense the position of a signal on the magnetic tape 26 the switches 46 and 47 remain open and the carrier 20 is moved across the magnetic tape. As the head reaches the position where the signal has been applied to the tape the head 28 is energized in such a way that current passes through the coil in the head and this is passed

through the switches 48¹, 49¹ along the line 51 to the amplification circuit 52. A signal is passed out of the amplification circuit to the transistor circuit 52 whereby the solenoid 48 is energized. At the same time a signal is passed to the amplification circuit 54 and along the line 55 to the trigger circuit 31² to switch off the oscillator 30¹ to stop the supply of pulses. As no pulses are then supplied to the drive motor this is halted and the carriage 20 and head 28 are also halted.

A pair of limit switches 56 are provided and located at the end of the travel of the carrier 20. These switches 56 are connected in the circuit to a Relay 57 whose contacts 57¹ are connected in the lines 34 to the drive motor whereby when the relay 57 is operated the phase of the voltage supplied to the motor is changed. A solenoid 59 is included in the circuit and is energized when the head 28 is sensing the signals applied to the tape 26. In this condition the solenoid 59 (FIG. 2) moves the tape 26 by a small amount to compensate of overrunning of the carriage and head 28 when sensing is effected.

Referring to FIG. 5 of the drawings there are shown diagrammatically at the bottom of the sheet three four position control switches 61, 62 and 63 which operate respective contacts to control the masks 29 of the vertical lines mechanism and the masks 29 of the horizontal line as well as the carriage.

Each of these switches has a common control supply contact connected to a voltage supply and capable of being connected to any one of the four contacts to close the contacts to pass the voltage supply to an associated circuit. It is arranged that opposite sets of contacts relate to the same function. Thus the vertically opposite contacts 61¹ of the switch 61 are concerned with the movement of the lower end of the representation representing the vertical lines on the machine. Thus these control the motor to drive the mask at the lower end of the vertical line to cause the mask to move to cover and increase the vertical lines. Similarly the horizontally opposite contacts 61² of the switch 61 are concerned with the movement of the left hand to cover and uncover the horizontal lines. Likewise the vertically opposite contacts 63¹ of the switch 63 control the movement of the upper mask and the horizontally opposite contacts 63² control the movement of the right hand mask.

The switch 62 has a pair of vertically opposite contacts 62¹ which control movement of the carrier to uncover the vertical line across the viewing screen and horizontally opposite contacts which control movement of the horizontal line across the viewing screen.

The contacts of the switches 61, 62, and 63 are also shown in the circuit part of FIG. 5. Each one of the pairs of contacts 61¹, 61², 62¹, 62², 63¹, 63² are connected up to a respective relay, each set of contacts being capable of being connected to two alternative relays whereby the mask or other device is caused to move in one direction or the other. Thus the switch contacts 61¹ are associated with two relays 61¹¹ and 61¹² and the switch contacts 63¹ are associated with two relays 63¹¹ and 63¹² and the switch 62² is associated with two relays 62²¹ and 62²² but these switches 62² are also associated with additional relays 62²¹¹ and 62²²¹ which are provided for the purpose of ganging together the movement of certain mechanism in the machine and are more fully under the control of the switch described in

the Specification of our copending application for British Pat. No: 49249/70.

The manual switches 65, 66, 67 are rotary switches to determine whether the screen mechanism, text mechanism or rule mechanism is to be selected.

The switches 68 in the negative circuit of each of the relays are limit switches to cut off the appropriate relay if the mechanism in question has reached the end of its travel.

The relays 69 and 70 are included to be operative under the control of the contacts 71 of a manual switch which is operative to determine whether the machine is under manual control or under the control of magnetic tape control mechanism 26-28 etc. (FIG. 4).

The relays control drive motors 80-89 to drive masks etc. mechanism as follows:

Relays 63¹¹, 63¹² control the movement of the

Left hand mask to move it in a left to right direction.

Relays 61¹¹, 61¹² control the movement of the right hand mask to move it in a left to right direction.

Relays 63²¹, 63²²

Top mask
Upwards and downwards
direction.

