Aug. 6, 1963 R. C. O'BRIEN 3,099,945

PHOTOGRAPHIC TYPE COMPOSITION

Filed June 30, 1960 3 Sheets-Sheet 1

FIG-1

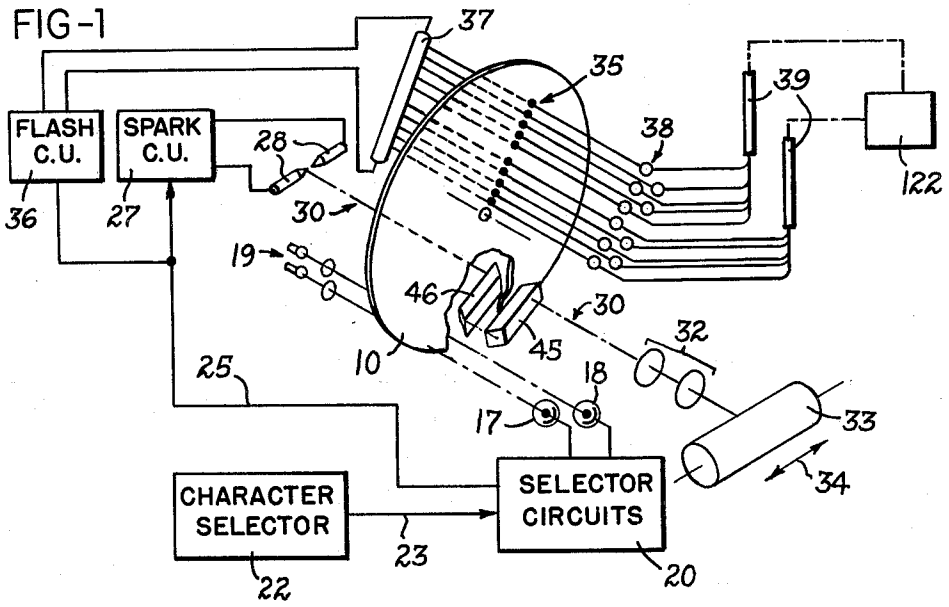


FIG-2

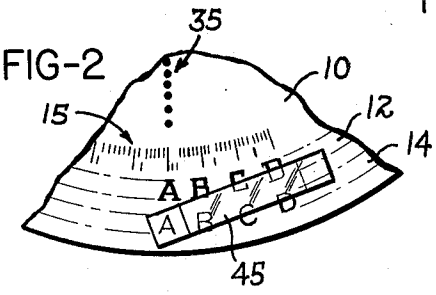


FIG-3

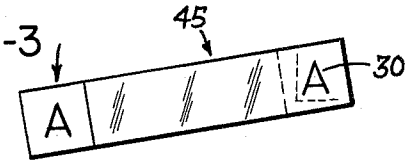


FIG-4

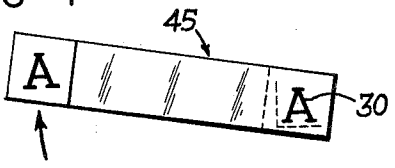


FIG-7

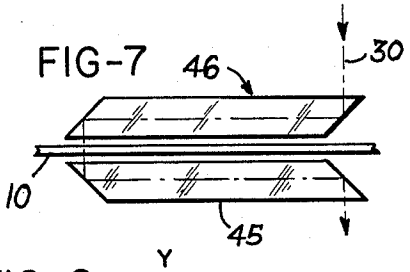


FIG-5

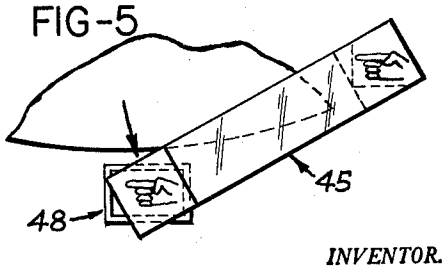
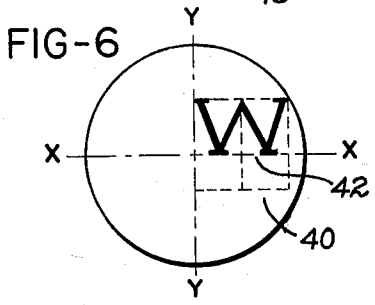


FIG-6



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PHOTOGRAPHIC TYPE COMPOSITION

