April 11, 1950 H. W. YOUNG 2,503,647

PHOTOTYPOGRAPHIC COMPOSING MACHINE HAVING ELECTROMAGNETIC SPACING MEANS

Filed May 2, 1947 5 Sheets-Sheet 1

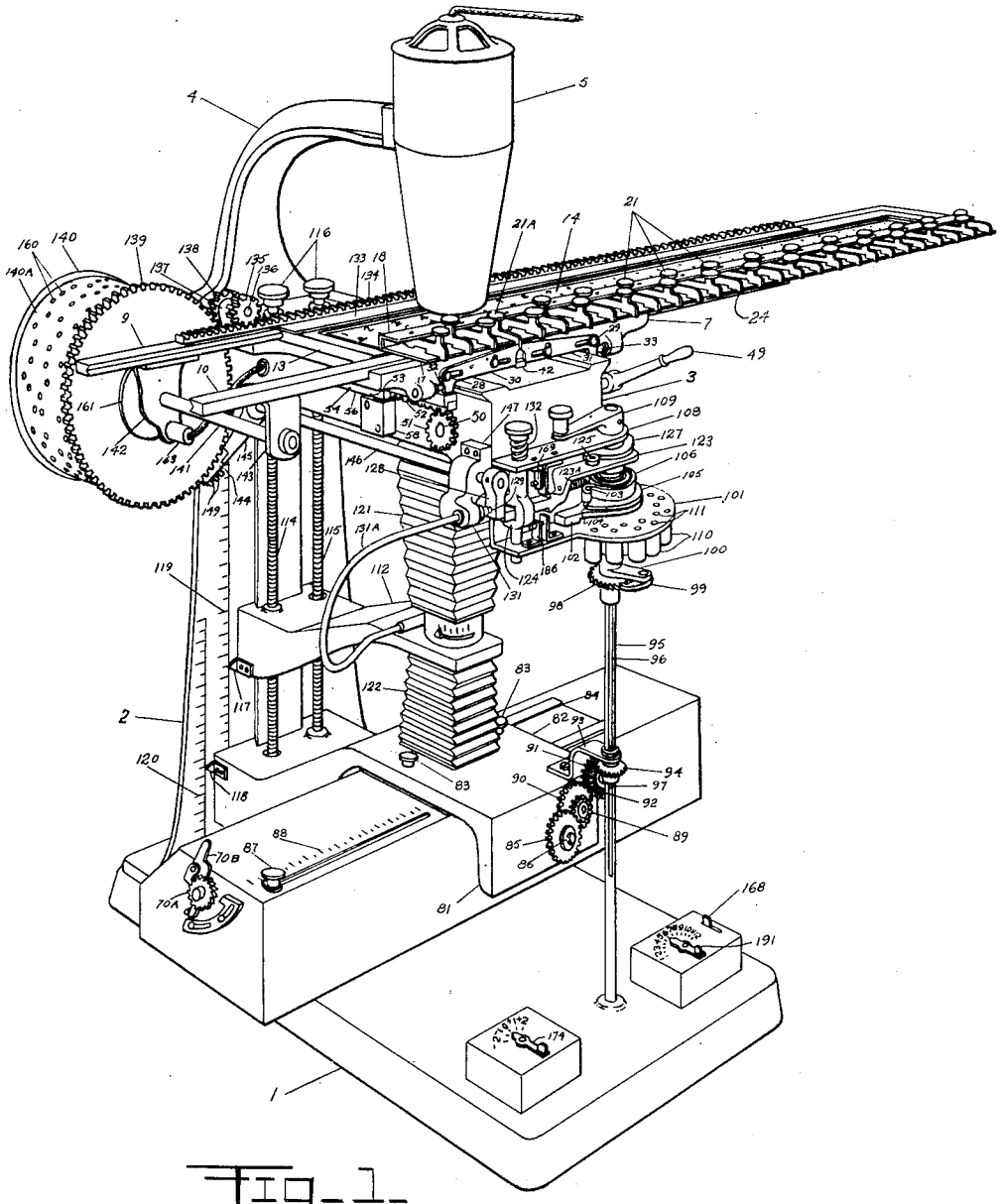


Fig. 1.

