# United States Patent [19]

**Friedel**

[11] **3,777,634**

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[54] **PHOTOGRAPHIC COMPOSING DEVICE**


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[73] Assignee: **Visual Graphics Corporation,** New York, N.Y.



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[52] **U.S. Cl.** ..... **95/4.5**

[51] **Int. Cl.** ..... **B41b 17/06**

[58] **Field of Search** ..... 95/4.5; 340/324, 340/378



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*Primary Examiner*—John M. Horan

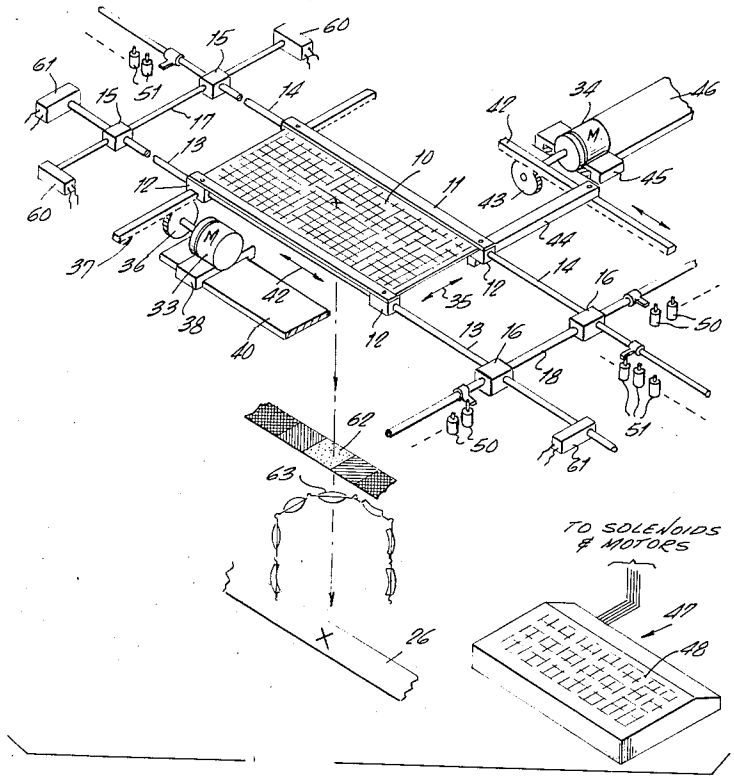
*Attorney*—Albert F. Kronman



[57] **ABSTRACT**

A photographic device for aligning, spacing and printing a series of symbols upon a photosensitive member. The symbols are arranged on a grid-type transparency frame which is mounted on a rectangular coordinate system of sliding guides so that any one of a large number of symbols can be selected and moved to a printing position. An optical system focuses the light from the symbol onto a photosensitive member and the member is then developed and fixed to produce the desired indicia.