Relays 61²¹, 61²²

Bottom mask
Upwards and downward
direction.

Relays 62¹¹, 62¹²

Line or text
UPwards and downward
direction

Relays 62²¹, 62²²

Line or text
Left to right
direction

The circuit for controlling the drive to a motor from a control switch is shown in greater detail in FIG. 6. Such circuits and drive motors circuits are used to control certain driven members in the photocomposing machine, for example they are used in the drive to the masks to cover and uncover the parts of the lined plates with different widths of lines in them, and they may be used to determine the length of line, or the position of the carriage. As shown in FIG. 6 there is shown a plurality of manual four position rotary switches 41 each having four contacts 41¹, 42², 41³, 41⁴; the positive supply line 42 is connected to the switches 41¹, 41² whereas the negative supply line 43 is connected to the respective switches 41³, 41⁴. These switches are arranged to supply a positive potential either to the line 44 or 45 or a negative potential either to the line 45 or 44 and depending on the plurality of such voltage so a current is caused to pass through selected windings of the electric drive motor 46 in a forward or reverse direction to drive the motor in a forward or reverse direction. By this means the electric drive motors moves in a predetermined direction dependent on the speed of rotation of the respective manual switch 41.

A supply of pulses from the line 34¹ (FIG. 4) is connected to each of the connections to the drive motors 46 and these are connected through normally unmade contacts 47 to the windings of the motor 46. The pulses obtained from the circuits 33¹ are as shown in FIG. 7 where A is the pulse train transmitted from the Schmitt counter 31¹ and the pulses T¹, T², T³, T⁴, are the pulses applied to the various amplification circuits 33¹ and hence to the lines 34¹.

The contacts 47 are contacts of the respective relays 61¹, 61², 62¹, 62², 63¹, 63² and operated and those Relays as described in connection with the operation of FIG. 5

The respective motors 46 drive the respective masks or other mechanisms alternately by alternating current supply or manually. Normally, coarse drive is attained by virtue of the alternating current supply whereas fine drive is by means of the rotation of the electric manual switches 41.

Provision is made for driving the various mechanisms when the photocomposing machine is being used on the one hand for the exposing lines onto the sensitized material and on the other hand for exposing text on the sensitized material. This is attained by a Relay 100 under the control of the switches 65,66,67.

In this case the appropriate switch 65,66,67 is operated to energize the relays 100 whereby different drive motors 46 are operate depending upon which kind of exposure is relevant.

What we claim is:

1. A photocomposing machine comprising:
a carrier for supporting documents to be reproduced;
means for projecting an image of said documents for exposure on sensitized material;
means for adjusting the position of said carrier to alter the position of the image on said sensitized material;
means for recording the positional movements of said carrier; and
means for sensing said recorded positional data to control said means for projecting said image on said sensitized material.

2. A photocomposing machine as in claim 1 wherein said means for positioning said carrier translates said

carrier in either of two directions along a given axis, said means for recording comprises a magnetic tape mounted to the housing of said photocomposing machine along at least a portion of the path traversed by said carrier and a magnetic read-write head mounted on said carrier, and said means for sensing comprises a magnetic sensing head mounted on said carrier.

3. A photocomposing machine as in claim 1 wherein said means for projecting said image includes means for selecting portions of said document for reproduction.

4. A photocomposing machine as in claim 3 wherein said means for selecting includes masking means for selectively covering and uncovering portions of said document to vary the size of the projected image.

5. A photocomposing machine as in claim 1 further comprising pulse generating means responsive to said means for sensing to generate first pulse signals representative of the recorded positional data, and wherein said means for positioning includes drive motors responsive to said pulse signals for moving said carrier.

6. A photocomposing machine as in claim 4 wherein said means for masking includes additional drive motors responsive to said pulse signals for varying the size of the projected image.

7. A photocomposing machine as in claim 6 further comprising manually operative means for generating second pulse signals and switch means for selecting either said first or said second pulse signals to energize said drive motors and said additional drive motors.

* * * * *

35

40

45

50

55

60

65