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PHOTOCOMPOSING MACHINES

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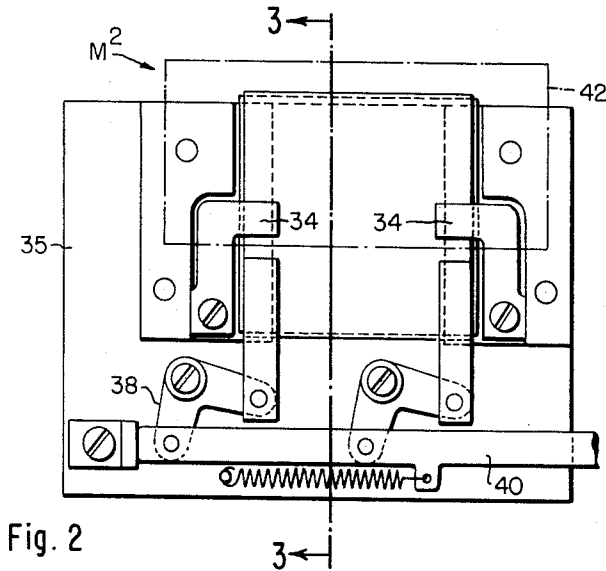


Fig. 2

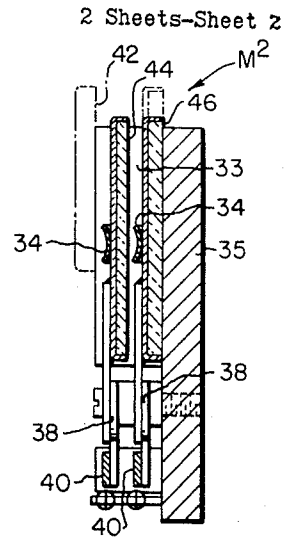


Fig. 3

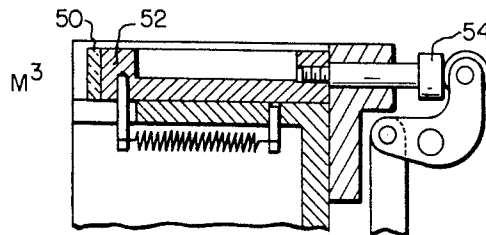


Fig. 4

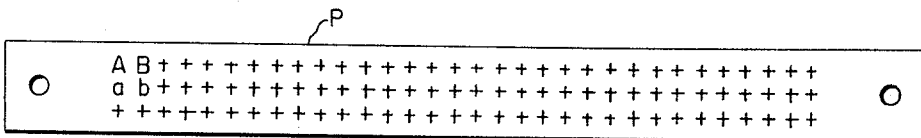


Fig. 5

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PHOTOCOMPOSING MACHINES

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1 Claim. (Cl. 95—4.5)

The present invention relates to photocomposing machines and more particularly to character selection and optical equipment for such machines.

Aside from the use of continuously moving character carriers with stop motion photography, the most common type of photocomposing machine that has been suggested involves the use of character bearing slides which may be moved (usually in two coordinates) to bring a selected character on to the optical axis of a projection system. Thus, in a font containing, say, one hundred characters arranged in ten rows and ten columns, it is necessary to move the carrier to one of the one hundred possible positions and then to photograph it. It has been found very difficult, if not impossible, to position the carrier with sufficient accuracy for correctly aligned and spaced characters. Furthermore, the large extent of motion required for characters remote from the center limits the speed at which composition can be effected.

The principal object of the present invention is to provide a character selection system in which the selection of a character from a stationary font is effected with high precision.

With this object in view, the principal feature of the invention comprises a plurality of mirror systems, each having one or more movable mirrors whereby the optical paths from the font are successively divided into groups and sub-groups, until at the final mirror assembly, a single character selection is made.

Other features of the invention comprise certain novel features of construction, combinations and arrangements of parts, hereinafter described and particularly defined in the claims.

In the accompanying drawings,

Fig. 1 is a diagrammatic plan view of the preferred system according to the present invention;

Fig. 2 is a front elevation of a mirror assembly;

Fig. 3 is a section on line 3—3 of Fig. 2;

Fig. 4 is a section on line 4—4 of Fig. 1; and

Fig. 5 is an elevation of the character-bearing plate.

In the illustrated embodiment of the invention a character plate P (Fig. 5) of transparent material on which characters appear is suitably mounted at its ends on studs 10. As shown in Fig. 1, each "font" comprises a single row of characters of which only a few are shown in the drawing, the positions of the remainder being indicated by crosses. The plate may be provided with more than one font as indicated by the several rows of crosses. The studs 10 are mounted in suitable guides 12 to permit the plate P to be raised or lowered to bring any desired row into correct position for projection.

A lamp L is mounted in back of the plate P and is of any suitable form to provide uniform illumination of the characters of the selected row.

Each row preferably comprises thirty-two characters. The selection of the desired character for projection is accomplished by the use of three sets of mirrors indicated at M¹, M² and M³. The set M¹ comprises four mirrors, each having its plane perpendicular to the plane of plate

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P. The thirty-two characters of the slide may be considered as being divided into four groups of eight each. One group of eight is adapted to be reflected by the uppermost mirror 16, the second group by the second mirror 18, the third group by the third mirror 20, and the fourth group by the fourth mirror 22. The optical axes for the several characters are indicated by horizontal lines running from the plate P to the different mirrors and the reflected rays are indicated by vertical lines in Fig. 1.