**4 Claims, 9 Drawing Figures**



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SHEET 1 OF 3




FIG. 7




FIG. 8




FIG. 2




FIG. 1

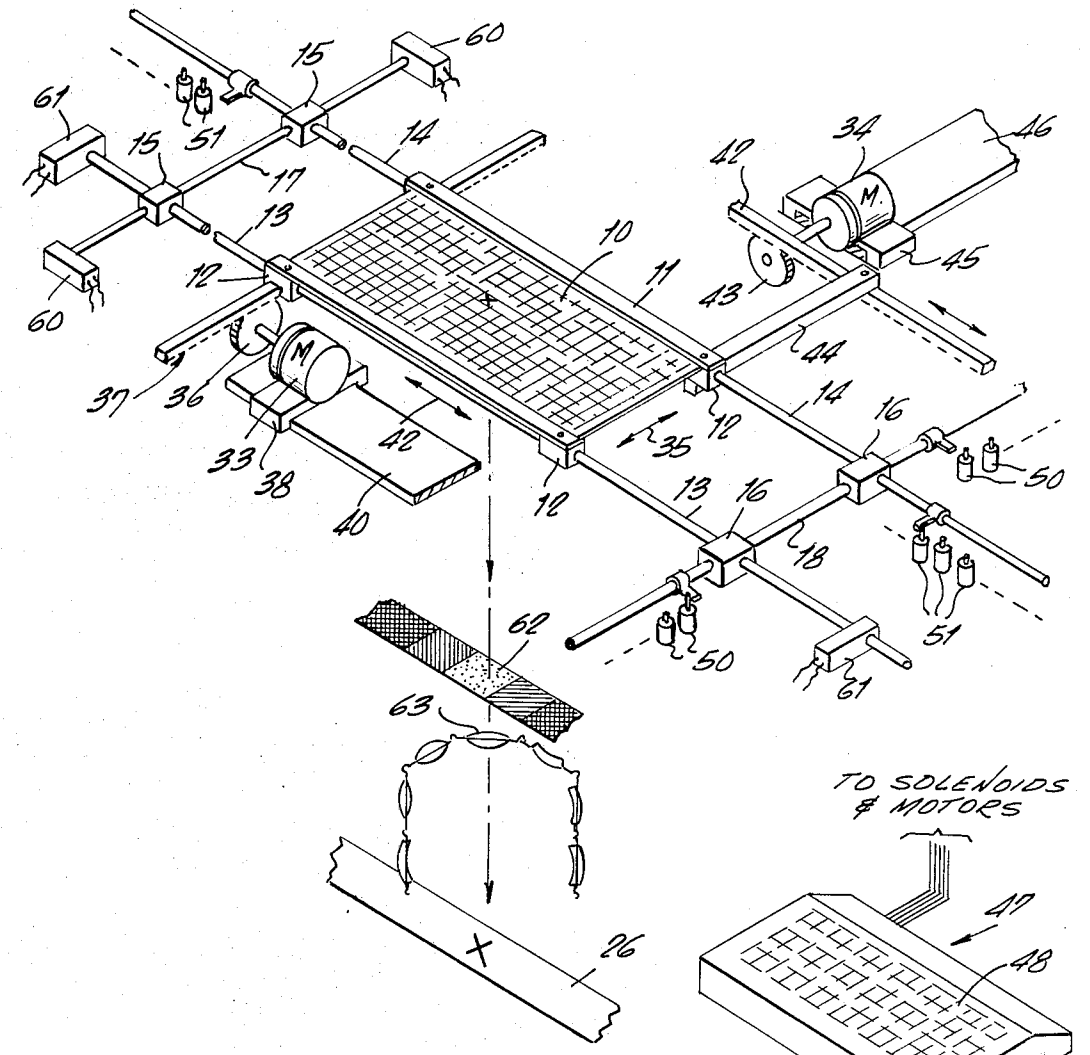



FIG. 3

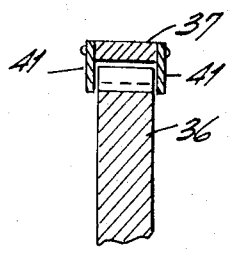


FIG. 4

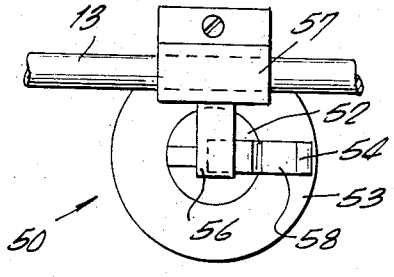


FIG. 5

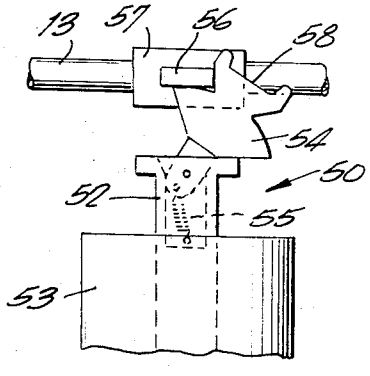