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FIG-8

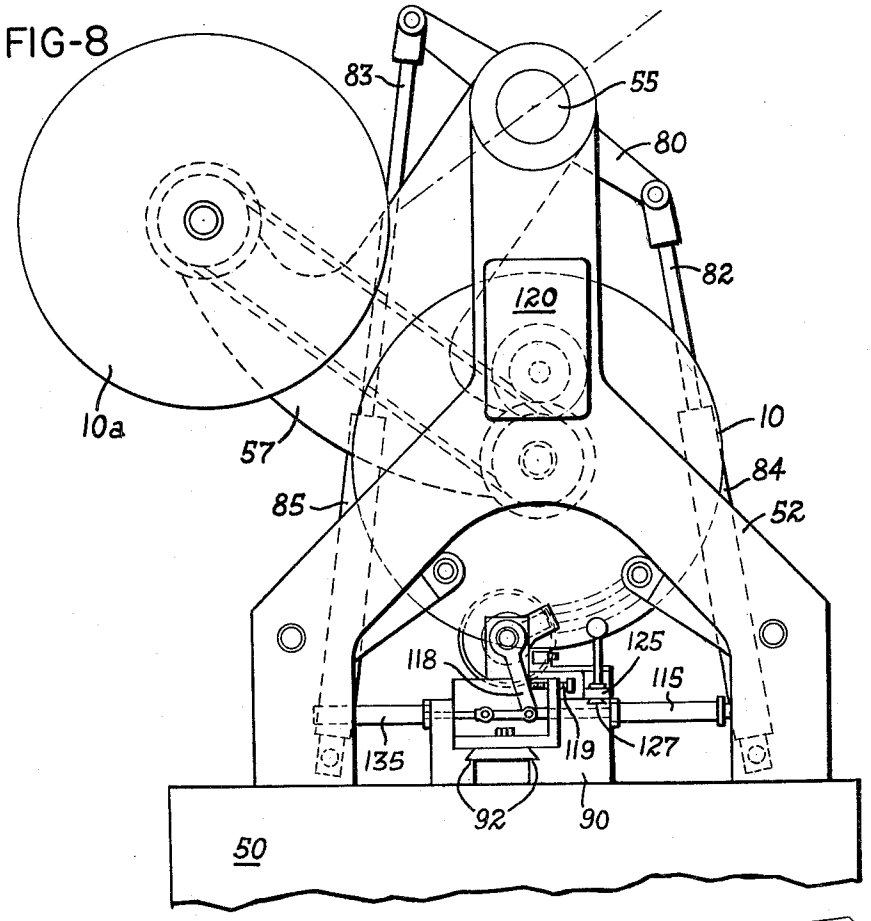
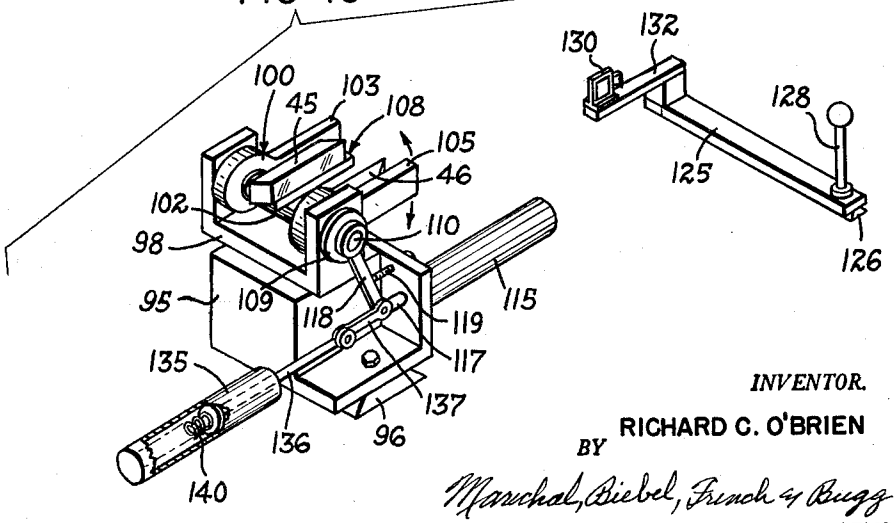


FIG-10



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PHOTOGRAPHIC TYPE COMPOSITION

