Sept. 29, 1953 W. E. PEERY 2,653,526

PRINTING SYSTEM FOR PHOTOCOMPOSING MACHINES OR THE LIKE

Filed Aug. 13, 1948 2 Sheets-Sheet 1

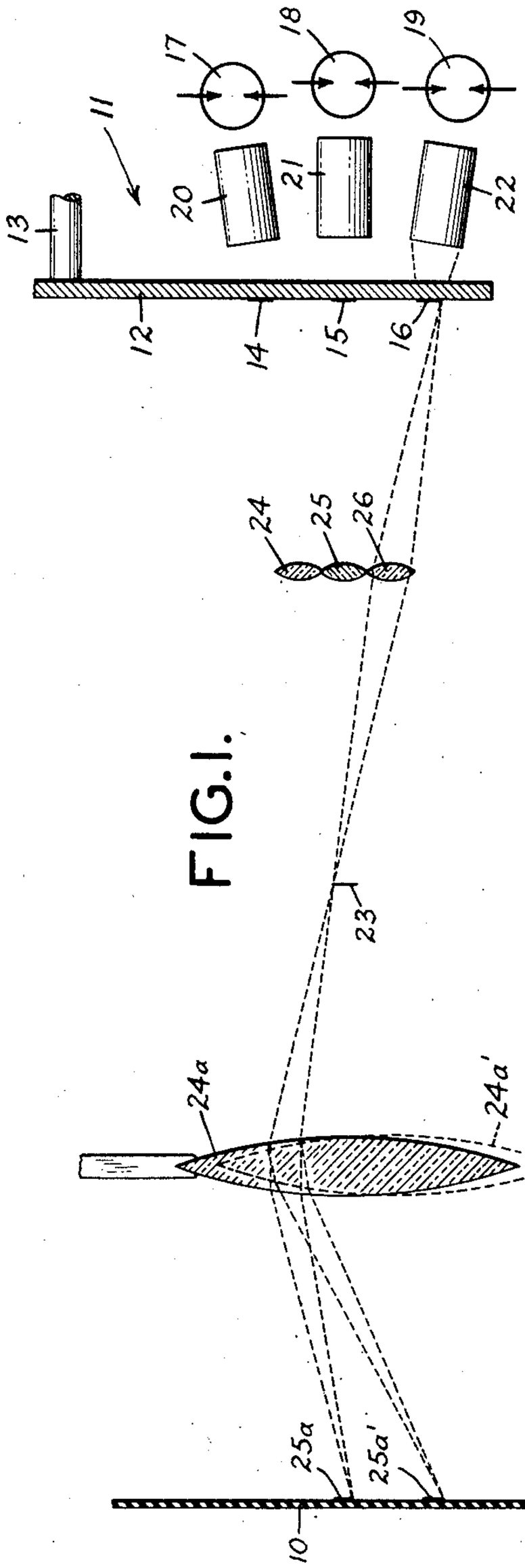

FIG. 1.