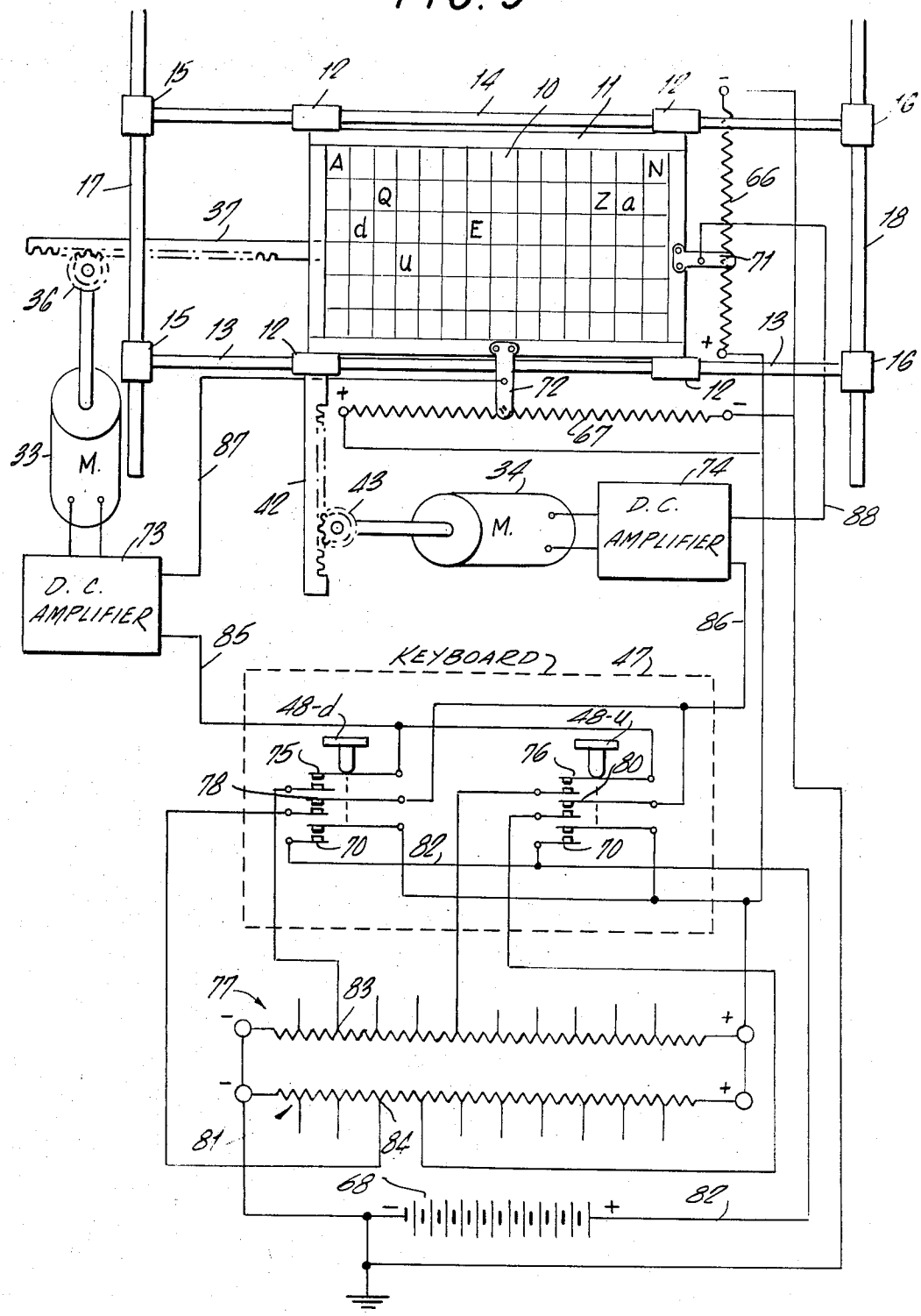


FIG. 6

FIG. 9



# PHOTOGRAPHIC COMPOSING DEVICE

## BACKGROUND OF THE DISCLOSURE

This invention relates generally to an improved transport for a plurality of symbols in a photographic composing device which permits the imprinting of symbols upon a sensitized paper to produce a complete message.