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FIG-9

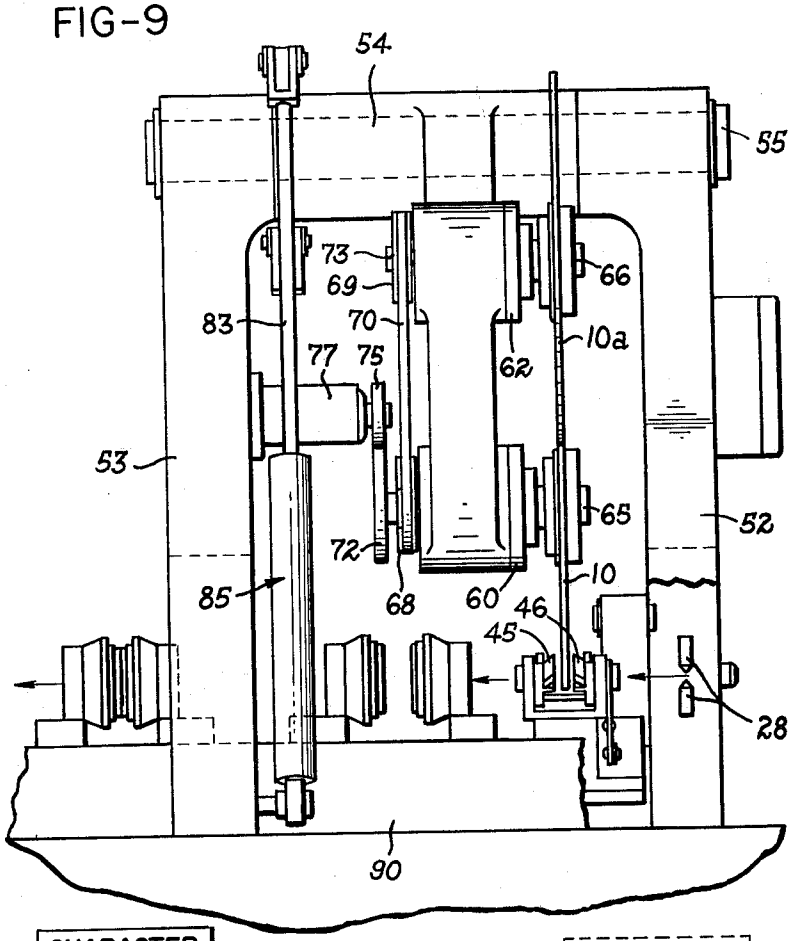
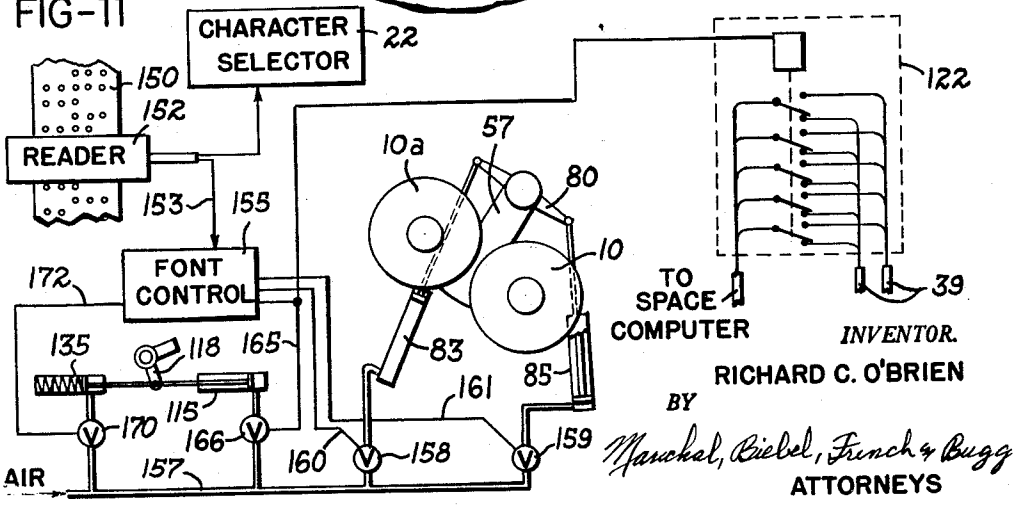


FIG-11



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United States Patent Office 3,099,945 Patented Aug. 6, 1963

3,099,945

PHOTOGRAPHIC TYPE COMPOSITION

Richard C. O'Brien, Cleveland, Ohio, assignor to Harris-Intertype Corporation, Cleveland, Ohio, a corporation of Delaware

Filed June 30, 1960, Ser. No. 39,859
9 Claims. (Cl. 95—4.5)

This invention relates to phototypesetting apparatus, and particularly to a font changing system which is adaptable to accommodate high speed changes from one font to another while composing at a high rate.

The present invention is particularly adapted for font changing in connection with phototypesetting machines which employ high speed photography of individual characters from a rotating character matrix on which more than one font of characters is carried in a predetermined order. The characters usually are all of the same relative size, but of different relative widths in accordance with the font design, and a flashing light source is mounted adjacent the character carrier to direct a beam of light through a single selected character to produce a character image-bearing light beam, with the image being focused upon photographic or like material for recording. The beam usually is directed through an optical system by means of which the size of the character image may be altered in relation to the size of the master character on the carrier, to obtain different point size from the same master characters.

In such systems, particularly where the character carrier is rotating continuously at high speed, for example 3600 r.p.m. or higher, and where the recording of characters likewise is proceeding at a proportionately high rate of for example 50 to 60 characters a second, it is desirable to change fonts as quickly as possible in order to avoid delays in the composing operation when, for example, the composer uses a few characters from a different font such as in the case of inserting a word in italics. Where the characters are located at a common radius in a drum or disk, and rotated past the light source, if the disk is made sufficiently large more than one font can be accommodated at the same radial distance from the axis of rotation. This of course requires that the size of each master character on the carrier or matrix must be relatively limited, or conversely that a carrier of rather large diameter must be used. In the former case it becomes impractical to enlarge the smaller size master characters optically over too great a magnification range, since the greatly enlarged images may not have the necessary sharpness and clarity for high quality printing work. On the other hand, larger character carriers require more space and may also lead to problems of dynamic balancing, etc.

In order to avoid some of the foregoing difficulties it is possible to place different fonts of characters on the same rotating carrier, but at different radii from the axis of rotation. Assuming that the master characters in each font are of the same relative size, then the same optical length must be provided between the master character or "object" of the optical system and the photographic recording material, otherwise changing between fonts may result in loss of focus or an unwanted change in image size. It is possible to overcome or alleviate this situation

but this involves a requirement for movement of the relatively heavy mounting bearings, etc., for the carrier which must be positioned accurately to maintain the correct alignment between the carrier and the light source. Furthermore, while the character carrier may not be excessively heavy, nevertheless since it is rotating at high by displacing the carrier with respect to the light source, speed sufficient force must be provided to move the carrier accurately under such circumstances while overcoming the gyroscopic forces resulting from such high speed rotation.

