United States Patent [19]

Debus et al.

[11] **3,750,554**

[45] **Aug. 7, 1973**

[54] **PHOTOCOMPOSING MACHINE**

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[73] Assignee: **Mergenthaler Linotype Gmbh,** Frankfurt am Main, Germany

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[21] Appl. No.: **162,999**

[30] **Foreign Application Priority Data**

July 16, 1970 Germany ..... P 20 35 313.3

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

[51] **Int. Cl.** **B41b 21/34**

[58] **Field of Search** 95/4.5

[56] **References Cited**

UNITED STATES PATENTS

2,791,162	5/1957	Snyder	95/4.5
3,008,392	11/1961	Mann	95/4.5
3,122,075	2/1964	Klyce	95/4.5
2,725,803	12/1955	Tansel	95/4.5

Primary Examiner—John M. Horan

Attorney—William P. Keegan

[57] **ABSTRACT**

A photocomposing machine especially adapted for display work. The machine employs a film holder that is horizontally disposed and movable along two coordinate axis. A layout sheet viewable by the machine operator can be placed on the upper side of the film holder so that latter can be positioned in accordance with the requirements of the copy to be produced as indicated on the layout sheet.

10 Claims, 17 Drawing Figures

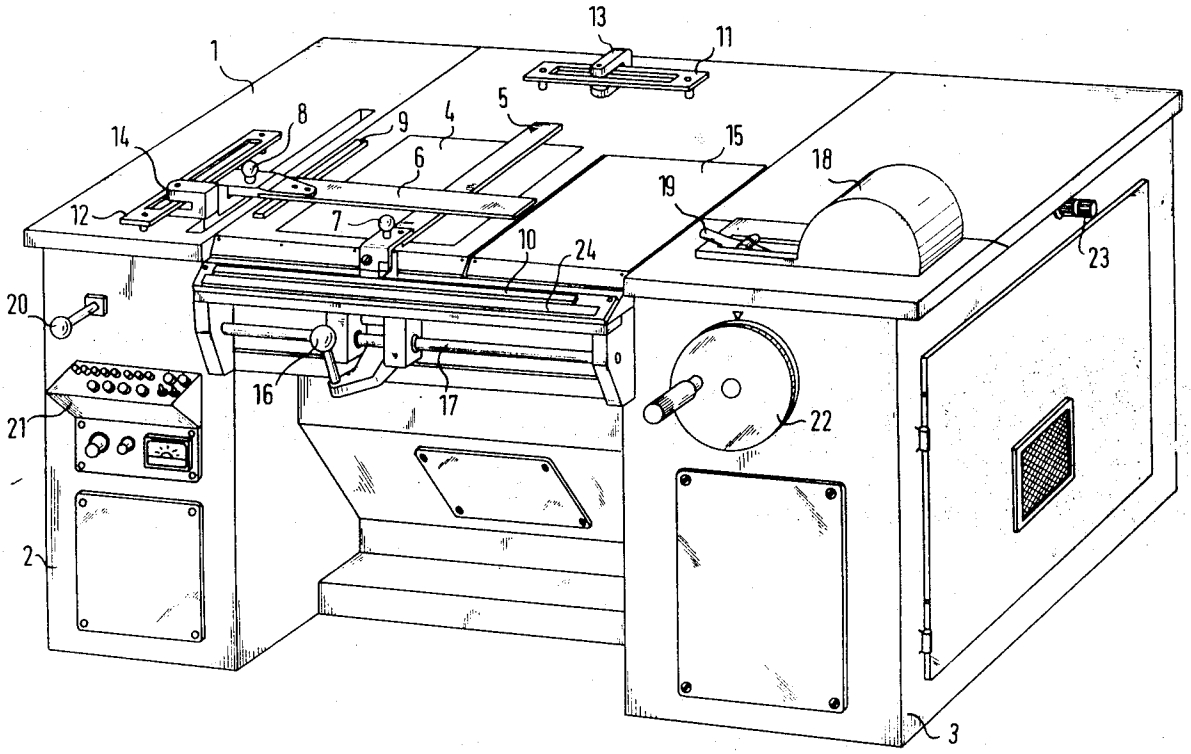


Fig.1

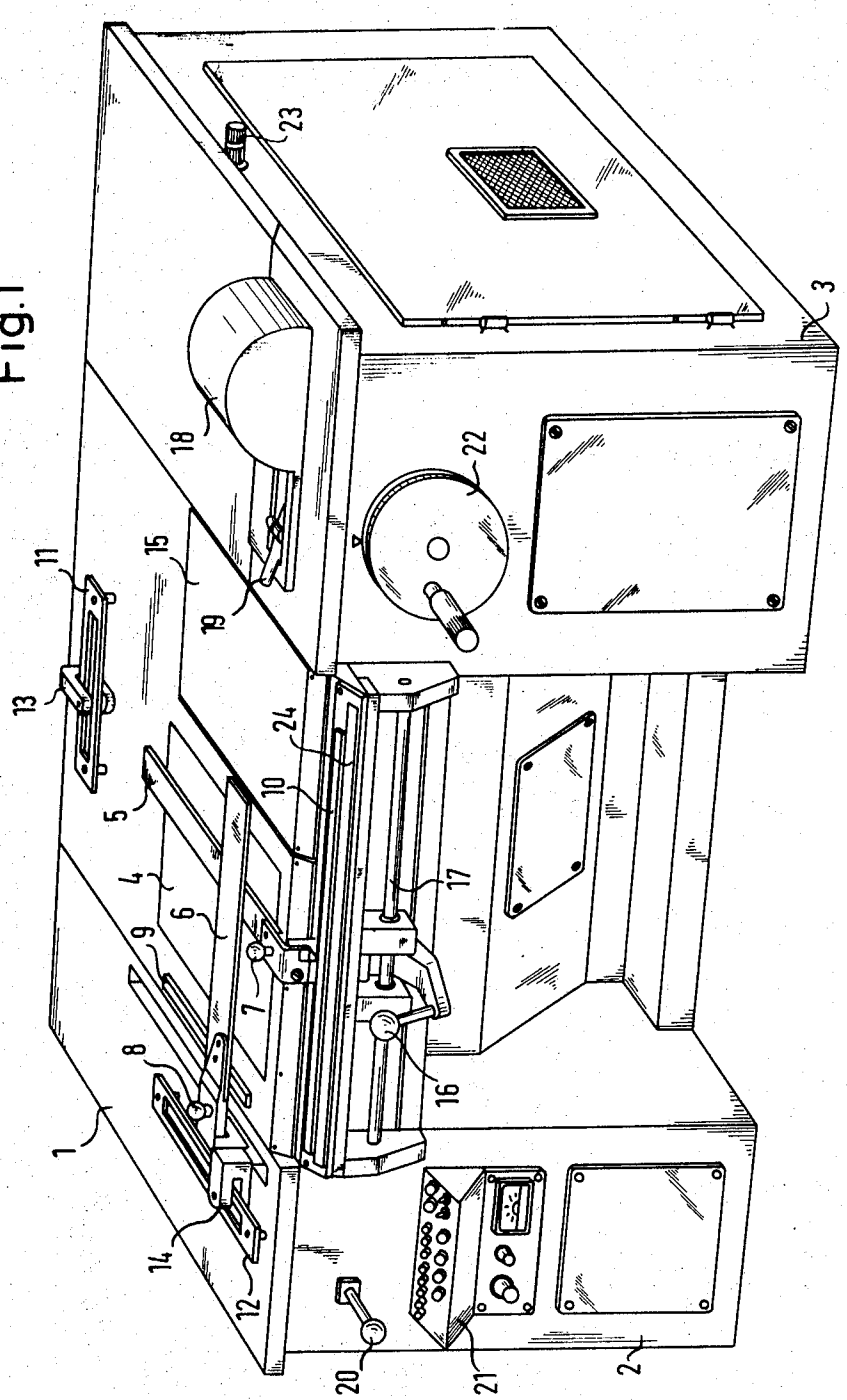


Fig. 2

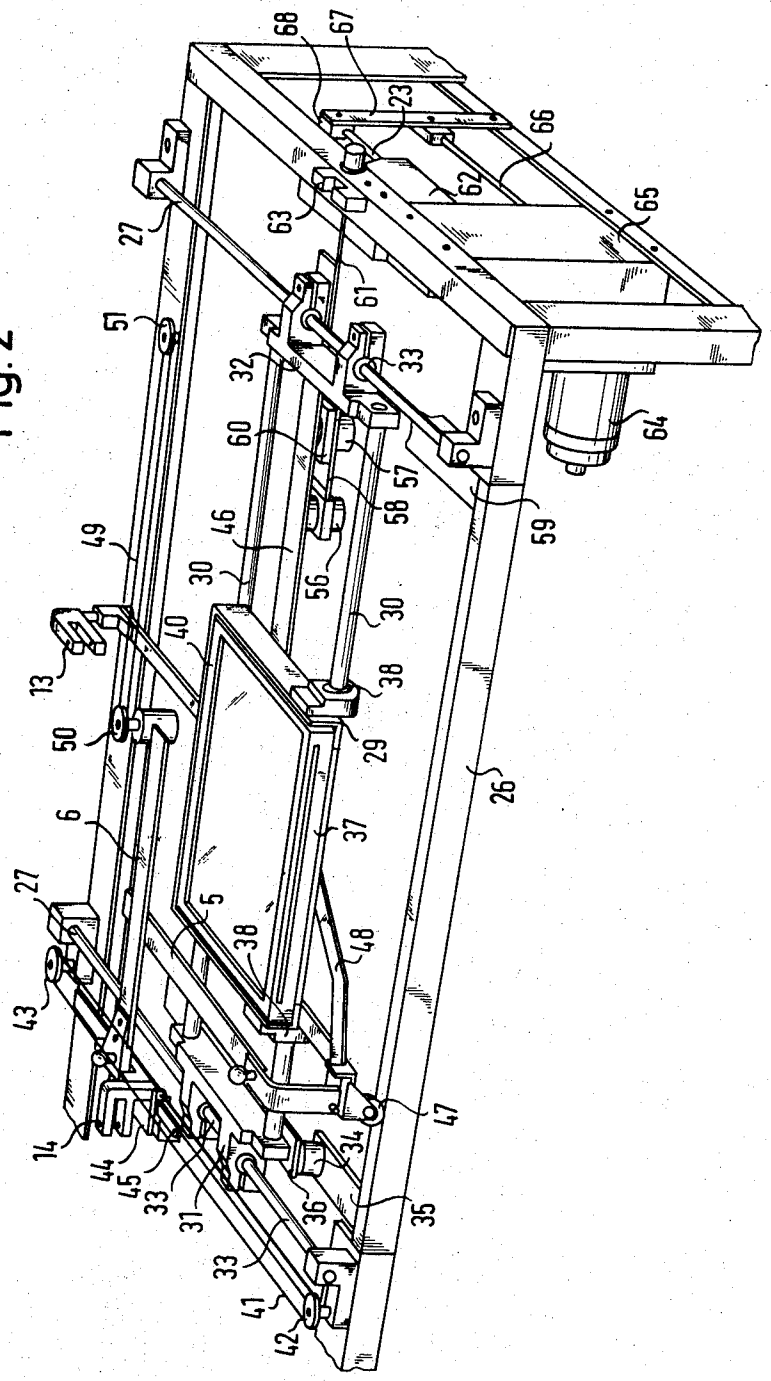

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Fig. 3

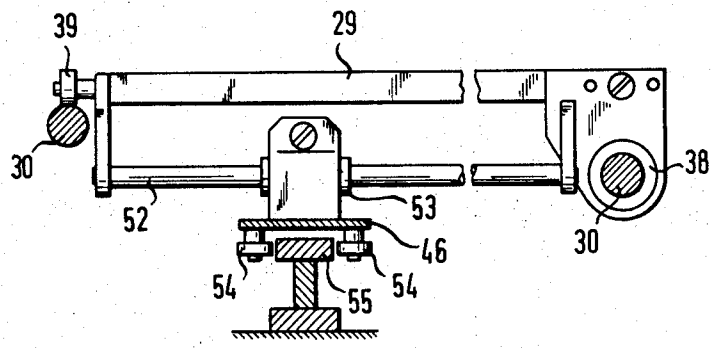


Fig. 4

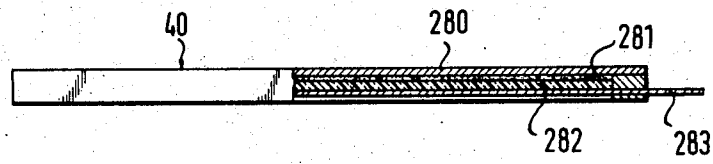
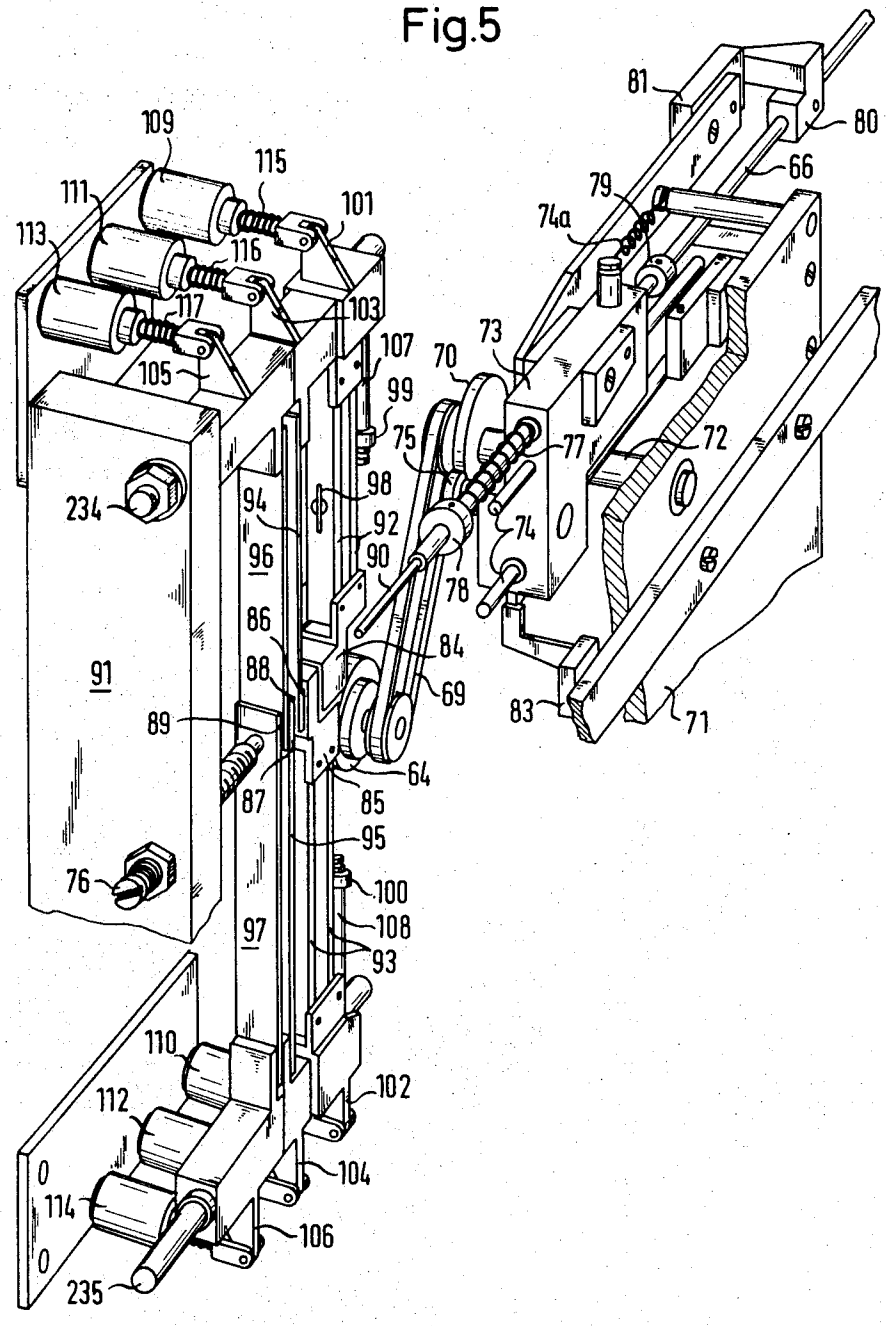


