

[54] PHOTO-COMPOSING MACHINES

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355/51, 355/75

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

[58] **Field of Search**.....355/40, 41, 42, 43,
355/50, 45, 51, 75; 95/4.5 R

[56] **References Cited**

UNITED STATES PATENTS

3,627,411	12/1971	Nagel	355/75
3,576,368	4/1971	Goetz	355/51
3,224,328	12/1965	Leistner	355/50

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[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 mechanism are also provided in the photocomposing machine and these mask mechanism have to be moved at the same time as the carrier. The present invention provides means for moving the text material and means for moving the masks and means for controlling the movement of the drive mechanism to drive the text material and the masks in synchronism whereby the desired text material can be more quickly located in the required position.

4 Claims, 9 Drawing Figures

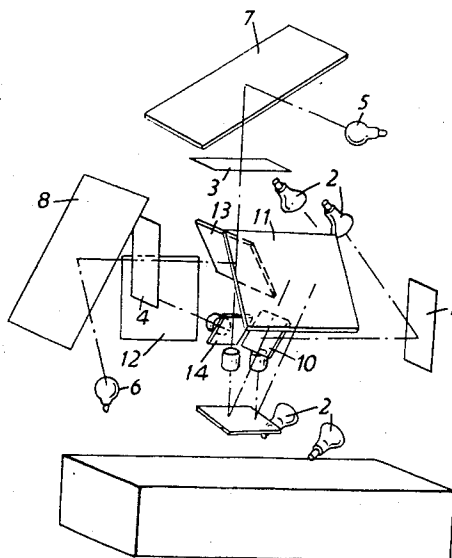
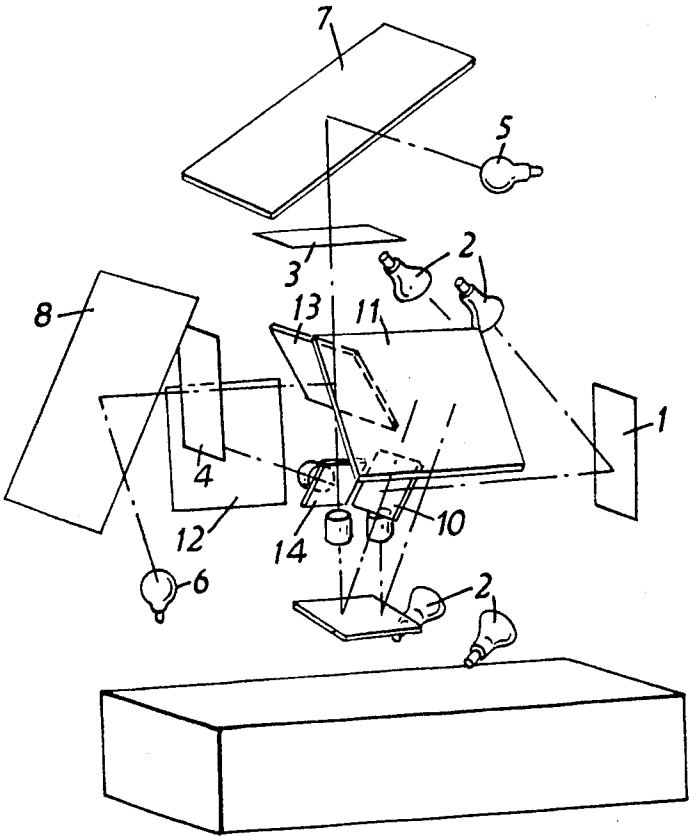
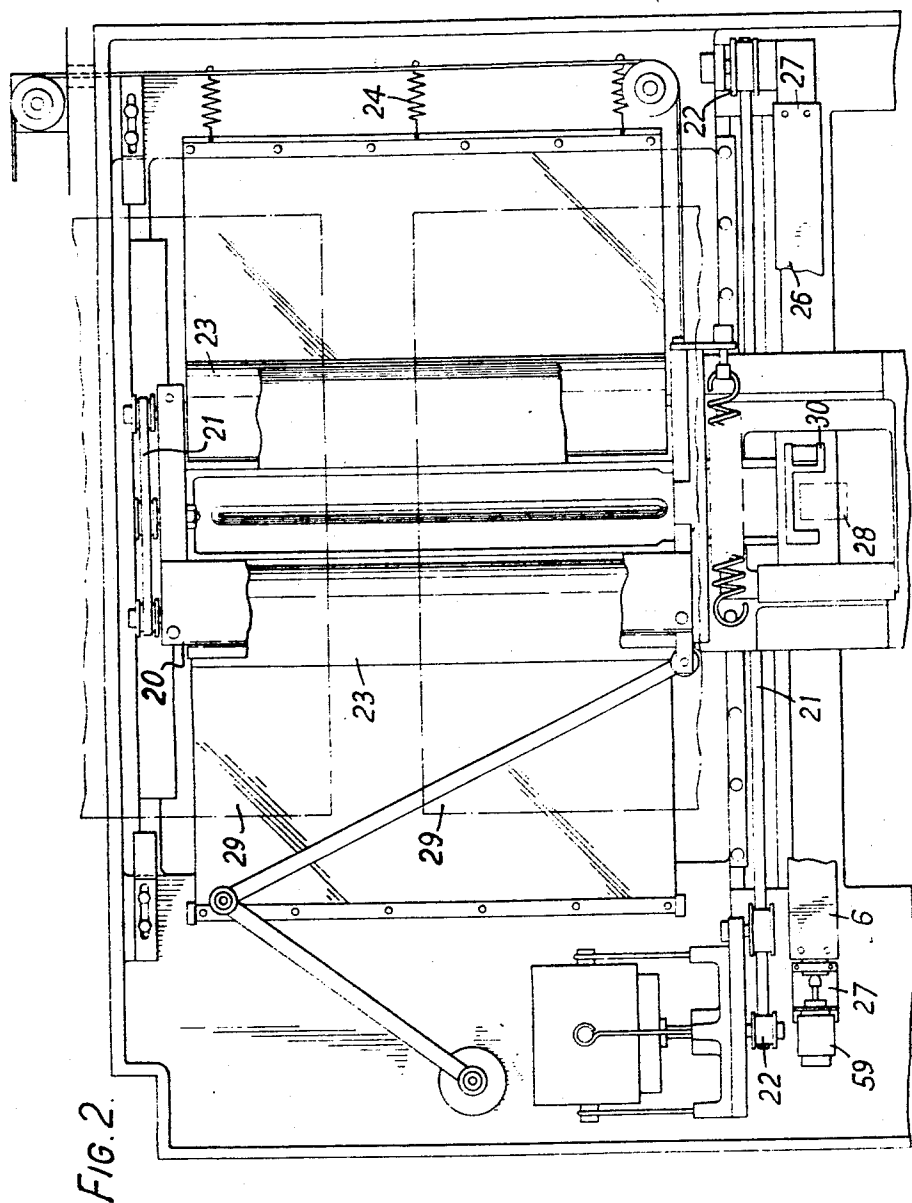