It is well-known to project a series of letters or figures from a transparency strip to form a latent message on a photosensitized strip which may then be developed and fixed in the usual manner. One such device has been described and claimed in U.S. Pat. No. 3,080,802, issued Mar. 12, 1963 to Murray Friedel. This device uses a flexible transparency strip for moving the symbols through an object plane, the printing positions of the symbols being adjusted by manual means. Another photographic composing device is described and claimed in U.S. Pat. No. 3,115,815 issued Dec. 31, 1963, also to Murray Friedel. This device increases the speed of operating and also permits the operator to adjust the optical projection system to change the size of the photographed symbols. An additional structure permits the operator to view the sensitized strip during the exposure and developing operations. However, both the above mentioned patents describe devices which use an elongated transparency film to carry the symbol images and, because of this, the operation takes considerable time to reel the film from one spool to the other in selecting a desired symbol.

When the symbol font is on a long film there is also considerable wear and scratching due to constant winding and unwinding, and rubbing the emulsion over the exposure window. Some films cannot be stored flat, but must be kept in a rolled condition, thereby maintaining a curl which must be corrected at the exposure window. The present invention corrects these difficulties by the use of a flat, rigid, sheet of symbols which increases the speed of selection and registration, and provides an improved and simplified means of handling and storing the film fonts.

One of the features of the invention is a flat oblong transparency font containing all the symbols in a single rigid mounting.

Another feature of the invention is its adjustable mounting for moving the transparency to a desired printing position. Linear slides on supporting rods give the font rectangular coordinate motion and make symbol selection fast and without abrasion of the transparency surface.

Still another feature of the invention is the addition of an automatic selection means whereby a depression of a key operates an electric motor to move the transparency to bring a desired symbol into the printing position.

Other features and additional details of the invention will be disclosed in the following description, taken in connection with the accompanying drawings.

## BRIEF DESCRIPTION OF THE FIGURES

FIG. 1 is a schematic perspective view of a portion of the selection device, showing the transparency font on its movable carriage, the photosensitive strip, and the reference font.

FIG. 2 is an end view of the portions of the device shown in FIG. 1 with the addition of parts of the optical system.



FIG. 3 is an exploded perspective view of an alternate form of the invention using electric motors, solenoids, and a keyboard to operate the symbol selection means.

FIG. 4 is a cross sectional view of a rack and pinion used in the automatic registry system shown in FIG. 3.

FIG. 5 is a top view of one of the solenoids used with the automatic system. A stop is shown in contact with the solenoid core.

FIG. 6 is a side view of the solenoid shown in FIG. 5 with the solenoid core stop in its actuated position.

FIG. 7 is a perspective view of a series of lens mounts, some of them anamorphic, which may be moved into the optical system to change the size of the symbols and also to change their shape. This view also shows a transparent Benday strip which may be used in the optical system to give a desired shading effect.

FIG. 8 is a schematic diagram of connections of a reversing switch which may be used with the device shown in FIG. 3.

FIG. 9 is schematic diagram of connections of a completely automatic system of symbol selection using two servomotors and two voltage dividers to determine the font position.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. 1 and 2, a transparency font 10 of symbols which may include letters, figures, and punctuation marks, is mounted in a carriage 11. The carriage 11 includes four rigid side pieces 11*a*, 11*b*, 11*c*, 11*d*, which retain the transparency in a flat condition. Suitable resilient clips (not shown) can be used to hold the transparency font while in use, but permit its easy replacement with another font when the type faces are to be changed. Each transparency includes all the symbols which may be used for a message, each symbol occupying a square or oblong area, and all the symbols arranged in rows and columns.