Fig.5


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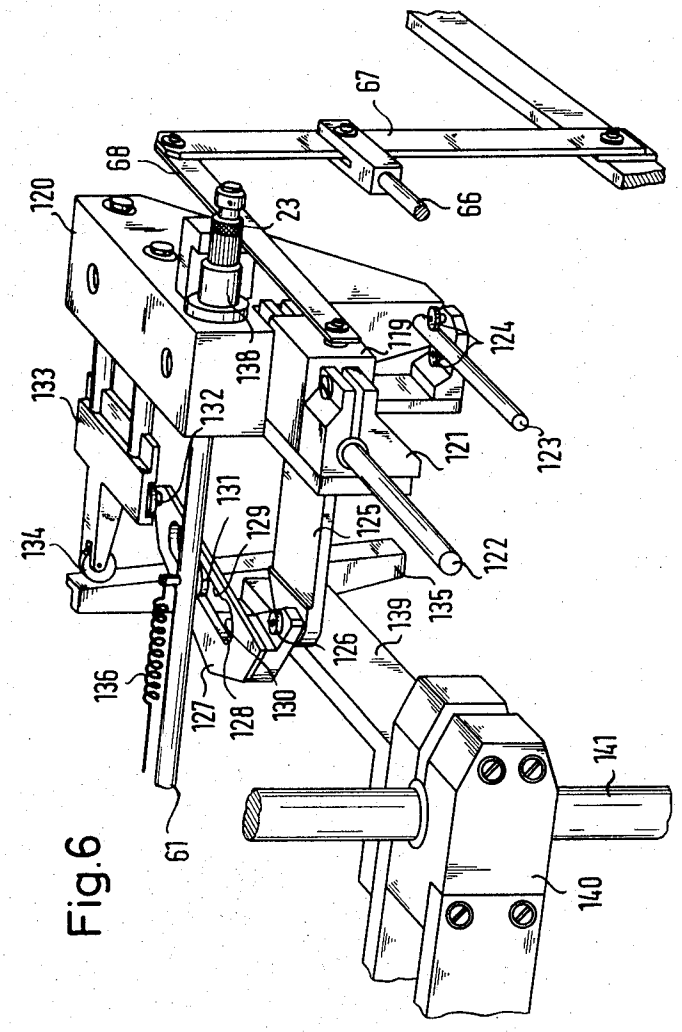