The primary object of this invention is to provide a novel system and apparatus for changing fonts in a phototypecomposing machine where different fonts are carried on the same rotating character carrier at different distances from the axis of rotation.

Another object of the invention is to provide such a font changing system wherein the moving parts are of relatively light weight and low inertia, and thus may be moved with high speed and accuracy.

A further object of the invention is to provide such a font changing system wherein the length of optical path between each font on the character carrier and the recording media is maintained equal during font changes, thus avoiding the need for optical compensation when changing from one font to another.

An additional object of this invention is to provide such a font changing system in which a common high intensity flashing light source may be used for photographing from whatever font is selected, without the need for relative movement between the light source and the character carrier.

Another object of this invention is to provide novel apparatus whereby pi characters can be inserted and photographed without altering the optics of the system, and without appreciably slowing the overall high speed operation.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

FIG. 1 is a diagrammatic view of the essential parts of apparatus in accordance with the invention;

FIG. 2 is a view of a segment of a character matrix disk having a plurality of fonts, showing the position of the font selection prism with respect to the disk;

FIGS. 3, 4 and 5 are diagrammatic views on an enlarged scale of the selection prism, showing the relative positions thereof for projecting characters from different fonts and for projecting pi characters not on the matrix;

FIG. 6 is a schematic representation of the lens of the optical system, showing the arrangement of the character field with respect to the optical system and the selection prism as shown in FIGS. 3–5;

FIG. 7 is a view looking through a segment of the character disk ad showing a pair of opposed selection prisms which provide for photographing from different fonts while using the same stationary light source;

FIG. 8 is a front elevational view of apparatus constructed in accordance with the invention, including mounts for a plurality of character disks;

FIG. 9 is a side elevational view, with parts broken away and in section, of the apparatus shown in FIG. 8;

FIG. 10 is an exploded perspective view of portions

of the prism mounting and position controls and the pi character support; and

FIG. 11 is a schematic diagram of an electrical and pneumatic control system for the apparatus.

Referring to the drawings, which illustrate a preferred embodiment of the present invention, and referring particularly to FIGS. 1–7, the apparatus includes a character matrix or carrier preferably in the form of a rotating disk **10** which is an opaque member having portions thereof suitably formed as master characters which are light transmitting parts, and which is rotated about an axis **11**. There are at least two separate rows of such characters, designated **12** and **14** (FIG. 2). It will be noted that these rows are in separate concentric zones, of different radii in the case of a disk carrier, and that corresponding characters as between the different fonts are preferably arranged along the same radius line.

About the edge of the disk, arranged in accordance with the spacing of the characters in each font, are character selection code markings, indicated generally at **15**. These markings may be of any suitable kind, and are shown as of the type disclosed in the copending application of Richard C. O'Brien, Serial No. 720,840, filed March 12, 1958, now Patent No. 3,059,219, issued October 16, 1962. These marks, which may form a selection code for a desired character, are preferably in the form of light transmitting segments arranged in the desired pattern to cooperate with one or the other of the selection code reading photocells **17** and **18**, and light passed from the corresponding bulbs **19** falls on one or the other these photocells to produce a discrete identifying code in the form of electrical pulses transmitted to the selector circuits, indicated generally at **20**.

An identifying code is set up in the apparatus from a keyboard or a control punch tape, or other suitable register means which will form a coded representation of selected characters in the proper sequence to make up lines of composition. For purposes of illustration this is shown as a character selector **22** which transmits through the connecting line or cable **23** the character selection code to the circuits **20**. When the identifying code on the matrix corresponds to the selection code, a control pulse is transmitted through line **25** to the spark control unit **27**. The details of this system are explained fully in said copending application Serial No. 720,840, or other suitable circuits and apparatus may be used to perform the same function.

The control unit **27** is arranged to produce a substantially instantaneous, high intensity flash of light, as by causing a spark to be produced in the gap between a pair of electrodes **28**. This projects a beam of light along the optical path **30**, through the selected character on matrix **10**, through a size controlling and focusing optical lens system **32**, and produces a character image of predetermined size on photosensitive material, such as a galley film, which is mounted on a drum or the like **33**. Suitable means are provided to produce relative movement between the galley film and the optical path along which the images are projected to allot the necessary space from each character in accordance with its relative width (with respect to the other characters) and the optical size change produced by the lens system **32**. For example, the drum **33** may be stepped in the direction of arrow **34** as projection of each character image in accordance with the necessary space for the recorded character image.

It is necessary, of course, to vary the relative spacing movement between the optical system and the drum **33** in accordance with the different widths of the successive projected character images. Each character has a characteristic width value relative to other characters in the same font, and this relative width value may provide the multiplicand for a computing operation in which the multiplier is determined by the optical size change which is in turn dependent of the setting upon the optical system **32**. Details of such aspace computing arrangement are described in detail in copending application Serial No. 39,858, filed June 30, 1960. The product of this computation represents the actual space along the line, in the direction of composition, to be alloted to each successively projected character image.