FIG. 1.





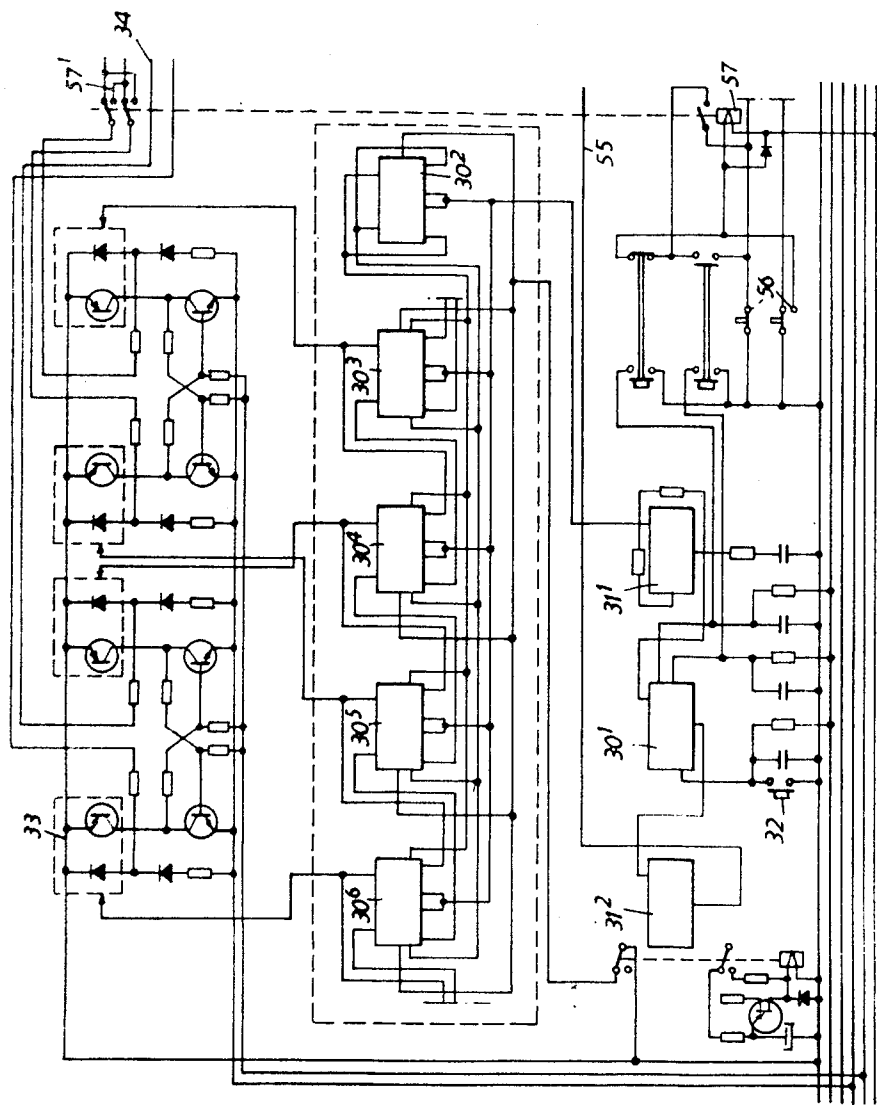
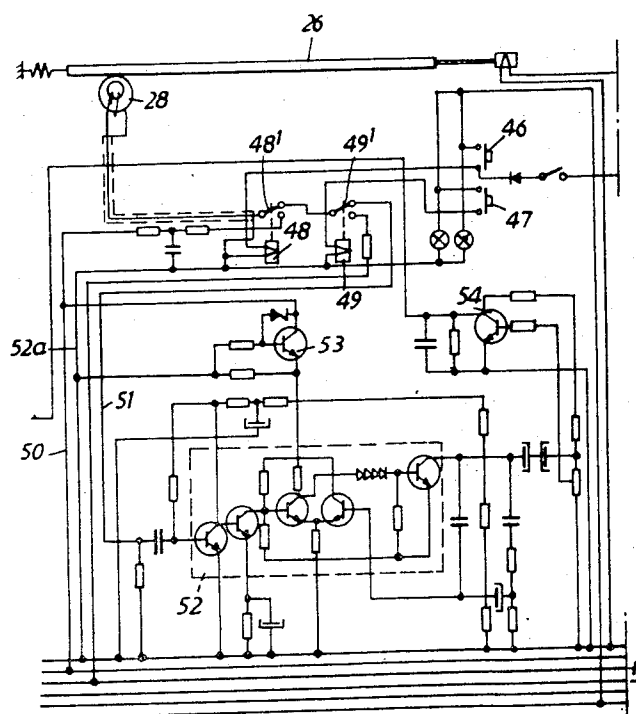