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Fig.6

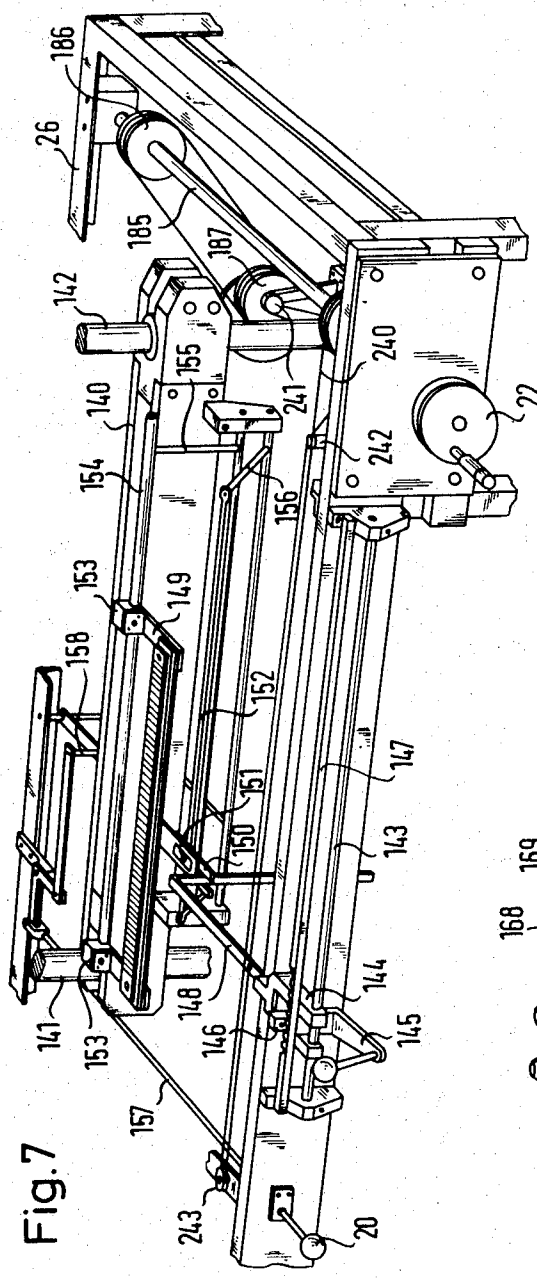

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Fig.7

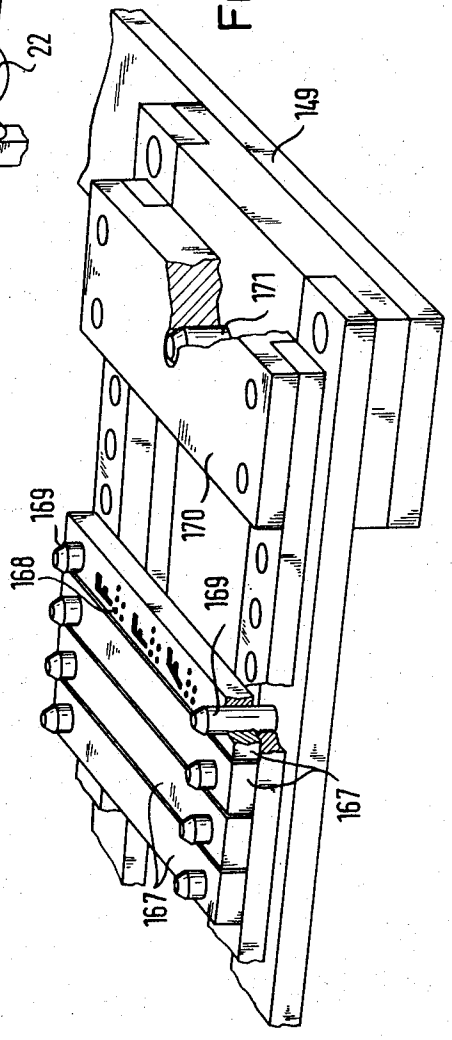

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Fig.8

Fig.9

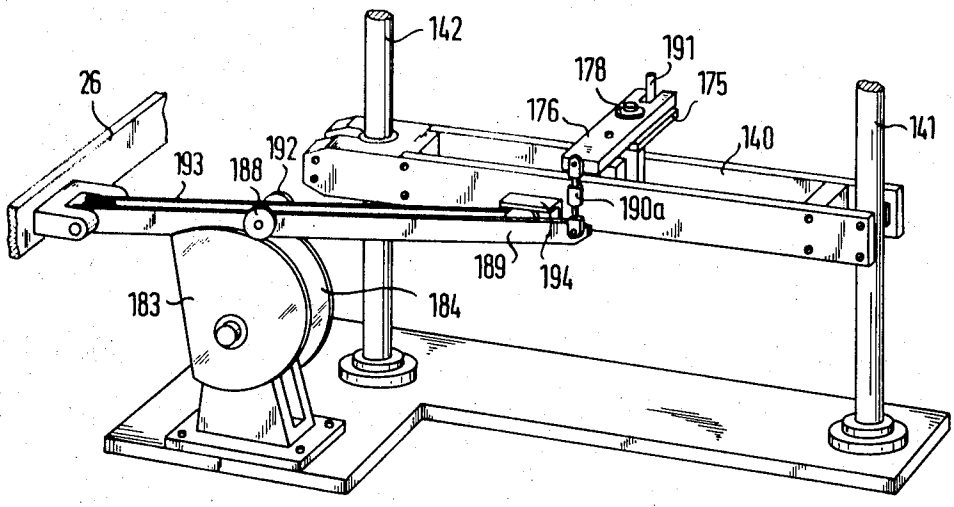

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Fig.11

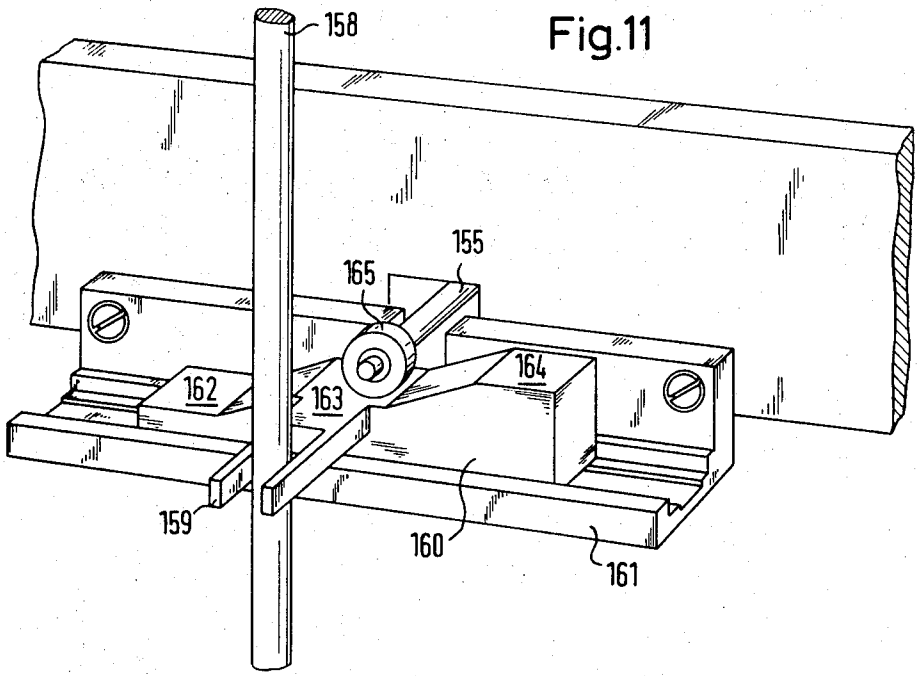

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Fig.10

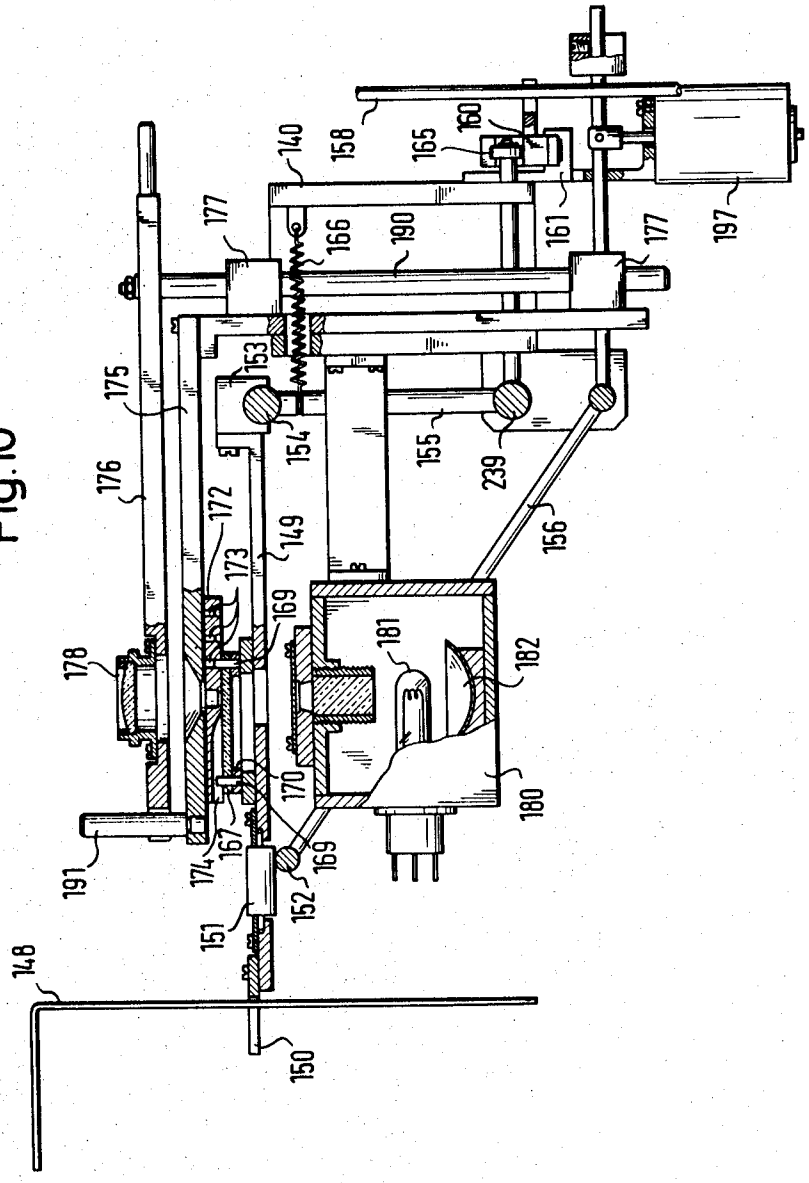

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Fig.12

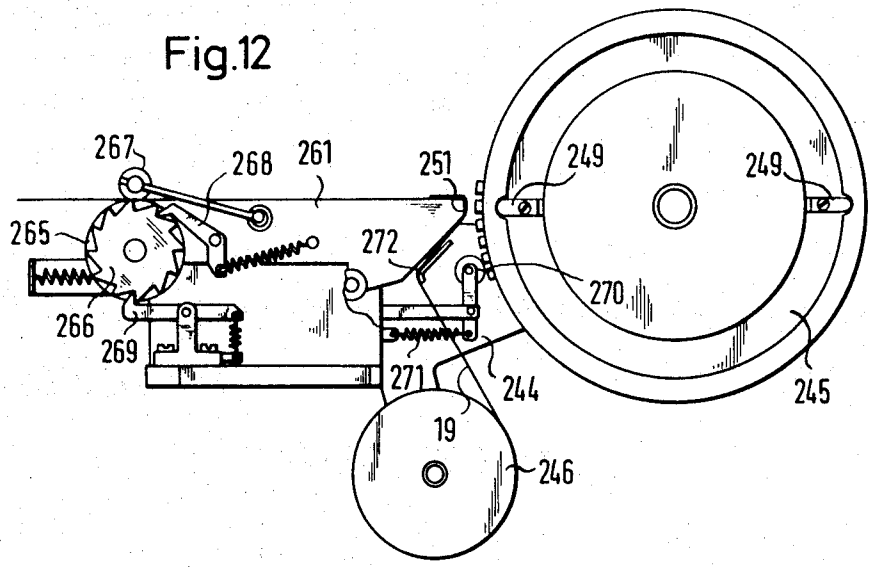


Fig.13