The aforementioned relative space information for each character on the disk may be conveniently provided by spacing code, indicated by the general reference numeral **35**, also on the disk or character carrier. Thus, in each radially extending zone on the character disk **10** occupied by characters of different fonts, and the corresponding selection code for these characters, there is also a characteristic relative space code for each of the characters in different fonts in that radial zone. In a suitable form of apparatus, illustrated here, a five digit binary space code is used to designate relative width information for the characters, thus providing a range of relative space increments from one to thirty-two space units or piclets. Accordingly, there are in each radial zone ten different positions in which space code dot information may appear, with five of these code places or positions providing the spacing information for the character in one font, and the other five providing the information for the character in the other font within that radial zone.

The space code dots preferably are formed as light transmitting openings in the disk **10**, and at the same time that the spark unit **27** is energized to illuminate a selected character, a flash control unit **36** is energized to flash an elongated lamp or flash tube **37** providing an instantaneous flash of light through the space code openings in the disk corresponding to the selected character. On the opposite side of the disk there is mounted a bank of ten code reading photocells **38**, one for each of the characteristic space code positions. When tube **37** flashes, the light will pass to those photocells opposite which there is an opening at the time of the flash, and the resultant output pulses from one or more of the photocells provide the space code information.

The output connections of these photocells are divided between two output lines or cables **39** each of which include five leads from the photocells corresponding to the space code for a character in one font. Thus, when a given font is selected one or the other of these outputs can be switched into a circuit, as will later be described, to provide the corresponding relative space data for the character selected from the desired font.

A lens of the optical system **32** is shown in FIG. 6, with the vertical and horizontal transverse axes of the system indicated appropriately by the *x*—*x* and *y*—*y* lines. The character field is indicated by the dotted lines **40**, and it will be noted that a base line **42** across the field is coincidental with the *x*—*x* axis, so that descenders will fall below this axis. The left side line of the character field coincides with the *y*—*y* axis, and thus enlargement or reduction of the character images by the optical system, with respect to the master characters on the matrix, will not change the base and side lines in the system, and the left side or reference line of the character field will always occupy the same position in the optical system with magnification preceding away from this line.

Selection between the font zones **12** and **14** is provided by directing the flash of light to the desired character in the desired font zone, and redirecting the image-bearing light beam thus formed along the common optical axis or path **30**, which is the path through the lens system **32**. This is accomplished by means of reflecting means such as an elongated prism **45** which has opposite end faces parallel to each other, and preferably at 45° to the front and rear thereof. This arrangement is seen most clearly in FIG. 7. The prism is mounted such that it will rotate about the center of the optical path **30**, which is also the central or longitudinal axis of the lens system **32**, and this axis intersects the center of one end face of the prism, as indicated in FIGS. 3 and 4. The other face of the prism thus swings in an arc between the two fonts on the

matrix, and preferably in the position where the character is vertical, as shown in FIG. 2, such that a character selected from either font will occupy the same precise vertical position.

The length of the light passing through the prism is the same for each position, and due to the nature of the reflecting surfaces, a character from either font appears centered and properly erect on the optical path. This is indicated by the dotted lines in FIGS. 3 and 4 which denote the reference side and bottom of the character field, and it will be seen that the character field is the same in both cases. Thus in FIG. 3 the character A is selected from the font sector **14**, and in FIG. 4 A is selected from the font sector **12**, and in each case the character image appears in the same line on the optical path with the image being thence transmitted through the lens system.

In order to provide a simplified and essentially uniform light source, a further prism **46**, hereinafter referred to as the light directing prism, is mounted on the opposite side of matrix **10**. This prism is of the same construction as prism **45**, and is mounted reversely. It receives the light from the source **28**, and directs this light through one or the other of the font sectors. Accordingly, the prism **46** is mounted to swing about the same axis **30** as the prism **45**, and the flash of light will pass only through the desired font. Therefore, the same light source is used for all fonts, and it may be mounted stationary, considerably simplifying the construction and controls of the light source.

It may be desirable to provide an unusual character, known in the art as a pi character, which does not appear in the fonts on the character carrier or disk. In accordance with the present invention it is possible to use the same flashing light source, i.e., the sparking electrodes **28**, and by providing a third position for the prisms **45** and **46**, to insert a master pi character plate, indicated generally at **48** in FIG. 5, in a position laterally of, and generally aligned with the character carrier or disk **10**. Thus, with the pi character plate or insert mounted in this position, by moving the prisms such that their facing portions are beyond the edge of the disk, light may pass from the light source along the optical axis **30**, and around the edge of the disk through the master pi character and thence through the optical system **32**. Therefore, if the master pi character is the same as the master characters in the fonts on the disk, i.e., of the same relative dimension, it is unnecessary to disturb the optical system, and the pi character image thus formed will appear at the same relative size as the other character images during the course of composition.

Of course, there is a limit to the number of fonts that can be placed conveniently upon a single character carrier or disk, and since it is desirable to provide substantial versatility in font selection in high speed photocomposing machines such as those contemplated by this invention, it is desirable to incorporate more than one master character disk or carrier in the system. Thus, referring to FIGS. 8–10, a construction with a pair of disks **10** and **10***a* is provided, incorporating the features of the invention previously described. A base **50** provides a mounting for a pair of inverted generally Y-shaped standards **52** and **53** (FIGS. 8 and 9) which are joined at their top by a cross member **54**. This cross member is mounted on a shaft **55**, which is suitably rotatably supported in the upper ends of the standards **52** and **53**, and a character carrier yoke is secured to, and depends from, the cross member **54**, shown in the form of an inverted generally T-shaped arm **57**. At opposite ends of this arm are bearing mountings **60** and **62** for rotatable shafts **65** and **66**, respectively.