FIG. 3 A

FIG. 3B



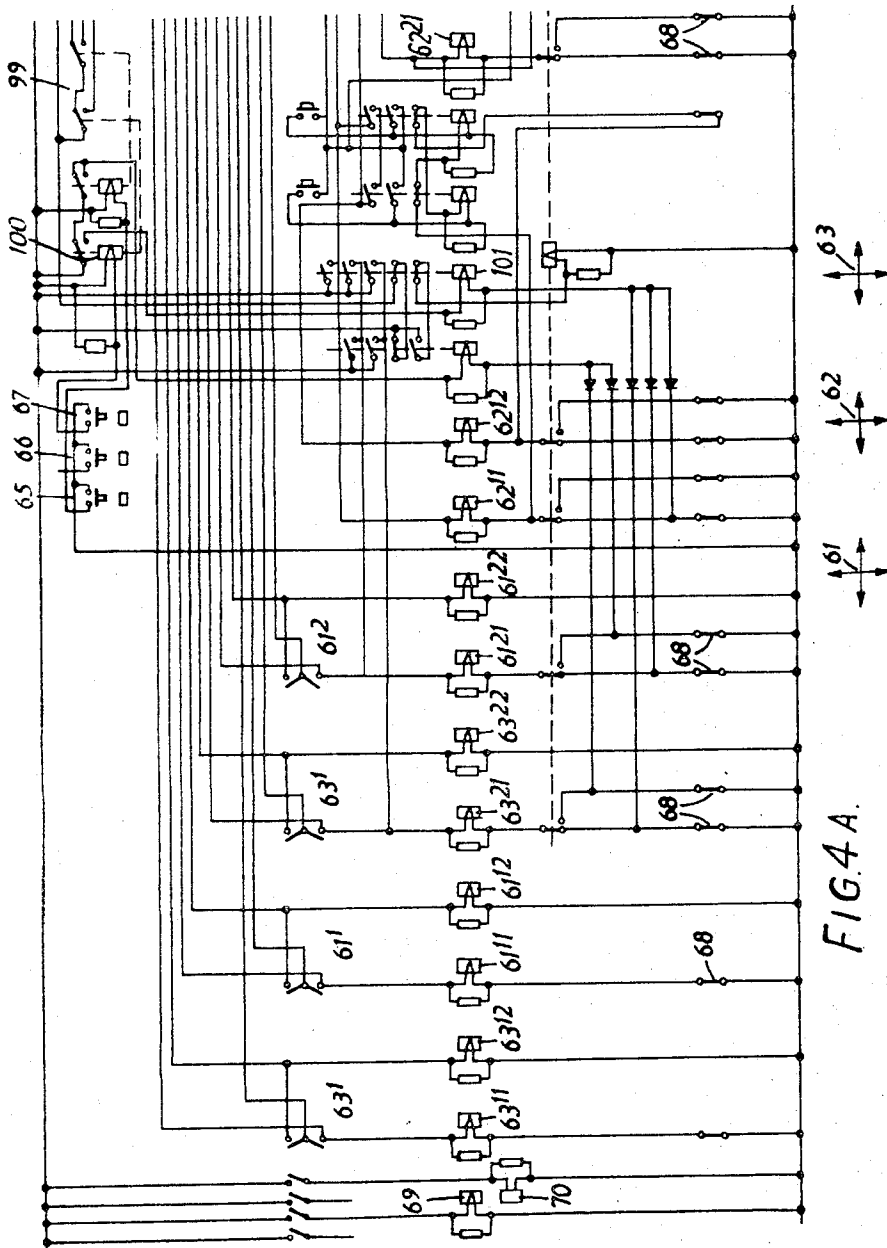