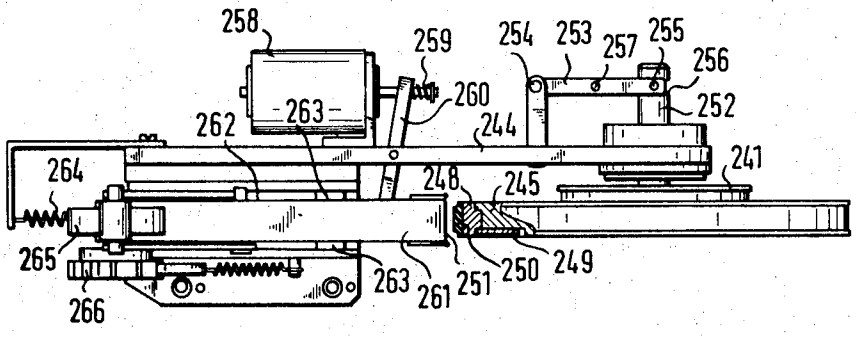


Fig.14



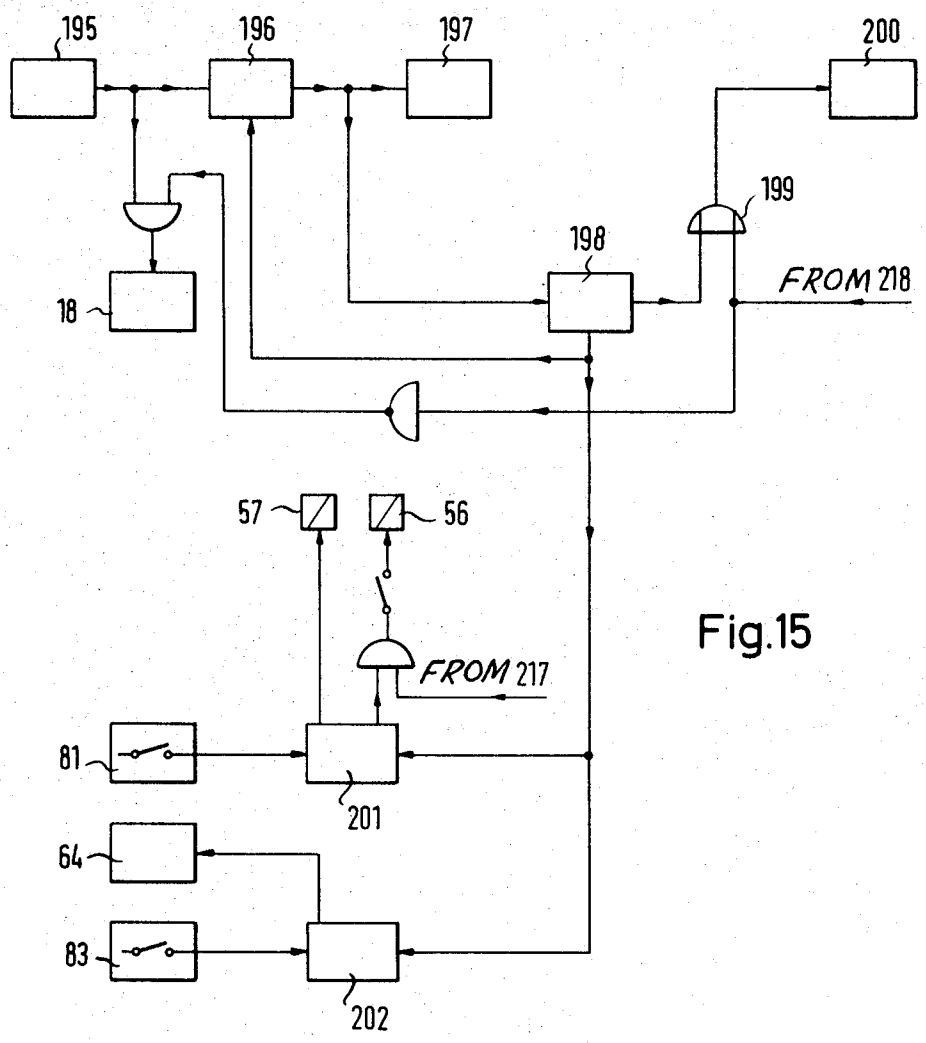

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Fig.15

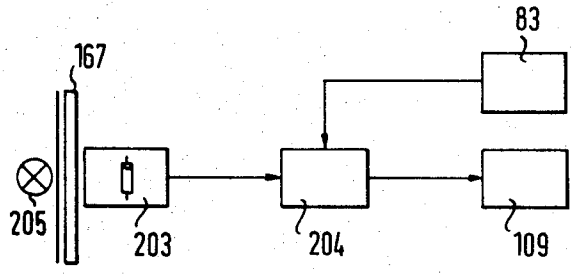
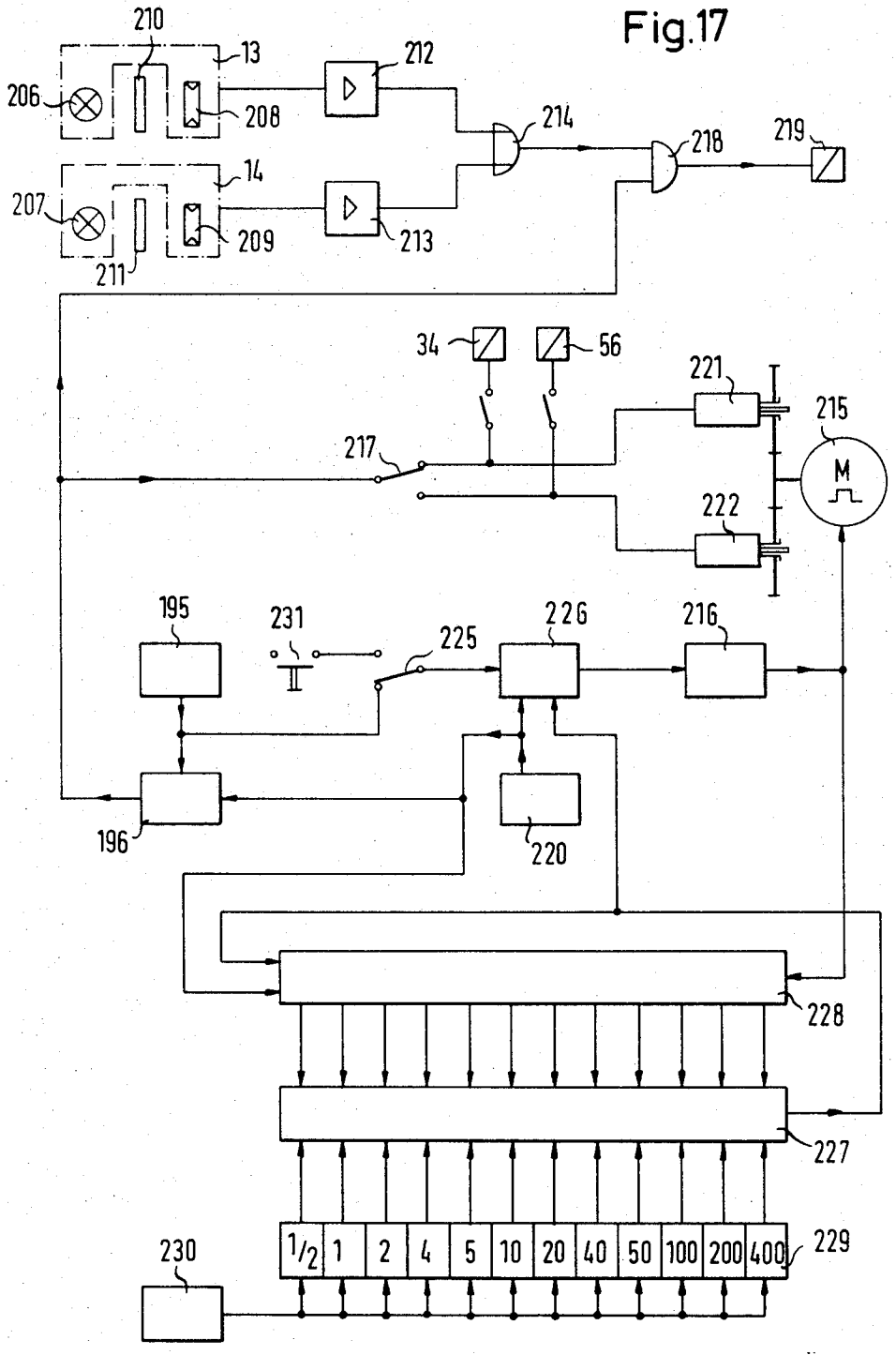

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Fig.16

Fig.17


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PHOTOCOMPOSING MACHINE

This invention relates to photocomposing machines, and especially to such machines intended for display composition as distinct from text composition.

Photocomposing machines available in the commercial market at the present time generally are relatively high speed tape operated machines better utilized to produce normal text composition. Because of the ease with which large point size images of characters can be obtained through optical magnification such machines are also used to produce display material. However, the use of such machines for display work is inefficient so far as the machines are conceived since they could be producing a greater quantity of text material if there utilization was restricted to such work. Some small number of photo-composing machines may be considered display machines, but they are generally slower simpler versions of text machines.