The disk **10** is fastened to one end of shaft **65**, and disk **10***a* is fastened similarly to one end of shaft **66**. At their opposite ends, these shafts carry pulleys **68** and **69**, receiving a belt **70** which provides for essentially continuous uniform rotation of the two disks. Behind each of the pulleys **68** and **69** the shafts **65** and **66** each carry a friction wheel **72** and **73**, respectively, and these wheels are adapted for frictional driving engagement with a friction wheel **75** mounted on the drive shaft of an electric motor **77** which is supported extending forwardly from the rearward mounting standard **53** such that the disk in operative position, the disk **10** in FIGS. 8 and 9, has its friction wheel engaged with the motor drive, and the other disk follows along.

Accordingly, even though but one disk is driven, the other non-operative disk is rotated concurrently, and when it is desirable to shift the position of the disks, to use a font on disk **10***a* for example, these disks operate with a fly wheel effect to maintain their high speed rotation as the driving relation is changed. Therefore, there is no substantial slowing of the spining disks as they are transferred into and out of operative position.

The apparatus for swinging arm **57**, and thus shifting the disks **10** and **10***a*, includes a cross arm **80** connected at its opposite ends through suitable pivot joints to the piston rods **82** and **83**, respectively, of pneumatic cylinders **84** and **85**, each of which is provided with a pivotal anchor to the base. Therefore, when fluid under pressure, such as compressed air, is supplied to one or the other of these pneumatic cylinders the appropriate character disk is swung to the operative position.

The base **50** includes a supporting bed or way **90** which preferably includes dovetail slots **92** forming a convenient mounting and alignment arrangement for the font selection and light directing prisms **45** and **46**, and also for the light source, which is shown only schematically in FIG. 9. The mounts for the prisms are provided by a block **95** having a dovetail member **96** secured to its bottom and received in the slots **92**. On the mounting block **95** is a U-shaped bearing support bracket **98** which provides rotary mounting bearing surfaces for opposite ends of the prism control and mounting member **100**.

This member is formed as an integral unit having a cutaway center section along one side of which extends an integral cross piece **102**. Arms **103** and **105** extend laterally from this member, and each is provided with an L-shaped platform **108** (only one shown in FIG. 10) which is machined or otherwise precisely formed on the arm to provide an exact mounting surface for the prisms **45** and **46** respectively. Outwardly of these arms, the mounting member **100** is provided with cylindrical bearing surfaces, one of which is shown at **109** in FIG. 10, and these may be machined or otherwise suitably formed precisely to define the axis of rotation of the member **100**, these bearings being mounted in opposite arms of the mounting bracket **98**. Through each of the arms **105**, and coaxially aligned with the bearing surfaces **109**, there is a central hole or passage **110** providing a path for light directed into and out of the prism system. The mounting member **95** is located on the way **90** such that the active font disk can be swung into the space between the prisms, as shown particularly in FIG. 9, preferably with the outer ends of the prisms generally aligned vertically beneath the axis of rotation of the active disk, as shown in FIG. 8.

Control of the prisms is provided by a fluid power cylinder **115**, preferably pneumatic, mounted on bed **90** and which has its output rod **117** extending through a side of the block **95** and into engagement with an end of control arm **118** which in turn is secured to the prism control and mounting member **100**. An adjustable stop screw **119** defines one position of the prisms, preferably the position wherein the innermost font row is being selected, as shown in FIG. 8, and in this position the cylinder rod **117** will be retracted. The extension of the cylinder can be predetermined by suitable built-in stops or the like such that the piston rod **117** will extend a precise distance, and thus swing arm **118** through an exact arc to move the prisms into alignment with the

outer font row. Thus, the font selection and light directing prisms, which together with their mounting member 100 are a lightweight relatively low inertia system, can be moved quickly and accurately between positions wherein light is directed through different fonts on the character carrier or disk, and at the same time the light path remains of constant length.

Above the prism controlling and mounting parts, on the upper arm of the front standard 52, is a mounting box 120 for the photocell bank 38. Thus, these photocells are aligned with the space code information for the characters in each font which are diametrically opposite thereto on the disk. The controls for the pneumatic font selecting cylinder 118 will also govern a double throw switch to connect one or the other of the output cables 39 into the space computing apparatus, depending upon which font is benig used.

Adjacent to the prism mounting is a pi character mounting and control apparatus provided by an elongated slide 125 which includes a dovetail 126 formed on its base and received in a complementary slot 127 in the base member or bed 90 (FIG. 8). Movement of the slide is controlled by a handle 128, and at its forward end the slide includes a pi character mounting frame 130 which is supported to one side of the slide 125 on an arm 132. This arm positions the frame 130 for alignment directly beneath the active character disk, and in a position where the prisms 45 and 46 can be swung into alignment therewith, as explained previously in connection with FIG. 5. Thus, a pi character of the same relative size as the master characters on the disk can be mounted in frame 130 and inserted into the machine readily for selection at any time, and of course different pi characters can readily be provided by exchanging them within the frame 130.