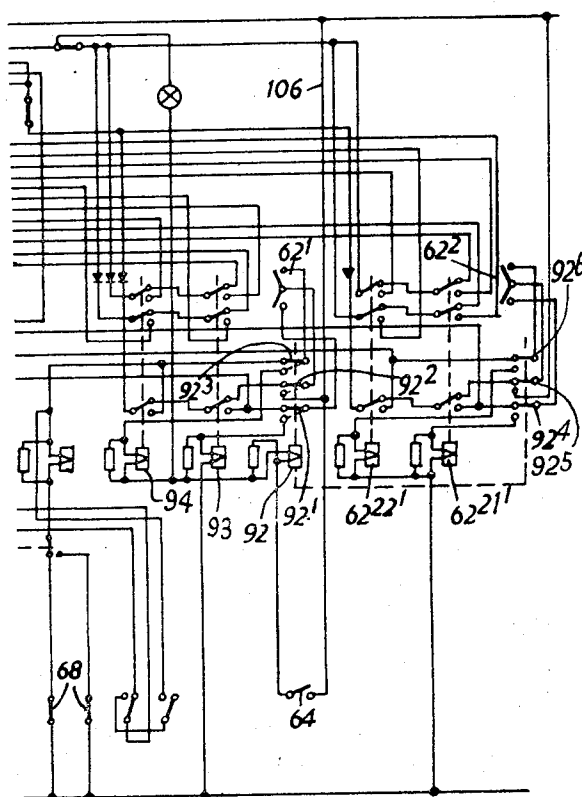
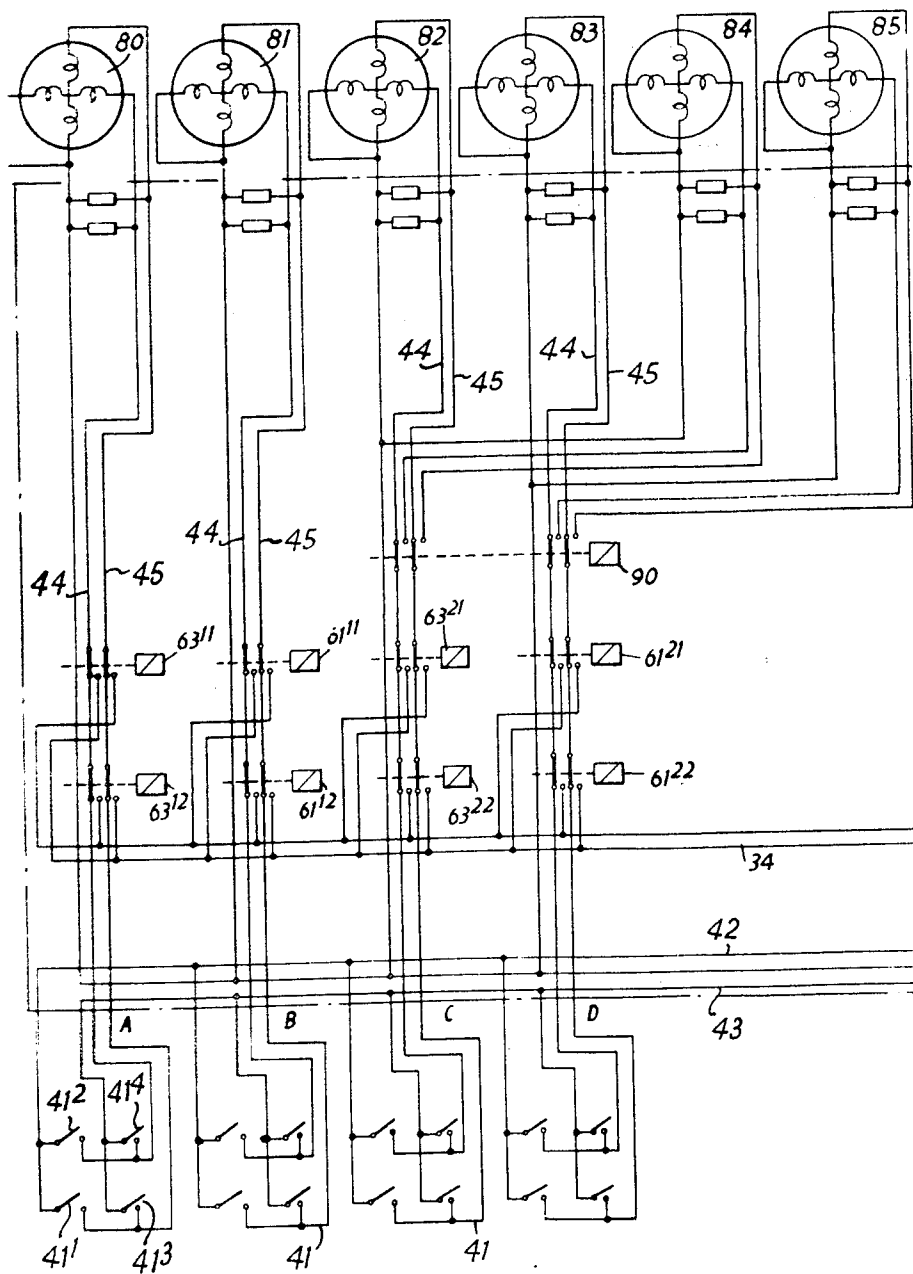