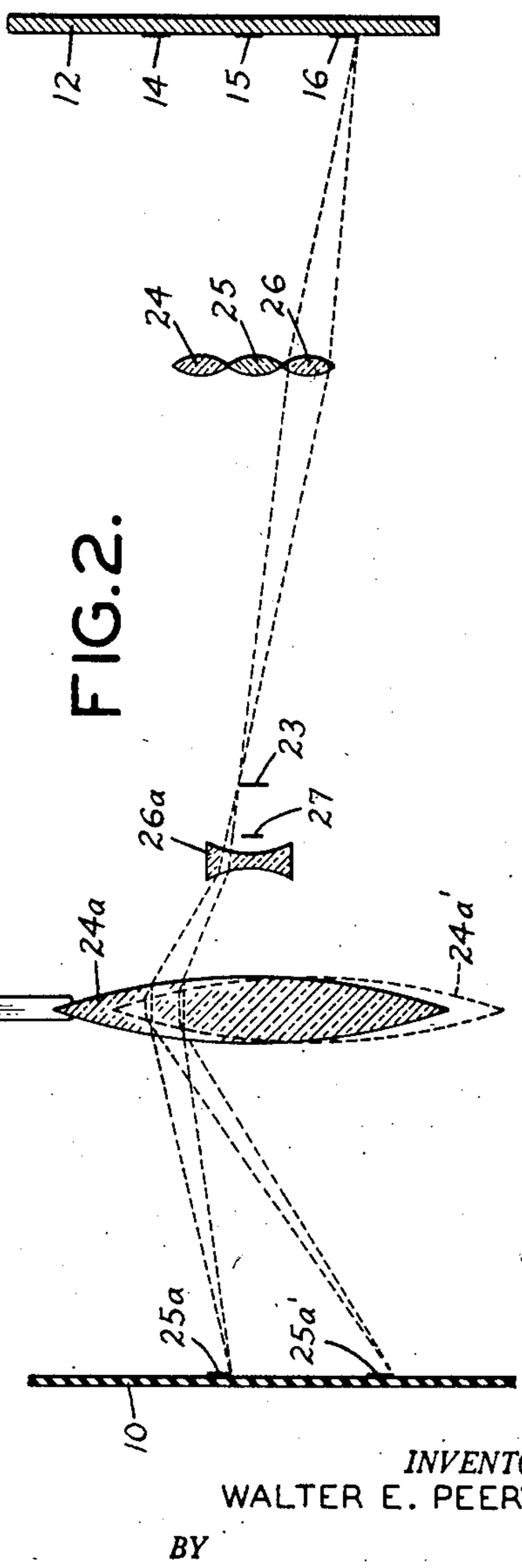

FIG. 2.

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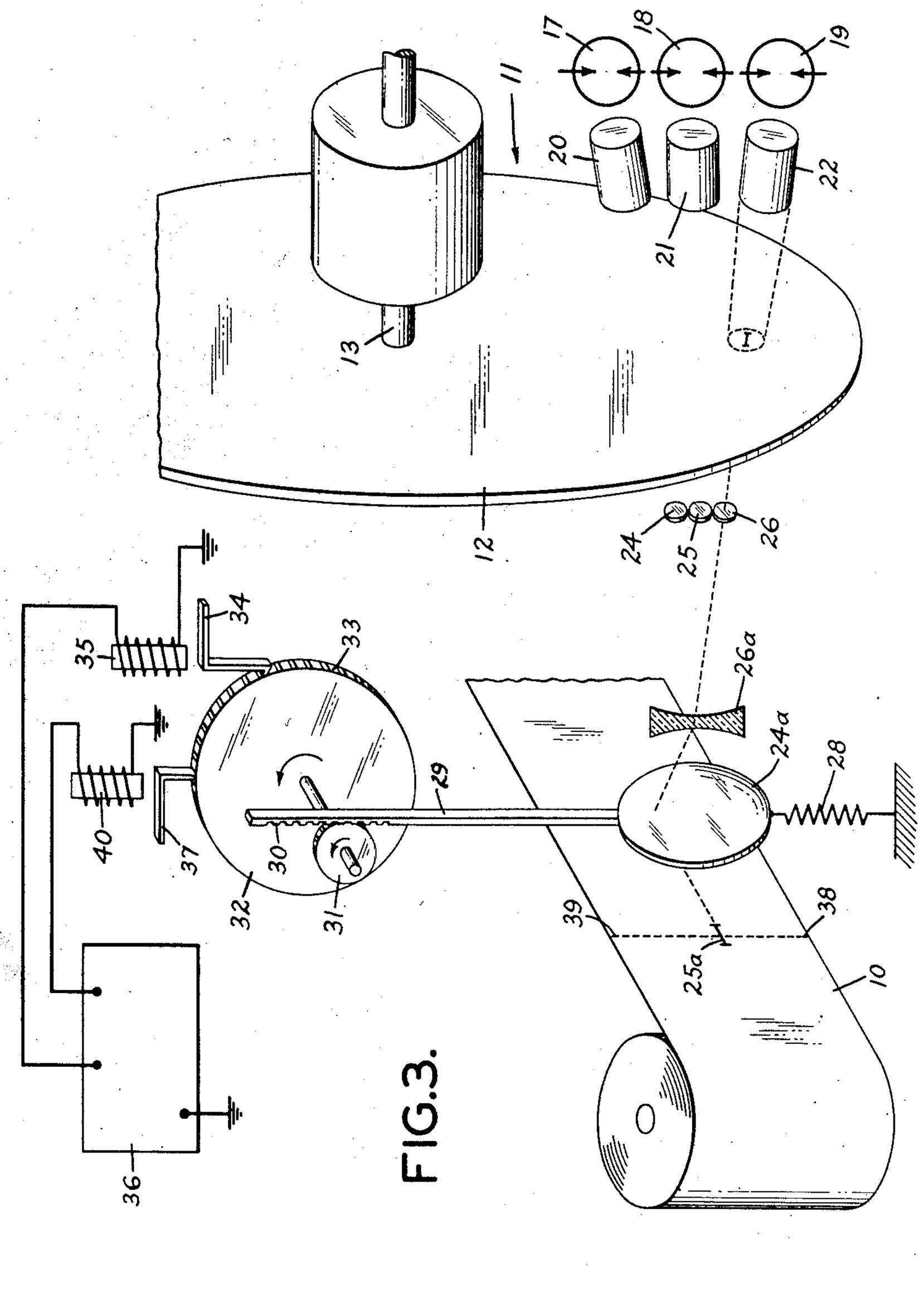

FIG.3.