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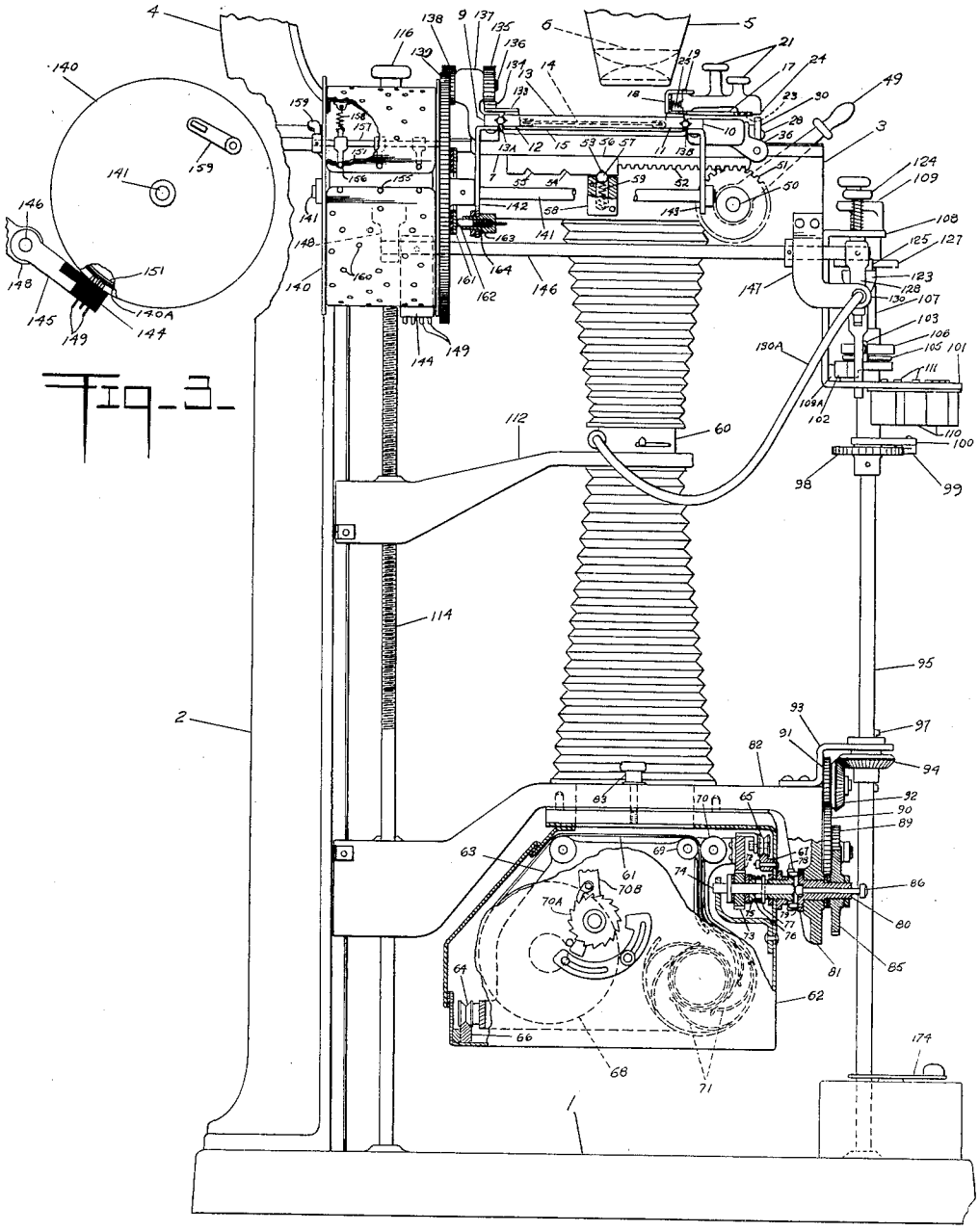


Fig. 3.

Fig. 2.

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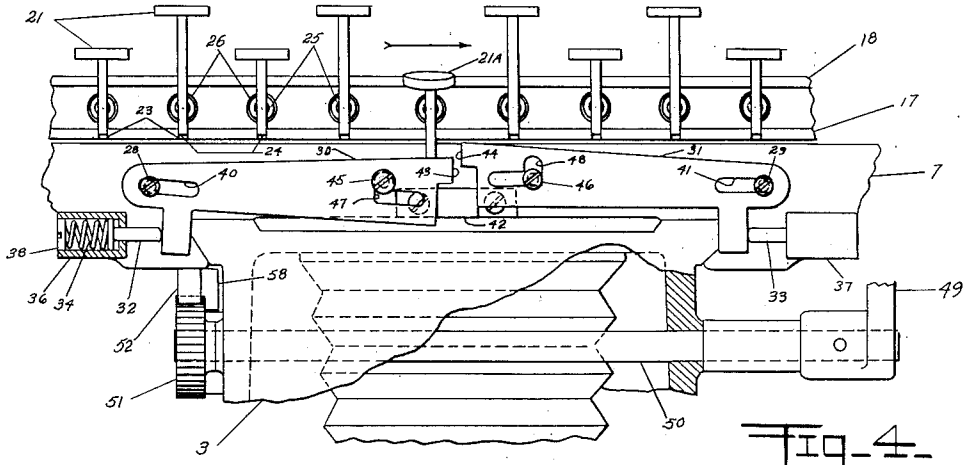


Fig. 4.

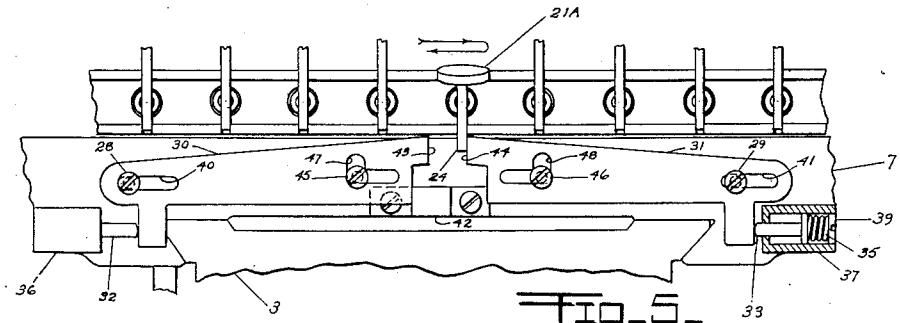


Fig. 5.

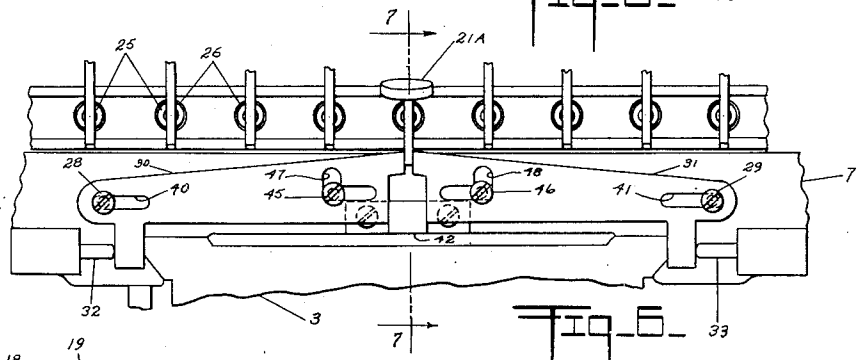


Fig. 6.

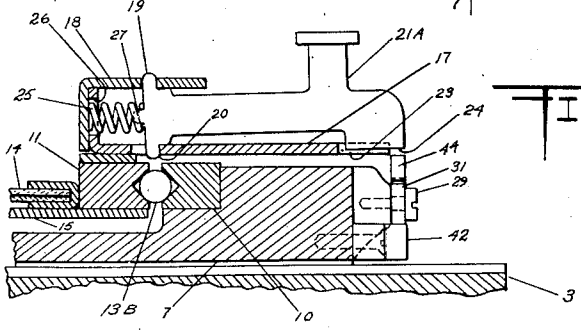


Fig. 7.