The mirror 16 is stationary while the mirrors 18, 20 and 22 are adapted for slight vertical motion whereby any of the mirrors 18, 20 and 22, if in raised position, will mask any mirrors behind it. Thus, to reflect characters of the first group it is necessary that the mirrors 18, 20 and 22 should all be in down position; characters from the second group are reflected by having mirror 18 up and mirrors 20 and 22 down; characters from the third group will be reflected by raising mirror 20 with 22 down; and characters from the fourth group will be reflected if mirror 22 is raised, regardless of the positions of the other mirrors.

The mirror assembly M¹ comprises the rigid frame 24 having a series of plates 26, 28, 30 and 32. The mirror 16 is rigidly fixed to the plate 26 and its reflecting surface extends above the frame. The mirror 18 is adapted to slide against the surface of the plate 28. It is firmly pressed against the plate by springs similar to those used for the assembly M², to be presently described.

The second group of mirrors M² comprises a fixed mirror 42 and two movable mirrors 44 and 46. The movable mirrors are mounted to slide against plates 33 and 35, respectively, each being pressed against its plate by springs 34, shown in Figs. 2 and 3. The upper surface of each plate is recessed in order that the reflecting portion of the mirror surface will not be in contact with the metal.

It will be noted that the rays reflected from the mirrors M¹ lie along eight possible paths. The purpose of the mirrors M² is to divide this group of eight paths into three paths whereby groups of three, three and two characters may be selected. (If the plate P contains thirty-six characters, the mirrors M¹ may be arranged to divide the characters into four groups of nine each, and M² may be arranged to divide each group into sub-groups of three each). It will be noted that the mirrors of group M² are somewhat closer together than those of group M¹ since the mirrors pick up rays from only eight instead of thirty-two points. The planes of the mirrors of group M² are parallel to those of M¹.

The actual raising of the mirrors may be effected by any suitable means indicated in Figs. 2 and 3 as bell cranks 38 connected by suitable rods 40 with any desired actuating mechanism. The mirrors 18, 20 and 22 of group M¹ are adapted for similar motion in their frames in the same manner.

The mirror M³ comprises a mirror arranged to select one of the three rays from the group M² and direct it along a predetermined axis. Preferably there is only a single mirror M³ with its plane parallel to the other mirrors, and arranged to be moved to any one of three positions indicated as 50, 50' and 50". To this end a mirror is mounted in a frame 52 and motion of the frame is effected by means of pins 54 and 56, accurately constructed in such a manner that upon pushing one of them the mirror will assume the position 50' or 50". In its retracted position the mirror 50 reflects the uppermost ray from any one of the three mirrors; in its second position it reflects the middle ray, and in its lower position it reflects the bottom ray from either of the mirrors 42 and 44. In any case, the final reflected ray is along a unique predetermined optical axis designated A.

From the foregoing it will be seen that all path lengths from the characters to any definite point on the axis A are identical in length. Therefore all characters may be projected with a single lens and will come to the same focus and will have the same optical magnification. From the theory of optical reflection it will also be observed that any character projected along the axis A will be as if the character originated at the point O which is at the intersection of axis A with a line extended from the plate P. In other words, regardless of the settings of the mirrors there is formed at O a virtual image of the selected character, and the selection is effected by the positioning of the mirrors of the several groups.

A lens indicated diagrammatically at 60 may then be used to project the selected character on to the film. Preferably however, the lens 60 comprises a collimating lens, forming one part of the optical system shown in the Caldwell Patent No. 2,670,665. To that end the lens 60 forms a virtual image at infinity, which image is picked up by a movable lens 64 and reflected by a mirror or prism 66 on to the film 68. The sizes of the projected characters may be varied by interposing afocal lenses between the lens 60 and the lens 64. A shutter 70 may be disposed in any convenient position, shown as being adjacent to the lens 60. A mask or diaphragm 72 forming a field aperture to limit the projection to a single character is also disposed at an appropriate place in the optical system.

From the foregoing description it will be seen that if there are m mirrors in M^1 , the rays are divided into m groups; the n mirrors of group M^2 divide a selected group from M^1 into n sub-groups; and a selected sub-group from M^2 may be further divided into p sub-groups by the mirror M^3 . The maximum number of characters in

any font is therefore $m \times n \times p$. In the example given the maximum number is 36, although only 32 are shown.

Having thus described the invention, I claim:

In photocomposing apparatus, the combination of a support bearing a row of characters on a surface thereof, a first set of reflectors each arranged in a plane perpendicular to said surface, each of said reflectors being rectilinearly translatable in its own plane to a position to reflect diverging light by a single reflection from a corresponding group of characters on said support on to a first light path, a second set of reflectors each perpendicular to said surface, each of said last-mentioned reflectors being rectilinearly translatable in its own plane to a position to reflect light by a single reflection from a part of said first light path on to a second light path, a support for a sensitized sheet, optical projection means adapted to focus light passing down said second light path on to said sheet, and selection means for the characters adapted to translate one selected reflector in each set into position to reflect the light from a selected character to said projection means, said reflectors and projection means being disposed relative to said surface of the character bearing support and to said support for a sensitized sheet to form virtual images of all the characters in a common position in the plane of said surface.

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