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PRINTING SYSTEM FOR PHOTOCOMPOSING MACHINES OR THE LIKE

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Application August 13, 1948, Serial No. 44,018

5 Claims. (Cl. 95—4.5)

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The present invention relates to photocomposing machines and more particularly to new and improved photo-composing apparatus for controlling the positioning of the successive characters to be printed so as to form a line or lines of composed matter.

In my copending application Serial No. 41,318, filed July 29, 1948, for Electronic Photo-Typecomposing System, is disclosed a photocomposing system in which a photosensitive record strip is exposed selectively to characters carried by a rotating member. Positioning of the successive characters is accomplished by a rotatable reflector which is suitably disposed to receive from the rotating member images of characters to be exposed, and to direct them to successive positions in a line or lines on the photosensitive strip. With this construction, it is necessary for the photosensitive strip to be curved transversely about the axis of rotation of the reflector, in order to maintain the image of a character in focus at any point in the line.

An object of the present invention is to provide new and improved photocomposing apparatus in which the images of characters may be maintained in focus without curving the photosensitive strip.

Another object of the invention is to provide new and improved photocomposing apparatus of the above character which enables the positioning of characters in a line to be effected by relatively small displacements of an optical system of relatively small mass, whereby rapidity of operation can be achieved.

The objects of the invention may be attained by providing a flat photosensitive strip and interposing a movable lens between the strip and a plane containing an image of a character to be exposed. The movable lens is adapted to be displaced linearly as a function of character spaces and word spaces in a plane parallel to both the strip and the plane containing the character image. By virtue of this construction, images of successive characters can be maintained in focus at any point in the line without curving the photosensitive strip.

In one embodiment, a suitable concave lens is interposed between the movable lens and the image containing plane in such fashion that a given transverse displacement of the image on the photosensitive strip can be effected by displacing a movable lens of minimum mass a minimum distance.

Additional objects and advantages of the invention will become apparent from the following

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detailed description of several typical forms of the invention taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a schematic diagram illustrating the optical principles upon which the invention is based;

Fig. 2 illustrates schematically the optical principles involved in a modified form of the invention; and

Fig. 3 illustrates schematically a typical photocomposing system constructed according to the invention.

In Fig. 1, a photosensitive record strip 10 is disposed in a plane and is adapted to be exposed to characters projected thereon by any suitable projection apparatus 11 which may be of the type disclosed in my above-mentioned copending application. Such apparatus may comprise, for example, a disc 12 adapted to be continuously rotated at relatively high speed about a shaft 13 and having thereon a plurality of concentric rows of characters 14, 15 and 16. The characters 14, 15 and 16 are adapted to be illuminated by suitable light sources 17, 18 and 19, respectively, through suitable optical systems 20, 21 and 22, respectively, which are preferably disposed at an exposure position along a radius of the disc 12, as shown.

When any of the characters 14, 15 and 16 are illuminated, a real image thereof is formed at a position 23 by means of the lens 24, 25 or 26, respectively. Interposed between the image 23 and the photosensitive strip 10 is a lens 24*a* which focuses the image 23 on the photosensitive strip 10 at the position 25*a*, for example.

In order for the characters to be printed on the photosensitive strip 10 in a line, it is necessary for the projection 25*a* of the image 23 to be moved after each exposure in the plane of the paper. This is accomplished, according to the invention, by displacing the lens 24*a* along a normal to its optical axis while maintaining the optical axis perpendicular both to the plane containing the image 23 and the plane of the photosensitive strip 10. Thus, by moving the lens 24*a* to the position 24*a'*, shown in dotted lines, the projection 25*a* of the image 30 moves to a new position 25*a'* on the photosensitive strip. It will be observed that this is accomplished without any deterioration in focus since the object and image planes have not changed.