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PHOTOTYPOGRAPHIC COMPOSING MACHINE HAVING ELECTROMAGNETIC SPACING MEANS

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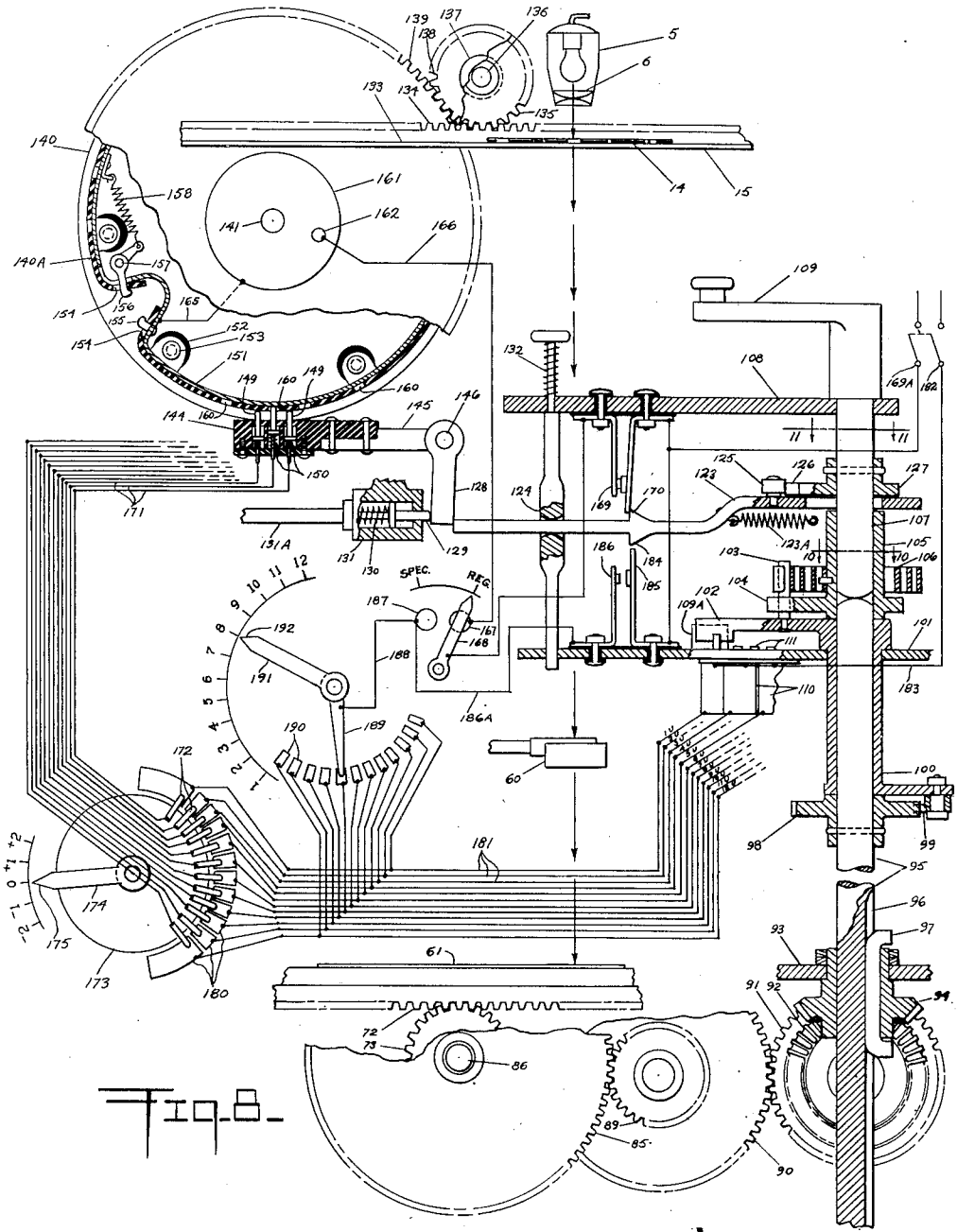


Fig. 8.

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PHOTOTYPOGRAPHIC COMPOSING MACHINE HAVING ELECTROMAGNETIC SPACING MEANS

Filed May 2, 1947 5 Sheets-Sheet 5

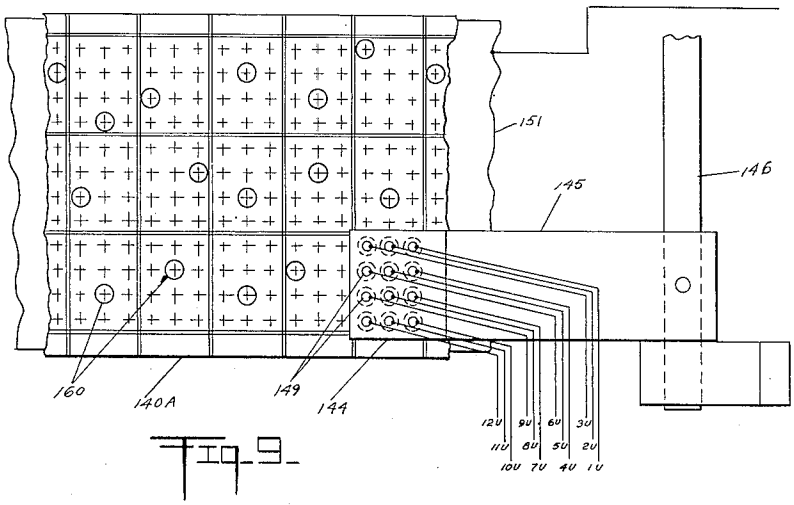


Fig. 9.