The selection of a pi character involves actuation of an overriding pneumatic cylinder 135 which has its piston rod 136 connected through a link 137 with the arm 118. Thus, when cylinder 135 is operated it will withdraw the arm 118 from either the rod 117 or stop screw 119, whichever the arm may be pressed against under bias of the internal spring 140 in cylinder 135, and the prisms will be swung into position to photograph the pi character. Then, when the cylinder 135 is deactivated the arm 118 will return to whatever was its previous setting, or to a new setting if such has been selected. Accordingly, it is possible with the present invention to project a pi character at the same point size (since the optical system need not be disturbed) as any other character from the carrier or disk, and the phototypesetting operation can proceed rapidly with a minimum of delay while the special or pi character is selected. This system, therefore, lends itself to high speed operation and automatic control, as from a perforated tape or other previously prepared record.

For example, referring particularly to FIG. 11, a perforated tape record 150 can be "read" by a decoder or reader 152 of standard construction, and information thus determined from the tape can be transmitted to the character selecter 22, for the purpose previously described, and information also can be transmitted through line 153 to a font control unit 155, which may also include circuits responsive to information relating to the selection of a pi character. The pneumatic cylinders 83 and 85 can be connected to a supply line 157 of pressure fluid, such as compressed air obtained from a suitable source, and these cylinders may be connected selectively to the pressure source through conventional solenoid operated valves 158 and 159, which are controlled respectively through lines 160 and 161 from the font control unit. Thus, opening of one or the other of these valves will position the appropriate disk 10 or 10*a* in the photographing position.

Similarly, line 165 is connected to control a valve 166 which in turn controls the supply of pressure air to the font selector cylinder 115, and whether or not this valve is open will determine the positioning of the font selecting prisms to select from characters on the inner or outer font row on the disk in photographing position. Also, the pi character control cylinder 135 is connected to the pressure air source through a valve 170, having a control connection through circuit line 172 by means of which this valve may be opened to move the prisms into a position whereby the pi character in frame 130 can be photographed.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. High speed font selection apparatus for phototypesetting machines, comprising a character carrier having a plurality of fonts of master characters each arranged with the characters thereof at a common radial distance from an axis of said carrier and with different fonts in separate concentric paths, means connected to rotate said carrier continuously about said axis including a fixed mounting for said carrier maintaining said axis in a stationary position, a light source mounted adjacent said carrier and cooperating with said carrier to illuminate by flash one character at a time and to produce an essentially stationary image of each illuminated character, optical means receiving image bearing light beams from said carrier and directing said beams along a common optical path to focus in a common plane, and font selector means operable on said optical means to move said optical means to direct image bearing light beams from any selected font into said optical means while maintaining constant the optical path in the system.

2. Font selection apparatus for phototypesetting machines, comprising the combination of a character carrier mounted for continuous rotation and having a plurality of fonts of master characters thereon, different fonts being arranged in different circles concentric with the axis of rotation of said carrier, a flashing source of light mounted adjacent said carrier and adapted for high intensity short duration illumination sufficient to direct a beam of light through a selected one of said master carriers to create a relatively stationary image bearing light beam, optical means associated with said carrier and said light source to receive said beams and to focus an image of each successfully selected character in a common plane, a plurality of reflecting elements maintained a fixed distance apart and pivotally mounted as a unit to swing about a fixed axis which is aligned with said optical means and which axis extends through one of said elements, and font selector means connected to said reflecting elements and operative for selective positioning thereof in alignment with one of said font circles to direct light from said source through a selected one of said character images in a selected font while maintaining said light source and the axis of rotation of said carrier in a fixed position.

3. In apparatus of the character described a rotatable character carrier having a plurality of fonts of characters formed as parts of differential light transmitting ability, each font having the characters thereof located in a circle concentric with the axis of rotation of said carrier and separate from the other fonts, means defining an optical axis along which an image bearing light beam of a selected one of said characters may be directed for recording, a flash source of light including controls therefor arranged to energize said light source for a sufficiently short duration and in such exact timing as to project a stationary image of a selected single character from a selected one of said fonts, means for directing the light from said flash source selectively toward a desired one of said font circles, and reflecting means including beam directing

surfaces operative between the selected one of said fonts and said optical axis defining means to direct the image bearing light beams of selected characters in any one of said fonts into said optical axis defining means, said beam directing surfaces being mounted at fixed spacing to maintain a constant optical length between said character carrier and said optical system.

4. In apparatus of the character described a rotatable character carrier having a plurality of fonts of characters formed as parts of differential light transmitting ability, each font having the characters thereof located in a circle concentric with the axis of rotation of said carrier and separate from the other fonts, means defining an optical axis along which an image bearing light beam of a selected one of said characters may be directed for recording, a flash source of light including controls therefor arranged to energize said light source for a sufficiently short duration and in such exact timing as to project a stationary image of a selected single character from a selected one of said fonts, means for directing the light from said flash source selectively toward a desired one of said font circles, reflecting means operative between the selected one of said fonts and said optical axis defining means to direct the image bearing light beams of selected characters in any one of said fonts into said optical axis defining means while maintaining a constant optical length between said character carrier and said optical system, support means for mounting a pi character plate laterally of said character carrier, and controls operative on said reflecting means to move said reflecting means beyond said carrier and into alignment with said support means to direct an image of a pi character along said optical axis.