At each corner of the frame carriage a slide bearing 12 is secured, each bearing including a hole for slidably receiving a rod 13, 14. Rods 13, 14 are mounted parallel to each other and permit the font carriage 11 to move to the right or left when an operator is bringing a desired symbol into printing position. The ends of rods 13, 14 are secured to four similar slide bearings 15, 16, each formed with a hole for slidably receiving two other rods 17, 18. Rods 17 and 18 are secured to the framework (not shown) of the device and are arranged parallel to each other and normal to rods 13, 14, so that the font carriage 11 and rods 13, 14, can be moved toward and away from the front of the device. The carriage 11 and its supporting rods are mounted in a suitable light tight housing.

The rear frame member 11a is secured to a flat upstanding guide 20 of a generally tapered shape and supports a horizontal control arm 21 at its lower end. An oblong or square aperture 22 is provided near the end of the control arm 21 for registry with a selected symbol 23 printed on a registry sheet 24. The registry sheet 24 is mounted on the machine bed and is held stationary by suitable means. A collection of symbols, corresponding to those in the font 10, is printed on sheet 24 so that, when a desired symbol is observed through aperture 22, the same symbol in the font 10 is in register with the optical system and its image 25 appears on a photosensitive member 26.

The elements of the optical system are shown in FIG. 2 in schematic array. The system includes a source of light **27**, a retractable red filter **28**, a condensing lens system **30**, the font transparency **10**, a focusing lens **31**, and the photosensitized member **26**, mounted in the image plane of lens **31**. A similar optical system is shown in both of the above listed patents.

The operation of this embodiment of the invention is as follows: With the red filter **28** in the position shown in FIG. **2**, a portion of the photosensitive member **26** is moved into the image plane of lens **31**. Then the operator moves the font **10** along rods **13**, **14**, **17**, and **18** until the symbol to be printed appears in the aperture **22**. Then the exposure is made by retracting filter **28**. The member **26** is now moved to the next printing position and the operation repeated. It is obvious that the operator can find the desired symbol easily since the entire arrangement of symbols is printed on sheet **24**.

Referring now to FIGS. **3** through **6**, a second embodiment is shown, but using the same transparency font **10** as before. The bearings and rod guides are also the same as described above, but in this case the font carriage **11** is moved by two motors **33** and **34**. Motor **33** moves the carriage **11** in a direction indicated by double arrow **35** and is coupled to the carriage **11** by a pinion **36** and a gear rack **37** secured to the carriage. The motor **33** is mounted on a slidable bridge **38** on flat guide bar **40**. FIG. **4** shows the details of the rack **37** and pinion **36**, the rack **37** including two flanges or shroud plates **41**. The flanges **41** and the guide bar **40** are necessary to permit movement of the carriage **11** along rods **13**, **14** in the direction of the double arrow **42**.

The second motor **34** is coupled to the carriage **11** by means of gear rack **42**, pinion **43**, and coupling bar **44**. Rack **42** is provided with flanges as shown in FIG. **4** and the motor **34** is secured to a bridge **45** sliding on flat guide bar **46**. The motors receive their energy from a keyboard **47** which is provided with a key **48** for each symbol on the font **10**.