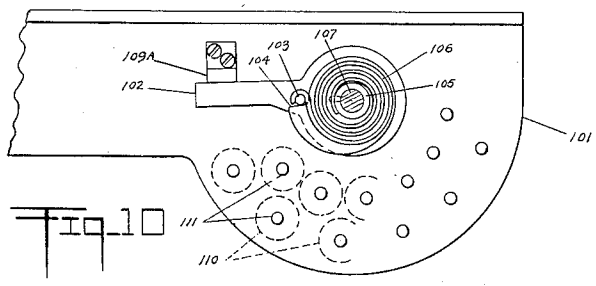


Fig. 10

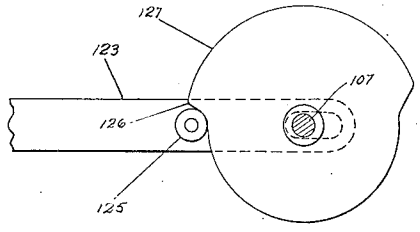


Fig. 11.

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UNITED STATES PATENT OFFICE

2,503,647

PHOTOTYPOGRAPHIC COMPOSING MACHINE HAVING ELECTROMAGNETIC SPACING MEANS

Homer W. Young, Ilion, N. Y.

Application May 2, 1947, Serial No. 745,468

2 Claims. (Cl. 95—4.5)

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This invention relates to improvements in phototypographic composing machines and particularly to improvements in such machines employing movable character bearing master negative plates, light projecting means for photoprinting selected characters upon a photo-sensitive material and means for spacing said printed characters.

A divisional application Serial No. 109,896 was filed August 12, 1949.

One of the principal objects of my invention is the provision of character negative carriage locating means which facilitates rapid selection and positioning of characters for printing.

Another object of my invention is to provide automatic means for variable spacing of the printed characters in accordance with the respective widths of the characters employed.

Another object of this invention is to provide resilient means for arresting the negative carrier at the printing position for any character and for locking the carriage in such position.

A further object is to provide a means for employing a keyboard carried by the negative carrier, in which positioning of the carriage for printing a selected character is accomplished solely through manipulation of the selected key.

Another object is to provide a keyboard in which the keys are adapted to cooperate with a resilient stop to arrest the carriage at printing position for a selected character.

Another object is to provide means for quickly and easily conditioning a machine of this character for automatically spacing the characters in accordance with their widths for any of various styles of type faces.

A further objective is to provide optional means for extending or contracting the spacing of all characters by a selected uniform amount.

A further objective is to provide optional means for expanding or contracting the spacing of selected characters.

Another object of this device is to provide means for interword spacing and means for optionally varying the interword spacing.

An additional objective is the provision of key controlled means carried by the character carriage for interengaging a centrally positioned locking means whereby when a selected key on the carriage is depressed and moved toward the central position the carriage will be resiliently arrested and locked at the printing position.

A further objective is to provide a means whereby a record strip accompanying a negative character plate is adapted to function in the machine to provide automatic spacing of the printed characters of that plate in accordance with the widths of the characters employed.

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Other objects and advantages will become apparent from the following description and accompanying drawings in which:

Fig. 1 is a perspective view of a phototypographic composing machine embodying my invention.

Fig. 2 is a side elevation of the machine.

Fig. 3 is a fragmentary rear view of the space control strip drum and sensing brush holder.

Fig. 4 is a fragmentary front view of the carriage positioning mechanism and showing the carriage being moved to the right with a selected character key approaching the central locking position.

Fig. 5 is a similar view showing the carriage rebounding toward the final locking position after being arrested by the resilient stopping means.

Fig. 6 is a similar view showing the carriage at rest in the final locking position.

Fig. 7 is a fragmentary sectional view taken on line 7—7 of Fig. 6 and showing the character key in the up position.

Fig. 8 is a schematic layout of the electrical system and component elements of the character spacing and printing means.

Fig. 9 is a schematic layout of the space control strip and sensing means, representing a bottom view of these elements.

Fig. 10 is a fragmentary section taken on 10—10, Fig. 8, showing the space control mechanism.

Fig. 11 is a fragmentary section on line 11—11, Fig. 8, showing cam means for operating selector brush and shutter.

The reference characters throughout the several views represent similar elements.

With reference particularly to Figs. 1 and 2, I have provided a general frame structure with a base 1, an upright rear member 2, a forwardly projecting table member 3 and a lamp supporting bracket 4 to which is secured the lamp housing 5 containing a light source and condensing lens system 6.

Mounted for forward and rearward movement on ways of the table 3 is a carriage base 7 having rail members 9 and 10 secured thereto which through their V-shaped inner faces and similar opposed V-shaped surfaces of the front and rear members 11 and 12 respectively of the negative character plate carriage 13 together with interposed balls 13A and 13B provide race means

for longitudinal reciprocation of the negative carriage. Ball retainer means of conventional which there is a series at both front and rear.

The front and rear members of the negative character plate carriage together with the end members thereof provide a rectangular frame within which the negative character plate 14 is disposed upon inwardly extending flange members 15, secured to the underside of the frame. Elements of the negative character plate carriage and bearing means are shown in Fig. 7.

Secured to the front member 11 of the character plate carriage is a key retaining frame comprising a lower plate 17 and an upper plate 18 (see Figs. 4, 5, 6 and 7) forming a forwardly facing channel, each of the plates having a longitudinally disposed series of openings for receiving upper and lower tongues 19 and 20 respectively of the key members 21, the openings 22 in the lower plate being elongated to permit forward and rearward movement of the lower tongue 20 of the key. The lower plate carries forwardly facing slots 23 in matched relation to the holes 22 for receiving the pendant guide tongues 24 of the key members.

Springs 25 engaged within holes 26 in the upturned rear portion of plate 17 and seated against the down-turned rear portion of plate 18 engage rearwardly disposed tongues 27 of the keys and urge the latter forwardly so the upper and lower tongues 19 and 20 respectively are normally disposed against the rearwardly facing front walls of the upper and lower openings in which they are disposed and in which position the keys are disposed with the pendant tongues 24 within the forward facing slots 23 but do not project below the plate 17. Thus disposed the keys are resiliently held in their "up" position and may be depressed until the body portion rearwardly of the pendant tongue 24 engages the plate 17.