5. Font selection apparatus for phototypesetting machines, comprising the combination of a character carrier mountable for continuous rotation and having a plurality of fonts of character image defining portions thereon arranged in separate circles concentric with the axis of rotation of said carrier, a flash source of light mounted adjacent said carrier and adapted to emit a flash of relatively high intensity and short duration such as to direct a beam of light through a selected one of said character image defining portions to create an essentially stationary image-bearing light beam of a selected character, optical means associated with said carrier and said flash source of light to direct said image bearing light beams along a common optical path for recording thereof in the succession of character selection, said optical means including apparatus for selectively varying the size of the images projected therefrom, and font selector mechanism operable between said carrier and said optical means including reflecting elements mounted to pivot about a fixed axis which is aligned with the optical path through said optical means and adapted for selective positioning in alignment with one of said font circles to project character images from a selected font while maintaining a constant optical length between all of said font circles and the axis of said optical means.

6. In photographic type composing apparatus of the character described, the combination of a character carrier having a plurality of master characters thereon, a flash source of light mounted adjacent said carrier and adapted to emit a flash of relatively high intensity such as to direct a beam of light through a selected single master character on said carrier to create an image bearing light beam of the selected character, selector means including controls for said light source and operable to project images of single characters in selected succession, optical means associated with said carrier and said light source to direct the image bearing light beams along a common optical path for recording thereof in the succession of character selection established by said selector means, support means for mounting a master pi character adjacent said character carrier, and selectively movable reflecting means mounted adjustably to direct light from said source through said master pi character instead of through said carrier and to direct the resultant pi character image bearing light beam through said optical means for projection of a pi character image not obtainable from said character carrier.

7. In photographic type composing apparatus of the character described, the combination of a character carrier having a plurality of characters arranged in a circle thereon and including means for continuously rotating said carrier about the axis of said circle to circulate the master characters on said carrier through a photographing position, means providing a fixed mount for said carrier maintaining the axis of rotation thereof in a stationary position, a light source mounted adjacent said carrier at said photographing position and cooperating with said carrier to illuminate by flash one character at a time to produce an essentially stationary image of each illuminated character, optical means receiving image bearing light beams from said carrier and directing said beams along a common optical path to focus in a common plane, support means for mounting a master pi character laterally of said character carrier, and reflecting means operative between said light source and said optical means to direct light from said light source selectively through a selected character on said carrier and through said master pi character to direct an image of a pi character through said optical means by light emanating from said light source while maintaining the same length of optical path between said optical means and master characters selected from said carrier and/or from said master pi character.

8. In apparatus of the character described a rotatable character carrier having a plurality of fonts of characters formed as parts of differential light transmitting ability, each font having the characters thereof located in a circle concentric with the axis of rotation of said carrier and separate from the other fonts, means defining an optical axis along which an image bearing light beam of a selected one of said characters may be directed for recording, a flash source of light including controls therefor arranged to energize said light source for a sufficiently short duration and in such exact timing as to project a stationary image of a selected one of said fonts, means for directing the light from said flash source selectively toward a desired one of said font circles, reflecting means operative between the selected one of said fonts and said optical axis defining means to direct the image bearing light beams of selected characters in any one of said fonts into said optical axis defining means while maintaining a constant optical length between said character carrier and said optical system, font selector means defining a selected position of said reflecting means, support means for mounting a pi character plate laterally of said character carrier, controls operative on said reflecting means independently of said font selector means to move said reflecting means beyond said carrier and into alignment with said support means to direct an image of a pi character along said optical axis and to return said reflecting means to the control of said font selector means.

9. In apparatus of the character described a plurality of rotatable character carriers each having a plurality of fonts of characters formed as parts of differential light transmitting ability, each font having the characters thereof located in a circle concentric with the axis of rotation of the associated said carrier and separate from the other fonts, means defining an optical system having an axis along which an image bearing light beam of a selected one of said characters may be directed for recording, a flash source of light including controls therefor arranged to energize said light source for a sufficiently short duration and in such exact timing as to project a stationary image of a selected single character from a selected one of said fonts, means mounting said carriers for selective positioning in an operative position relative to said light source, means for directing the light from said flash source

selectively toward a desired one of said font circles on the carrier located in said operative position, and reflecting means operative between the selected one of said fonts on the carrier in said operative position and said optical system to direct the image bearing light beams of selected characters in any one of said fonts on the carrier in operative position into said optical system while

maintaining a constant optical length between said character carrier in operative position and said optical system.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,099,945 August 6, 1963

Richard C. O'Brien

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 64, after "situation" insert -- by displacing the carrier with respect to the light source, --; column 2, line 7, strike out "by displacing the carrier with respect to the light source,"; line 56, for "ad" read -- and --; column 3, line 31, after "other" insert -- of --; column 4, lines 40 and 41, for "include" read -- includes --; column 9, line 75, for "mounted adjustably" read -- adjustable --.

Signed and sealed this 3rd day of March 1964.

(SEAL)
Attest:

ERNEST W. SWIDER

Attesting Officer

EDWIN L. REYNOLDS

Acting Commissioner of Patents