FIG. 4B





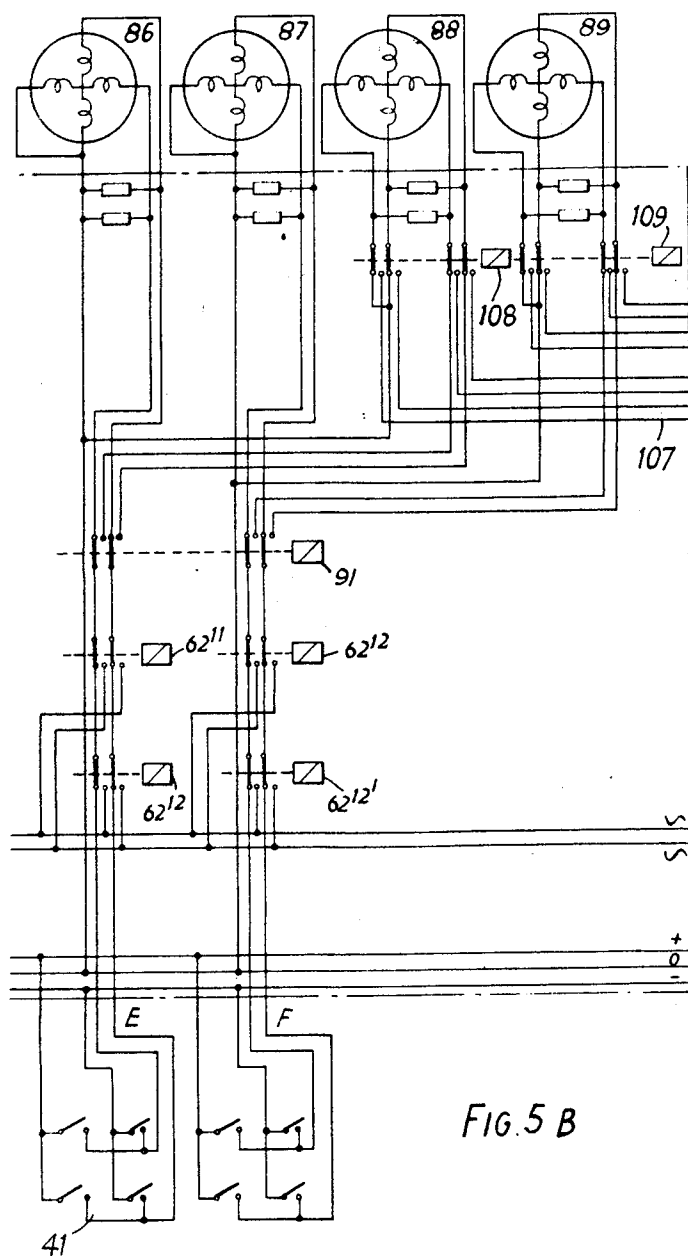


FIG. 5 B

FIG. 6

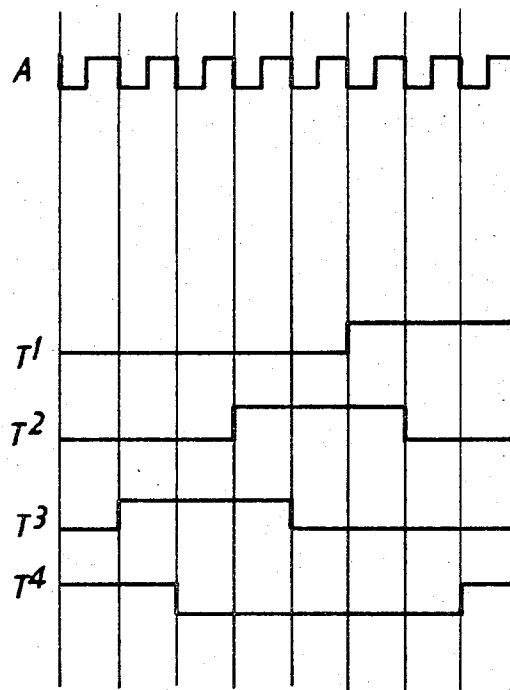


PHOTO-COMPOSING MACHINES

This invention has reference to photocomposing machines.

In the specification of our 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 away 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 as well as the width and length of the line so that an image of the required line is reproduced on the viewing screen. When the position and size of the line of the viewing screen has been adjusted to provide the required line, an image of the line is also projected onto the light sensitized material at a corresponding position whereby the representation of the required line is exposed on the sensitized sheet.

In this machine provision is also made for reproduction of an image of certain text material. The amount of such text material being reproduced on the viewing screen is limited by masks which are moved in such a way as to cover the part of the text which it is not required to copy. When it is required to adjust the position of the selected text matter on the screen it is necessary to move the position of the image of the text material itself and also to adjust the position of the masks so that the selected text only is viewed on the screen.

The necessity for having to adjust the text matter and the mask separately is somewhat time consuming and it is an object of the present invention to reduce the time required to adjust the position of the text matter and masks in the photocomposing machine.

According to the present invention a photocomposing machine includes a carrier for text material; an optical system to reproduce an image of the text material; a mask or masks capable of movement to cover and uncover the text material whereby a selected part of the text only can be reproduced; drive mechanisms for moving the carrier for text material and for moving the masks; and means for controlling the movement of the drive mechanism to drive the carrier, text material, and the masks in synchronism.

Preferably the drive mechanisms include pulsed drive motors, movable in response to the supply of electric pulses, and switch means operable to connect the supply of electric pulses to the respective drive motors in parallel circuits.

A photocomposing machine 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;

FIGS. 3A, 3B, 4A, 4B, 5A and 5B are circuit diagrams of part of the electric circuit of the photocomposing machine; and

FIG. 6 is a diagram showing the pulse sequence.

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 mechanisms 3, 4. The characteristics of the representation to be reproduced may 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 belts 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 unrequired 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, or alternatively to select the text to be reproduced. These lines are positioned beneath a slot 20b in a cover member 20. So that an image of a selected line may be projected on to the viewing screen. The length of the line in the selection of the predetermined text is determined by the positioning of two steel plates or masks (shown in chain dotted lines in FIG. 2 at 29). These masks are moved towards and away from each other by drive motors (not shown) under the control of switches which control the supply of voltage 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 slits of different widths are cut. Thus the slits at one side of the sheet are wide and adjacent slits are of gradually decreasing thickness until the slits are on the other side

are narrow. The sheet is mounted in a framework 62 connected to a movable carrier 63. Mechanism is provided for moving the movable carrier and slotted sheet across the carrier 20 which is more fully described in the specification of our co-pending application for U.S. Pat. No: 47589/70.