In order to position the font carriage **11** accurately, a series of solenoids **50** is used to stop the carriage in its transverse travel and a similar series of solenoids **51** is used to stop the carriage longitudinally. Each solenoid **50**, **51** includes a ferro-magnetic core **52** inside an electromagnetic winding **53**. The top portion of the core **52** is slotted (see FIGS. **5** and **6**) and a rockable stop **54** is mounted therein. The stop **54** is normally held errect in a neutral unactuated position by a small spring **55** and when a limit arm **56**, secured to a clamp **57** and one of the rods **13**, **14**, **15**, **16**, is moved against one of its edges, the stop **54** moves to one side, permitting the limit arm to be positioned directly over the center of the solenoid axis. If the limit arm approaches from the right instead of the left, the stop **54** is moved in the other direction, but the limit arm comes to rest in the same position. In the event that the limit arm is already at the desired position, the arm is clamped by a flat end portion **58** and held there until the key **48** is released. Each key **48** is connected to a solenoid **50** which determines the row of the font, and a solenoid **51** which determines the column. As the key **48** is depressed, the solenoids **50** and **51** are activated causing the cores **52** to be elevated. Then, when further depressed, both motors are started, moving the font until stopped by the limit arms **56** coming in contact with the stops **54**. A pair of reversing switches **60** is mounted on one of the rods **17** to reverse the direction of motor **33** in case the motor starts in the wrong direction and moves away from the desired font position. A similar set of reversing switches **61** is mounted on rod **13** to reverse the direction of motor **34** for the same reason.

Light from the symbol in the font **10** may be altered on its way to the photosensitive member **26** by either a Benday transparency **62** or an auxiliary lens **63**. The Benday transparency **62** may be used to create a shading effect or to set off some of the symbols by the use of cross hatching lines. The auxiliary lens **63** may include surfaces having a cylindrical shape, in which case the images projected on the photosensitive member **26** will be condensed, expanded, or given a pronounced slanting characteristic. FIG. **7** shows a Benday strip **62** on a flexible base suitable for mounting on two spools (not shown). In this figure a collection of auxiliary lenses **63** is shown, each lens mounted in a flat, square holder **64**, and all the holders **64** linked together by hinges **65**. When these auxiliary components are used they are operated as a belt and indexed into register with the optical axis of the projection system.

The servosystem shown in FIG. **9** is used when fully automatic symbol retrieval is desired. The font of symbols **10** is mounted in a carriage **11** as before and the sliding bearings **12** on rods **13**, **14**, operate as described above. Motors **33** and **34** are coupled to the font carriage **11** by gear racks **37** and **42**. In this embodiment there are no solenoids and no reversing switches as shown in FIG. **3**. Instead, the position of the carriage **11** is determined electrically by the aid of two voltage dividers **66** and **67**. Each divider comprises a long resistance unit having its end terminals connected to a source of direct current potential which may be battery **68**. In the circuit shown in FIG. **9**, the battery is connected in series with a plurality of normally open contacts **70**, one under each key in the keyboard **47**. This connection is made to conserve current and reduce heating. The only time the battery **68** delivers current is when a key **48** is depressed.

A sliding contact **71** is secured to the carriage **11** and makes contact with divider **66**. Contact **71** is moved along the resistance **66** when the carriage **11** is moved toward or away from the operator. A similar sliding contact **72** is also secured to the carriage **11** and makes contact with divider **67**. Contact **72** is moved along resistance **67** when the carriage **11** is moved to the right or left of the central portion of the machine in a longitudinal direction. Motors **33** and **34** are respectively connected to direct current power amplifiers **73** and **74** and one input terminal of each amplifier is connected respectively to a sliding contact **71** and **72**. The other input terminals of the amplifiers **73** and **74** are connected to normally open contacts **75** and **76** in the keyboard.

The keyboard **47** contains as many keys as there are symbols to be photographed. In FIG. **9** only two keys **48-*u*** and **48-*d*** are shown for the sake of clarity. Each key closes three sets of normally open contacts, an upper one (such as **75** or **76**) to close a circuit between an input terminal of D.C. emplifier **73** and a permanent point on a voltage divider **77**. A middle contact **78** or **80** closes a circuit between an input terminal of D.C. amplifier **74** and a permanent point on another voltage divider **81**. The lower contacts under each key, as mentioned above, connect the positive terminal of battery **68** with one end of each of the four voltage dividers **66**,

67, 77, and **81.** Contacts **70** can be omitted and a single switch connected in series with conductor **82** from the positive terminal of the battery. In that case the battery will provide current for all four dividers during the total time the device is in use. As shown in FIG. **9,** each voltage divider **77** and **81** is provided with nine permanent contact points. This will provide the voltage combinations necessary for positioning **81** symbols, the symbols for such a circuit being arranged in a rectangular frame having six rows and **14** columns of symbols.