Disposed slightly forward of the plate 17 and pivoted on studs 28 and 29 (Fig. 4) and carried by the carrier base 7 are latch members 30 and 31 respectively, resiliently urged inwardly and upwardly at the inner ends by spring loaded plungers 32 and 33, the springs 34 and 35 (Figs. 4 and 5) being adjustably supported in the cylindrical housings 36 and 37 by threaded plugs 38 and 39 respectively.

Slots 40 and 41 permit outward movement of the latch members on the pins 28 and 29 while the block 42 limits the inward movement of the latch members and determines the minimum space between the opposed faces 43 and 44 of the latch members. Studs 45 and 46 disposed within L-shaped slots 47 and 48 respectively limit the upward movement of the latches and excepting when the latter are in their extreme innermost position also prevent their depression. The latches 30 and 31 are so disposed that they will not be engaged by any of the carriage keys if the latter are in their uppermost position.

Depression of any key such as 21*a* (Figs. 1, 4, 5 and 6) brings the pendant tongue 24 of the key below the level of the top surfaces of the latches 30 and 31 at their inner ends whereby when a selected key, located outwardly of the central position in respect to the latches, either to the right or to the left, is depressed and moved toward the central position the pendant tongue 24 will engage the top surface of the adjacent latch (Fig. 4) causing the latter to swing downward to allow the movement of the key to the central position whereupon it will disengage the depressed latch allowing it to return to its upper position and

will engage the remaining latch (Fig. 5) which, being spring loaded will resiliently arrest the carriage and reverse its motion to return the key to the central position whereupon it will reengage the first latch which again resiliently arrests the carriage (Fig. 6). The amount of overtravel of the carriage beyond the printing position of the selected character key and the subsequent number of reversals will depend upon the velocity with which the carriage is initially moved. Finally the carriage comes to rest with the selected key interposed between the faces 43 and 44 of the latches, the space between such faces when the latches are in engagement with the block 42 being adjusted to closely approximate the thickness of the pendant tongues 24 of the keys so there will be a minimum of clearance either between the pendant tongues and the latches or between the latter and the block 42 when the carriage is locked in printing position.

The master negative character plate 14 in the present embodiment carries three longitudinal rows of characters, representing capital, lower case and figure characters disposed respectively in front, middle and rear positions on the plate with a comma and period in both the middle and front rows and auxiliary characters such as parenthesis, question mark, etc. in the figure, or rear row. Such characters are distributed longitudinally of the plate so that a character in each row is disposed opposite one of the keys of the carriage, like capital and lower-case characters of the alphabet occupying the same longitudinal position on the plate, whereby each key excepting the period and comma keys represent the longitudinal position of a particular alphabetical character in both capital and lower-case and also one of the figure or auxiliary characters.

The carriage base 7 being adapted as previously disclosed for forward and rearward movement on the table 3, selection of any longitudinal row of characters is obtained by moving the lever 49 secured to the shaft 50 which carries a pinion 51 engaging a rack 52 carried by the carriage base 7. Notches 53, 54 and 55 in the plate 56 carried by the carriage base 7 are adapted to engage a spring urged ball 57 disposed in a cylindrical opening in the block 58 secured to the table 3. This detail is shown partly in section in Fig. 2 wherein the spring 59 has detented the ball in the front notch 53 which locates the carriage base 7 in proper transverse position to bring the front or capital row of characters on the master character plate in printing position. Shifting the carriage base to allow detention of the ball with notches 54 or 55 locates the master negative plate transversely in position for printing respectively the lower-case and figure row of characters.

The printing position of any character on the negative plate is such that the character on the negative plate is disposed about the optical axis of the projection system whereby the image if the character which is clear and delineated by an opaque background, may be projected through a suitable camera lens within the housing 60 upon a light sensitive element such as photographic paper 61 disposed within the light-proof housing 62.

Within the housing 62 and mounted for longitudinal movement there is a paper carriage 63. Rollers 64 and 65 mounted on the paper carriage at one end thereof and similar rollers at the other end engage tracks 66 and 67 respectively carried by the housing 62.

The paper carriage (Fig. 2) is adapted to receive

a roll of sensitized paper 68 and suitable feed rollers 69 and 70 are adapted to feed the paper in a manner known to the art in line by line steps and resilient blades 71 are adapted to re-roll the paper as it is fed through the carriage. Manual ratchet and pawl line feed means indicated generally at 70A is suitably geared to rollers 69 and 70 to actuate the latter. The paper is shown as being fed forwardly which necessitates printing the characters upon the paper with their tops toward the front which in turn requires that the master negative carry the characters with their tops disposed at the rear and further requires that the paper carriage be fed from left to right to properly dispose the printed characters within a line.

Character spacing and inter-word spacing is provided for through a rack 72 carried by the paper carriage and engaged by a pinion 73 loosely mounted on the shaft 74 and frictionally locked therewith through a clutch member 75, the shaft 74 being urged into locking position by the spring 76 bearing on the pin 77 carried by the shaft 74 and passing outwardly through slots in the clutch member 75. The clutch member 75 passes through a suitable bearing in the front wall of the housing 62 and terminates in a radially slotted head 78 adapted to engage pins 79 carried by a shaft 80 disposed in a bearing in the down-turned apron portion 81 of the movable paper carrier head 82 to which is removably attached the paper carriage 62 through screws 83—83. The slots 78 in the clutch member together with the pins carried by the shaft 80 provide an universal joint which permits of slight misalignment between the clutch member and the shaft and provides a disengaging means when the housing 62 is removed from the machine, as for loading or unloading the photographic paper in a dark room. A conventional dark slide (not shown) is provided to engage a slide guide 84 (Fig. 1) to close the opening in the top of the housing when the latter is removed from the machine or when the machine is not in use.