A text representation is mounted on the carrier in place of the line representation. In this case the carrier with the text is moved in either one of two directions so that the text is positioned at the required position on the screen and on the sensitized material. The carrier as well as being movable from left to right as shown in FIG. 2 is also movable up and down. The steel masks 29 are movable towards and away from each other and an additional pair of steel plates (not shown) move towards and away from each other in directions at right angles to the direction of movement of the plates 29, each mask being driven by respective drive motors.

A magnetic tape 26 is mounted between a pair of supports 27 at opposite ends of the framework of the photocomposing machine. The carriage 20 has mounted on it a sensing/read/write/erase head 28. This head is mounted on the carriage 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. 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.

Referring to FIG. 3 of the drawings there is shown six flip-flop oscillators 30¹ - 30⁶ and a Schmitt trigger circuit 31² and a supply 31¹ of clock pulses. A stop-switch 32 is connected as an input to the first of the flip-flop oscillators 30¹ 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 and the output thereof is connected to the first Oscillator 30² of a train of flip-flop oscillators 30. The flip-flop oscillators 30², 30³, 30⁴, 30⁵, 30⁶, are arranged in cascade in such a way that the train of pulses A (FIG. 6) transferred from the output of the clock circuit 31¹ 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 therefrom is shown in FIG. 6. Thus the train of pulses given off from the clock 31¹ is as shown in train A of FIG. 6 whereas the outputs of the four remaining oscillators is as shown on T¹, T², T³, T⁴ (FIG. 6) 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 33 are passed through the lines 34 to the respective windings of a servomotor 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 a set switch 46 and an erase switch 47 (FIG. 3B). These switches are connected to a circuit to cause energiza-

tion 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 the 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 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 contacts 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 53 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 the head 28 are halted.

A pair of limit switches 56 (FIG. 3A) 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 moves the tape 26 by a small amount to compensate for overrun of the carriage and head 28 when sensing is effected.

Referring to FIGS. 4A, 4B of the drawings there are shown diagrammatically at the bottom of the sheet three four position control switches 61, 62, 63 with associated contacts as shown in the body of the circuit.

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 but act in opposite directions. Thus the vertically opposite contacts 61¹ of the switch 61 are concerned with the movement of the lower end of the object representing the vertical lines on the machine to move the masks along the lines. Similarly the horizontally opposite contacts 61² of the switch 61 are concerned with the movement of the left

hand mask. Likewise the vertically opposite contacts 63¹ of the switch 63 control the movement of the upper masks 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 vertically line or vertically arranged text across the screen and horizontally opposite contacts 62² which control movement of the horizontal line or horizontally arranged text across the screen.

Each of the pairs of contacts 61¹, 61², 62¹, 62², 63¹, 63² of the switches 61, 62, 63 are connected 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. The relays have associated contacts connected in the circuits to drive motors as will be hereinafter described. 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 for the purpose of ganging together the movement of the carrier on which is mounted the text to be copied as well as the masks to shield the text not required to be copied so that the carrier and masks may be moved together in synchronism. Thereby the selected text can be accurately, positively and quickly positioned on the viewing screen and on the sensitized material. These relays 62²¹¹ and 62²²¹ are operative under the control of a manual, preferably a front operated switch 64, which when in the closed position operates a relay 92 to close the first lower contacts (as shown in FIGS. 4A, 4B) 92¹, 92³ of the relay to energize the two relays 94, 93 to operate the switches associated with these relays. This ensures that in the closed position of the switch 64 the pulses supplied to the drive motor to drive the text carrier to move the carrier in the up and down direction are also passed to the drive motors to drive the Top Mask and Bottom Masks in synchronism with the text carrier. As the same number of pulses are supplied to the motors are and as the gearing etc. associated with the motors similar the text carrier and the masks will be moved by the same amount and will be driven in synchronism. Similarly the contacts 92⁴, 92⁶ are operated by the Relay 92 and closure of these contacts serve to drive the text carrier in a left and right direction in synchronism with the masks which are likewise driven in a left to right direction. In the open position of the switch 64 the relay 92 is de-energized and the relays 62²²¹ and 62²¹¹ are not operative, therefore the motors to drive the master and text carrier are not ganged together and the motors to drive the master and text carriers have to be operated separately.

The manual switches 65, 66, 67 are switches for selecting the screen mechanism, text mechanism or rule mechanism. These switches are included in the circuits to the relays 90, 91 (FIGS. 5A, 5B) to control the associated contacts.

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 (that is the text or mask carrier) 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. (FIGS. 3A, 3B).

Referring to FIGS. 5A, 5B the various relays (shown in FIGS. 4A, 4B) control drive motors to drive masks etc. so that the mechanism operates as follows:

Relays 63¹¹, 63¹² control the circuit to the drive motor 80 to drive the Left hand mask to move it in a left to right direction. Relays 61¹¹, 61¹² control circuit to the drive motor 81 to drive the right hand mask to move it in a left to right direction.