The operation of this form of the invention is as follows: With all the keys **48** in their undepressed position, no current is applied to the four voltage dividers, but it is assumed that the amplifiers are operational and that steady field current is flowing in both motors **33** and **34.** Now, let it be assumed that the operator wishes to print a lower case *d* on the photosensitive member **26.** The *d* symbol is in the third row and second column, so the operator depresses the key **48-***d* whose upper contact **75** is connected to point **83,** the second point on voltage divider **77,** and whose middle contact **78** is connected to the third point **84** on voltage divider **81.** These connections to the two voltage dividers apply definite voltages to conductors **85** and **86** which are connected to input terminals of amplifiers **73** and **74.** The other amplifier input terminals are connected by conductors **87** and **88** to the movable contacts **71** and **72** bearing on voltage dividers **66** and **67.** If there is any difference in voltage applied to either of the amplifiers, the voltage is amplified and sent to motor **33** which moves the font to the right or left, or motor **34** which moves the font carriage in a transverse direction. The motor action continues until the contacts **71** and **72** have the same voltages as points **83** and **84.** At this condition the inputs to the amplifiers are zero and the action stops.

The font carriage **11** is now in position to print a *d* and the operator can now proceed to expose the photosensitive material **26** and develop the image as disclosed in the above mentioned patents. The second letter *u* is automatically selected by depressing the second key **48-***u*. The action is the same as described above. In order to provide for reversing the motors, it is obvious that a separate field winding for each of the motors is required. The power supply to the fields is not affected by the keyboard or by any other component shown in FIG. **9.** The above operation is accurate in selecting symbols only if the key is held down until the carriage movement is complete. Also, only one key may be depressed at a time. A ball or banjo lock may be added to insure single key action.

Having thus fully described the invention, what is claimed as new and desired to be secured by Letters Patent of the United States, is:

**1.** A photographic composing device for projecting the image of indicia upon a photosensitive member comprising:

a. An indicia bearing transparency,

b. A carriage to support the transparency, said carriage comprising spaced pairs of rods normally disposed with respect to each other, bearing members slidably received upon the rods and a rigid transparency support member carried upon the bearing members

c. Means including a first electric motor coupled to the transparency support for moving the transparency along one path of rectangular coordinates, a second electric motor coupled to the transparency to move it along the other path of rectangular coordinates, a plurality of limit stops to stop the transparency support at a desired location.

d. An optical projection system, including a light source directed through a selected portion of the transparency and a lens system to focus the light coming through the transparency upon the photosensitive member, and

e. Keyboard means connected to the said motors and limit stops to bring a selected portion of the transparency into register with the optical axis of the projection system to direct an image of the indicia upon the photosensitive member.

**2.** A device according to claim **1** in which the limit stops are operated by electrical solenoids each of said solenoids being responsive to a key on the keyboard.

**3.** A device according to claim **1** in which the carriage transport includes a first voltage divider, a movable contact secured to the transparency support, movable therewith and connected to at least one motor, a second voltage divider having a plurality of conductors connected thereto in spaced array, and the keyboard comprises a plurality of manually operable keys for each of the items of indicia on the transparency, each of said keys adapted to close a normally open pair of contacts connected in series between one of the conductors connected to the second voltage divider and said motor and a source of direct current power connected across both voltage dividers.

**4.** A device according to claim **3** in which a direct current amplifier is coupled to the input terminals of the motor.

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