A removable gear 85 is secured to the shaft 80 and a key or pin (not shown) prevents relative rotation of these parts. A clutch release member 86 extends through a central opening in the shaft 80 and is adapted to be pushed rearward to engage and depress the shaft 74 against the spring 76 to effect release of the clutch whereby the paper carriage may be independently shifted to any desired position such as the beginning of a line by the external indicator button 87 (Figs. 1 and 2) which is interconnected with the paper carriage. A scale 88 on the housing 62 provides an indication of the lineal position of the carriage.

Engaged with gear 85 is a companion gear 89 also removable and carried by the gear 90, the latter being rotatably mounted on a stud secured to the apron 81, the gears 85 and 89 comprising a pair which are adapted to be replaced by any other pair having the same combined diameters, whereby different ratios can be established between the rotation of the gear 90 and the shaft 80 to provide a greater or less relative movement of the paper carriage for a given rotative movement of the gear 90 to compensate for varying image enlargement or reduction resulting from the selective positioning of the paper carriage and camera lens with respect to the negative master character plate.

Gear 90 engages a pinion 91 carried by the bevel gear 92 and rotatable therewith on a stud carried by the apron 81. A bracket 93 secured to the carriage head 82 carries at its outer end a bevel gear 94 (Fig. 8) mounted for rotation within a vertically disposed opening in the bracket and engaging bevel gear 91. The bevel gear 94 is slidably engaged on the upright shaft 95 and a slot 96 is provided in the shaft for receiving a sliding key 97 carried by the bevel gear 94 whereby relative rotation between these parts is prevented and whereby the gear may be vertically displaced on the shaft when vertical adjustment is made on the carrier head 82.

Keyed to the shaft 95 is a ratchet wheel 98 which is engaged by the pawl 99 of the ratchet sleeve 100 which surrounds the shaft 95 and is supported for rotation in a plate 101 secured to the table 3 (Fig. 10) the sleeve 100 terminating above the plate in a flange which carries an arm 102 having an upwardly projecting pin 103 adapted to engage the projection 104 of the flanged lower end of the sleeve 105 and is resiliently held in such rotative engagement by the spring 106 attached at its inner end to the sleeve 105 and having its outer hooked end engaged around the pin 103. The sleeve 105 is keyed to the shaft 107 which extends upward through and is supported by the plate 108 secured to the table 3 and carries a hand lever 109 at its upper end.

The flanged sleeve 104 engaged an extension of the shaft 95 to form a lower bearing for the shaft 107.

Counter-clockwise (left to right) movement of the hand lever simultaneously moves the sleeve 105 in the same direction and the spring 106 through the pin 103 urges the arm 102 in the same direction.

Electro-magnets 110—110 secured to the plate 101 are adapted to project plungers 111—111 upwardly to provide stops for the arm 102 and are so spaced radially that they each represent a rotative displacement equal to one tooth of the ratchet wheel 98 whereby when the lever 109 is moved to the right and any one of the plungers 111 is projected in the path of the arm 102, the arm will engage and be arrested by such plunger (although the hand lever together with the sleeve 105 may be moved to the extreme right).

With the hand lever 109 at the normal position at the extreme left against the stop 109A sufficient space is provided between the arm 102 and the first plunger to permit rotative movement of the arm equivalent to the angular displacement of one tooth of the ratchet wheel 98 plus an initial movement of the arm equal to slightly less than one tooth of the ratchet wheel whereby the energization of any of the magnets may occur before the arm 102 reaches the first plunger as will be explained in connection with selection and energization of the magnets. It will be observed that the pawl 99 is adapted to engage the teeth of the ratchet wheel when the arm 102 is moved in clock-wise direction (right to left) and that the arm 102 is adapted to be picked up by the extension 104 of the sleeve 105 during the return of the hand lever to the left to its normal position whereby the spacing of the paper occurs only during the return of the hand lever, and after the photographic exposure has been made.

In the present disclosure the widest spacing required by any character is taken as a base and is comparable to an "em" space in ordinary printing. Such maximum width is broken up into twelve units corresponding to $\frac{1}{12}$ em each and the angular spacing of the plungers 111—111

and the teeth of the ratchet wheel 98 correspond to one unit of spacing, it being understood that actual movement of the rack 72 and consequently the photosensitive paper for each unit of movement of the ratchet wheel 98 will depend upon the degree of reduction or magnification effected through the gear train as a consequence of the selection of change gears 85 and 89 and that a gear ratio is chosen that will produce a paper carriage spacing to correspond with the character image reduction or enlargement desired in the printed characters. Obviously a change-gear box can be substituted for the gears 85 and 89 to facilitate changing the gear ratio.

Setting the machine for a given enlargement or reduction of the projected image is accomplished by adjustment of the head 82 and the bracket 112 which carries the shutter and lens housing 60, lead screws 114 and 115 being provided for raising or lowering the head 82 and the bracket 112 through threaded engagement with these elements. Hand wheels 116—116 at the projecting top ends of the lead screws provide a means for rotating the latter and pointers 117 and 118 in conjunction with scales 119 and 120 may be provided as a means for determining the proper setting for a given enlargement or reduction. Suitable bellows 121 and 122 interconnect the table 3 and carriage head 82 respectively with the movable camera lens housing bracket 112.

A push rod 123 (Fig. 8) having at one end an elongated opening in which the hand lever shaft 107 is disposed and which is guided at its opposite end by passing through a slot in a space-bar 124 carries a roller 125 which is adapted to be engaged by the lobe 126 of the cam 127 secured to the shaft 107 when the latter is moved to the right, such engagement and consequent movement of the push rod to the left occurs during the initial stage of rotation of the hand lever and is completed before the arm 102 reaches the first of the plungers 111. A spring 123A anchored to the plate 108 urges the push rod to the right. The push rod is adapted to engage the lever 128 (Fig. 8) which in turn is moved to the left and depresses the shutter cable extension 129, the latter being urged outward by the spring 130 within the housing 131 to which the cable sheath 131A is attached. The shutter and cable may be of conventional design and need no further description excepting to to note that the shutter should have incorporated therein a timing mechanism to control the length of exposure and an adjusable diaphragm opening.