It will be apparent that for maximum speeds of operation the mass of the lens 24*a* and the displacement thereof should be kept as small as possible. Both the mass of the lens and the dis-

placement required for translation of successive characters on the photosensitive strip 10 can be kept to a minimum by interposing a double concave lens 26*a* between the position of the real image 23 and the lens 24, as shown in Fig. 2. The double concave lens 26 produces a reduced virtual image 27 of the real image 23, which reduced image becomes the object for the lens 24*a*. Since the virtual image 27 is smaller than the real image 23, the lens 24*a* should preferably be located nearer to the position of the image 23 than the projection 25*a* of that image on the photosensitive strip 10. With the lens 24*a* so located, it will be apparent that a smaller displacement is required to move the projection 25*a* of the image 23 to the position 25*a'* than would be required with the apparatus shown in Fig. 1. Also, since the displacement is less, the physical dimensions of the lens 24*a* can be reduced. By virtue of the lower mass of the lens 24*a* and the lesser displacement in operation, the translation of the successive characters across the photosensitive strip 10 can be accomplished more rapidly than with the form of the invention shown in Fig. 1.

The details of suitable mechanism for displacing the lens 24*a* are shown in greater detail in Fig. 3. In Fig. 3, the lens 24*a* is normally maintained in an initial position by means of a compression spring 28, for example, and it is adapted to be moved from that initial position by means of an arm 29 having a rack 30 on the upper end thereof adapted to engage a pinion 31 on a wheel 32. The wheel 32 is provided with a rack 33 at the periphery thereof which is adapted to be advanced by a pawl 34 actuated by means of a solenoid 35. The solenoid 35 may receive character space and word space signals from suitable control equipment 36, which may be of the type disclosed in the above-mentioned copending application, for example. Reverse rotation of the wheel 32 is prevented by a pawl 37.

In operation, successive characters on the disc 12 of the projection apparatus 11 are illuminated and after the photosensitive strip 10 has been exposed to a character, the lens 24*a* is moved to a different position along a line 38, 39 extending transversely of the photosensitive strip 10 until the last character in the line has been printed. When that occurs, the control system 36 supplies a line signal to a solenoid 40 which releases the pawl 37, permitting the lens 24 to be returned to the initial position under the influence of the spring 28.

From the foregoing, it will be apparent that the invention provides a novel photocomposing system in which a flat photosensitive record strip can be used, on which all of the characters appearing in a single line are accurately in focus. Further, by employing a double concave lens between the real image of the character and the object lens, both the mass and displacement of the latter can be kept to a minimum, thus insuring a relatively high degree of speed in operation.

It will be understood that the several embodiments described by way of illustration can be modified within the spirit of the invention. For example, other projection systems and control systems than those described herein can be employed. Other changes that might be made will be apparent to those skilled in the art. The embodiments described, therefore, are not to be regarded as limiting in any way the scope of the following claims.

I claim:

1. In photocomposing apparatus, the combination of a flat photosensitive record strip, means for projecting a succession of real images of characters at a fixed location between said record strip and said projecting means, object lens means interposed between said image location and said record strip, auxiliary lens means interposed between said image location and said object lens means for producing reduced virtual images of said real images, said object lens being disposed nearer said real image location than said record strip so as to project enlarged images of said virtual images upon said record strip, and means for displacing said object lens means relatively to said fixed location where the real images are formed along a normal to the optical axis thereof with said optical axis disposed substantially perpendicular to both the record strip and the plane of said real images.

2. In photocomposing apparatus, the combination of a flat photosensitive record strip, means for successively projecting real images of characters at a fixed location in a plane parallel to said record strip, object lens means interposed between said record strip and said real image plane, means for displacing said object lens means relatively to said character images and transversely of the record strip along a normal to the optical axis of said object lens with said optical axis disposed substantially perpendicular to both said record strip and said real image plane, double concave lens means interposed between said object lens means and said real image plane for forming a reduced virtual image of character images in said real image plane, said object lens being so disposed as to project an enlarged image of said virtual image on the record strip, and means for actuating said object lens displacing means in accordance with character and word spaces, whereby a line of characters will be printed on said record strip.

3. In a photocomposing machine of the type which produces character images individually in succession upon a laterally fixed photosensitive record strip to form a line of recorded images, and in which said record strip is moved longitudinally after each line is recorded to record a subsequent line, the combination of means for supporting a flat photosensitive record strip in a fixed lateral position, means for producing a succession of character images at a fixed location with respect to a record strip positioned by said supporting means, an objective lens interposed between said fixed location and said record strip, and means for displacing said objective lens in a lateral direction only with reference to said record strip by successive amounts related to the widths of the characters being recorded, whereby to control the spacing of characters recorded on each line of said record strip.

4. A photocomposing machine in accordance with claim 3, in which said objective lens is disposed with its optical axis perpendicular to the plane of a record strip positioned by said supporting means.

5. A photocomposing machine in accordance with claim 3, in which said means for producing a succession of character images comprises a character-bearing plate and a lens for producing real images said characters at said fixed location.

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