Relays 63²¹, 63²² control the circuit to the drive motor 82 to drive the Top Mask to move it in an Upwards and Downwards direction.

Relays 61²¹, 61²² control the circuit to the drive motor 83 to drive the Bottom mask to move it in an Upwards and downward direction.

Relays 62¹¹, 62¹² control the circuit to the drive motor 86 the Line or Text Masks to move it in an Upwards and downward direction.

62²¹, 62²² control the circuit to the drive motor 87 the Line or Text to move it in a left to right direction.

The circuit for controlling the drive to a motor from a manual control switch is also shown in greater detail in FIGS. 5A, 5B. Such manual circuits and drive motor 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 texts, and they may be used to determine the position of the masks covering the text. A plurality of manual four position rotary switches 41 each has four contacts 41¹, 41², 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 a line 44 or 45 and a negative potential either to the line 44 or 45 connected to windings of a selected one of the drive motors 80-89. Depending on the polarity of such voltage so a current is caused to pass through selected windings of one of the electric drive motors 80-89 in a forward or reverse direction to drive the motor in a forward or reverse direction. By this means the electric drive motor moves in a predetermined direction dependent on the speed of rotation of the respective manual switch 41.

A supply of pulses from the line 34 also shown in (3A) 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 motors 80-89. The pulses obtained from the circuits 33 are as shown in FIG. 6 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 33 and hence to the lines 34.

The motors 80-89 drive the respective masks or other mechanisms alternately by alternating current supply or manually by the switches 41. 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 for

exposing lines onto the sensitized material and, alternatively, for exposing text on the sensitized material. This is attained by a Relay 100 (FIG. 4A) or Relays 90,91 (FIGS. 5A, 5B) under the control of the switches 65, 66, 67.

In this case the appropriate switches 65,66,67 are operated to energize the relays 100, 101 whereby different drive motors are operate depending upon which kind of exposure is relevant. The switch 65 is only relevant when the text mechanism is operative.

In the case where it is required to expose text material and where it is required to position that text on the screen and on the sensitized material the text position and the first text position is selected by driving the text carrier and the masks whereby the selected text is in the required position on the viewing screen and on the sensitized sheet. The sensitized sheet is then exposed. If a new text is required the switch 64 is closed and the position of the carrier and the positions of the masks are adjusted whereby the carrier and the masks are positioned so that the required new text is shown on the viewing screen. This is attained by moving the carrier and the masks in synchronism so that the said carrier and masks move by the same amount.

Furthermore when it is required to control the drive of the various motors under the control of one or more magnetic tape mechanisms the signals are derived from the tape devices 26, 28 through line and controlled by control relays 108,109 which are change relays operative by control switches to determine whether the machine is operative under the control of the magnetic tape mechanisms or under manual control.

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 covering portions of said document for reproducing selected portions thereof; means for moving said carrier and said means for covering; and

- 5 means for controlling said means for moving whereby said carrier is moved synchronously with said means for covering.

2. A photocomposing machine as in claim 1 wherein said means for controlling includes means for generating pulses and switching means for connecting said pulses to said means for moving said carrier and said means for moving said means for covering.

3. A photocomposing machine as in claim 2 wherein said means for covering includes a first pair of spaced mask members extending parallelly across said carrier and a second pair of spaced mask members extending parallelly across said carrier in a direction transverse to said first pair of mask members; said means for moving said means for covering includes a pulse step motor for moving each of said mask members; said means for moving said carrier includes a pulse step motor; said switching means includes a pair of relays for each of said pulse motors and an associated two-position switch for actuation of said pair of relays whereby with said associated switch in one position of said pair of relays is actuated to drive the associated step motor in one direction and with said associated switch in the other of said two positions the other of said pair of relays is actuated to drive the associated step motor in the opposite direction.

4. A photocomposing machine as in claim 3 wherein said means for controlling further includes synchronizing switch means for providing synchronous or independent control of said step motors and said switching means further includes first switch means for actuating the step motors for moving said first and second pairs of mask members independently of said step motors for moving said carrier and a second switch for actuating the step motor moving said carrier independently of said first and second pairs of spaced mask members.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,732,009 Dated May 8, 1973

Inventor(s) George William Callum

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

[30] Foreign Application Priority Date

October 16, 1970 Great Britain No. 49249/70

Signed and sealed this 22nd. day of January 1974.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

RENE D. TEGTMEYER
Acting Commissioner of Patents

UNITED STATES PATENT OFFICE
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