The space-bar 124 is assumed to be in the "up" position in the foregoing description and is so urged by the spring 132, however the space-bar is mounted for vertical movement within bearings in plates 101 and 108 and if depressed will carry the push rod 123 out of possible engagement with the lever 128 whereby if the hand lever 109 is operated the shutter will not be opened and consequently no exposure will result on the photo-sensitive paper, but spacing of the paper carriage will occur in accordance with provisions to be described in connection with the inter-word spacing mechanism.

At the top of the rear member 12 of the negative character plate carriage a plate 133 is attached and the latter carries a rack 134 which engages a pinion 135 secured to a shaft 136 mounted for rotation in a bracket 127 carried by the carriage base 7. Rearwardly of the bracket 137 the shaft 136 has secured thereto a pinion 138 which engages the gear 139 secured to the space control strip drum indicated generally at 140. The drum is secured to a shaft 141 mounted for rotation in hangers 142 and 143 attached to the rail members 9 and 10 respectively, whereby longitudinal movement of the negative plate carriage will result in rotation of the control strip drum and transverse movement of the carriage base results in similar movement of the control strip drum. The circumference of the drum is somewhat in excess of the total length of the negative character plate and since any movement of the character plate is translated to the conrol strip drum an insulated control strip 140A disposed at the periphery of the drum will have thereon areas which correspond with given character positions on the negative character plate. An insulated brush holder 144 secured to the brush holder arm 145 (Figs. 3 and 8) attached to the shaft 146 which also carries the lever arm 128 described in connection with the shutter opening mechanism. The shaft 146 is supported at the front and rear by brackets 147 and 148 respectively carried by the table 3.

Suitable holes are provided in the insulated brush holder 144 for receiving brushes 149—149 of which in the present disclosure there are twelve, each of which corresponds with a given number of units of character spacing from one to twelve. Springs 150—150 urge the brushes upward to provide resilient projection of the exposed contact portions thereof.

The brush holder is disposed beneath the control strip drum and in such front to rear relation therewith that when the carriage base 7 is shifted transversely through the capital, lowercase and figure positions the brush holder will occupy a front, middle and rear position respectively on the control strip drum, as for instance in Fig. 2 the carriage base 7 is in position to register the capital line of characters with the projection system and the control strip drum is shifted rearwardly on the brush holder so the latter occupies a front position on the drum.

A metallic member 151 comprises the peripheral cylindrical surface of the drum 140 and (Fig. 8) is insulated from the end members of the drum by washers 152 and suitable insulating sleeves around the rivets 153. Holes 154—154 in the ends of the insulated control strip provide means for engaging stationary hooks 155 carried by the metallic member 151 and movable hooks 156 carried by the shaft 157, the latter hooks being urged inward by the spring 158 to tighten the control strip on the drum. A lever (Fig. 3) attached to the projecting end of the shaft 157 provides a means of releasing the hooks 156 from the control strip.

Holes 160—160 selectively positioned in the control strip 140A permit brushes 149 in juxtaposition therewith to contact the metallic member 151 when the brush holder is elevated toward the drum. Such elevation is accomplished through outward movement of the arm 128 by the push rod 123 as described in connection with the shutter operating mechanism and occurs with the initial movement of the hand lever 109 whereby contact is established between a predetermined one of the brushes 149 and the metallic member 151 before the arm 102 of the spacing mechanism reaches the first magnetic controlled plunger 111.

The front end plate of the control strip drum carries in insulated relation therewith a commutator plate 161 with which is engaged a brush

162 which is slidably positioned in the brush holder 163 (Fig. 2) carried by the bracket 142, the brush 162 being held in engagement with the plate 161 by a spring 164. A lead 165 (Fig. 8) connects the metallic member 151 with the plate 161. A lead 166 connects the brush 162 with one post 167 of a throw switch 168 and through the switch blade 168 and electrical circuit is established with the stationary arm of a relay 169. The movable arm of the relay 169 in circuit with one of the main line switch leads 169A is adapted to be engaged by a projection 170 on the push rod 123 whereby the relay is closed when the hand lever 109 is operated. Closing of this relay occurs after electrical contact is established between a brush 149 and the metallic member 151 and upon returning the hand lever to its normal position, thereby releasing the push rod 123, contact at the relay is broken before the brush holder 144 is lowered sufficiently to break contact between the brush 149 and the metallic member 151 whereby no arcing can occur at the brushes 149 and consequently contact surfaces at this point are not readily corroded or pitted and maintenance in this respect is confined principally to the master relay 169.

Inasmuch as the present machine is designed to employ negative character plates in a wide variety of type styles and in general the character spacing is different between like characters in different styles of type it is necessary to provide a control strip for each style of type. Such control strips are divided into areas corresponding with the relative position of the brush holder 144 (Fig. 9) when the character plate is shifted from one position to another to register the various characters for printing.

Each character position on the negative plate is represented by a rectangular area on the control strip and this area is divided into twelve brush positions one of which in each area may be punched as at 160 to provide contact between a given brush and the member 151, whereby any spacing from one to twelve units may be provided for any character of the negative plate.

Each one of the brushes 149 (Fig. 8) is connected by a lead 171—171 to one of the spring switch terminals 172—172 secured to an insulated plate 173 which is adapted to be rotated by the handle 174 secured thereto to any of the positions indicated for the pointer 175. The central position marked "0" represents standard spacing and in this position the spring switch terminals make contact with lead posts 180—180 which in turn are connected by leads to the magnet windings of magnets 110—110 and the magnets are connected with the main line switch terminal 182 through the common lead 183.

As indicated in the bottom view, Fig. 9, the brushes are so located that the numerical order of the unit spacing represented thereby reads in the front row 1, 2 and 3 units from right to left and in the second row 4, 5 and 6 and so on to 10, 11 and 12 in the rear row whereby in Fig. 8 the numerical order of the leads is 1 to 12 reading down on the terminals 172—172, therefore with the indicator 175 set in the position shown the electrical connection is direct from a brush of a given unit designation to a magnet of similar designation whereby the resultant character spacing will be represented by the location of the punched holes 160—160. However, by shifting the pointer 175 to "plus 1" the terminals 172—172 will be shifted to posts 180—180 of one unit higher order excepting in the case of the

12 unit terminal which will still engage the 12 unit post. In this position instead of spacing the characters in accordance with the punching provided on the control strip each character will receive one extra unit of spacing excepting those punched for 12 units in which case the spacing will remain 12 units. Seldom, however, is any character given a regular spacing of such width. In certain styles of type faces the capital "W" is sometimes given such spacing but it is usually desirable to omit expansion of this character when other characters are expanded due to its appearance. Further expansion may be had by shifting the pointer 175 to "plus 2" which adds 2 units to each lead 172 excepting the 11 and 12 unit leads, the 11 unit lead receiving one additional unit.

Certain styles of type permit contraction of character spacing and if such a contraction is desired the pointer 175 is shifted to the "minus 1" or "minus 2" positions which deducts 1 or 2 units respectively from the punched value, excepting in the lowest value wherein no reduction is made from a single unit space.

Interword spacing is provided for as previously mentioned by depressing the space-bar 124 while operating the hand-lever 109. Depressing the space-bar 124 prevents engagement of the push rod 123 with the lever 128 thereby omitting operation of the shutter and no engagement of the brushes 149 with the member 151 occurs. The projection 170 of the push rod 123 will not engage the movable arm of the relay 169 and instead the lower projection 184 of the push rod will engage the movable arm 185 of the relay 186 to connect the lead from the main switch terminal 169A through lead 186A to the throw switch post 187 and through lead 188 to the switch blade 189 which is selectively engageable with any one of the posts 190—190 connected with the various leads to the magnets 110—110.

An indicator arm 191 secured to the switch blade 189 carries a pointer 192 which placed opposite any of the indicated positions "1" to "12" will result in positioning the blade 189 in contact with a post 190—190 leading to a magnet of unit value corresponding with that indicated by the pointer 192 whereby when the hand lever is operated with the space-bar depressed the interword spacing may be given any desired unit value.

By throwing the switch blade 168 from the post 167 which represents "regular" character spacing to post 187 representing "special" character spacing the lead from relay 169 is connected with the switch blade 189 instead of the brush 162 and consequently any character printed will receive whatever spacing is indicated by the pointer 192, whereby optional spacing may be obtained for any character independently of the punched value of the record strip.

In operation a negative character plate is placed within the rectangular opening in the negative character plate carriage and a space control strip having punchings corresponding with the proper character spacing of the particular type style chosen is installed on the space control strip drum. The bracket carrying the lens and the paper carriage head are located in a position to obtain focusing of the character with the desired enlargement or reduction and a pair of change gears are chosen which will produce proper spacing of the characters for the selected image size in standard spacing. If character spacing of standard value is desired the character space indicating lever 174 is set with its pointer at "0"

and the interword space indicating lever 191 is set with its pointer indicating the desired unit spacing between words.

It will be observed that if the total unit spacing of a line of given characters including an arbitrary interword spacing is computed or otherwise arrived at prior to printing the line the interword spacing can be modified by increasing or decreasing the interword spacing to lengthen or shorten the line to provide justification of a series of lines in a column or for other purposes.

Prior to printing a line of type characters the paper carriage is set with the indicator at the desired point for the beginning of the line. It will be noted here that if line justification is desired indentation of a line beginning a paragraph, etc., can be made by using the space-bar in conjunction with the space indicator 191 to determine the unit value of such indentation.

The shutter and diaphragm are conditioned to provide proper exposure for the given enlargement or reduction, the switch 168 is set on "Reg" to provide automatic character spacing and with the projection light on the machine is in condition for printing.

Printing is accomplished by shifting the negative character plate to the desired longitudinal line of characters through the lever 49 and a selected character key such as 21A (Fig. 1) is depressed and moved to the center of the machine where it will automatically be stopped and locked, bringing the corresponding character in line with the projection system. The hand lever 109 is now swung through a left to right arc and returned to its original position. This operation results in photographically printing the selected character on the paper and subsequently spacing the paper carriage in accordance with the punched value on the character space control strip. Additional characters may be subsequently chosen and printed in the same manner and having completed a line the clutch release member 86 is pushed in and the paper carriage returned by the button 87 to the beginning of another line. Operation of the lever 70B of the line spacing mechanism 70A carries the paper forward to a new line position.

I claim:

1. A phototypographic composing machine comprising a master character bearing plate, means adapted to advance a photosensitive image receiving medium in variable accumulative unitary amounts corresponding to predetermined individual character widths, said means including a series of electromagnets each of which is adapted to effect a different unitary spacing and a control strip for determining the magnet to be associated with each character of the master plate; means for selectively modifying such advancement to increase or reduce the spacing of all characters one or more like unitary amounts, said means comprising a multiplicity of electrical leads, each of said leads being adapted to effect operation of a different electromagnet of said variable spacing means and multiple switch means adapted to universally divert each of such leads to an electromagnet effecting a greater unitary spacing or to universally divert each of said leads to an electromagnet effecting a lesser unitary spacing.

2. A phototypographic composing machine having a character bearing plate; spacing means adapted to advance a photosensitive medium in variable cumulative unitary amounts corresponding to predetermined individual character widths, said means including a series of electromagnets, each of which is adapted to effect a different unitary spacing to said photosensitive medium and control strip means for determining the electromagnet to be associated with each character of the character bearing plates; and means for selectively increasing or decreasing the spacing of all characters universally one or more like unitary amounts, said means comprising a series of electrical leads, each of said leads being adapted to effect operation of a different electromagnet and a multiple switch means adapted to universally divert each of said leads to an electromagnet effecting a greater unitary spacing or to universally divert each of said leads to an electromagnet effecting a lesser unitary spacing.

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