It is the object of the present invention to provide a photocomposing machine that is particularly adapted to the production of display or advertising material.

Thus, it is the aim of the present invention to provide a photocomposing machine of the aforementioned kind suitable for multiple typographical jobs such as the setting of forms, tabular matter and other jobbing work, especially to a layout. Said photo-composing machine will distinguish itself by having a rapidly and accurately operable adjustment device for the record support for set-wise transport after exposure of the letters. For this purpose, it is desired that both manual and automatic transport of the cassette containing the record support be possible with little effort. In order to meet such exacting typographical requirements, the cassette should reliably be stopped in its preset position when the feed motion according to the set value of an exposed sign is completed, and should be secured against unintentional displacement in manual operation. For manual adjustment, a preferably direct contact between the adjusting elements to be operated for the cassette and a layout sheet is desired, so that the record support can be adjusted rapidly and perfectly also by relatively unskilled operating personnel. In the case of adjustment by hand it is important that the movement of the record support be conveniently coordinated with the adjusting elements and that, as with the automatic transport, the mechanism be of small mass so that it can readily be moved and stopped. And the place of exposure of the hidden record support and, preferably, the exposed sign should be controllable. The compositor shall be afforded an opportunity of orienting himself about the point at which the record support is adjusted and about what has been composed. In addition to these advantages, a great flexibility also in regard to the type sizes and type founts and a good accessibility of the layout as well as of the record support are desired. Despite the versatility of this photo-composing machine, it shall be possible to achieve a relatively high composing speed at small expenditure.

The above features are obtained in a photocomposing machine of the aforementioned type having a cassette opened toward the bottom for exposure, in which the record support is spread out horizontally and is transportable with a cassette carriage in line direction by a thrust magnet which is automatically slidable in only one plane and with a stroke corresponding to the set width value of the character being exposed.

Moreover the cassette carriage is supported for easy motion on a slide which is movable transverse to the line direction, and holding magnets are provided for locking the cassette carriage and the slide after they are positioned where desired. The cassette carriage and the slide are each connected with an adjusting ruler and the adjusting rulers, cassette carriage and the slide can be moved relative to a stationary layout sheet which can be secured in a plane above and parallel to the cassette.

Due to the fact that the cassette carriage and its slide are mounted in such a way as to minimize friction and permit easy movement of the cassette carriage and the slide, (this is possible because holding magnets are used when it is desired to arrest these elements and maintain them in the arrested position) manual adjustment of the cassette is substantially facilitated if the electromagnets for the respective direction of motion are deenergized. It is then possible to position the record support at any desired point of exposure by shifting the adjusting rulers in two directions in vertical relation to each other. This adjustment can be effected most accurately since the adjusting rulers rest directly against the layout without disturbing the view of the letter to be composed or the like, and since the shifting of the adjusting rulers on the layout effects a corresponding shifting of the record support. Thus, neither a parallax correction nor a transmission ratio between the adjusting rulers and the cassette need be taken into consideration. Consequently, the record support can rapidly and accurately be positioned manually to that point which, according to the layout, is assigned to a characteristic point of an em-quad of the letters. The cassette carriage and the slide are safely retained in the adjusted position by the energized holding magnets.

With the present photo-composing machine, also a very accurate, automatic feed of the record support according to the set values of the exposed letters is ensured. For this purpose, a feeding magnet for shifting the cassette carriage is energized after the holding magnet of the cassette carriage is deenergized. When the thrust magnet has covered a path according to the set value of the exposed letter, it is locked in this direction until the momentum of the cassette has been absorbed and the cassette arrested at the desired point. Accordingly, the slide of the cassette does not coast uncontrollably far, which would reduce the precision of adjustment, although the friction between the slide and the guide elements is kept low. Due to the near frictionless support of the cassette and its slide, a relatively small driving power and lightweight transmission elements will be sufficient. The design of the photo-composing machine is, furthermore, substantially simplified by the fact that the thrust magnet is movable in one single plane only, in which it takes along the cassette in line direction from a fixed starting point up to a variable end point, returning into its starting position after the cassett is locked in place by energization of the holding magnet.

Since the layout is attached above the record support, and since the record support is exposed from below, the spacing between the layout and the record support may be very small because merely the supporting plate for the layout is arranged between them. Although the cassette with the record support and the layout are superposed closely, the cassette can easily be reached from the top of the photo-composing machine, e.g., when the compositor pushes the cassette next to

the point of support of the layout. Operation of the photo-composing machine is substantially facilitated by the fact that all essential elements can be handled by the compositor without his having to leave his workplace for this purpose. The compositor can conveniently overlook and control the adjustment of the photo-composing machine, especially of the adjusting rulers, from the same position. All of these advantages are achieved by the arrangement, guide and connection to the automatic and manual feeding means of the cassette and by the arrangement of the cassette with respect to the layout and the projection equipment of the letters.

The driving mechanism for the letter-by-letter feed comprises a driving element for driving an electromagnetic counting-value adjustment device with a scanning rod which is automatically slidable according to the relative set width of the exposed letter and which is carried to a mechanical multiplier for alowance for the type size, and the mechanical multiplier is meshed with a connecting rod connected with the magnet carriage. For all type sizes in which a letter can be composed it is, thus, only necessary to store one single counting value assigned to the letter in the magazine and the need for a special counting magazine for all type sizes is eliminated. It is thus possible to transport the cassette in accurate and very rapid, successive steps. The insignificant errors eventually occurring upon shifting the scanning rod will be reduced for smaller type sizes, whereas inaccuracies with larger type sizes are, anyhow, hardly noticeable. The feed of the scanning rod takes place very rapidly since it is reliably braked at the end of its path of movement by spacers still to be described. The mechanical multiplier is characterized in that it converts the path given by the scanning rod into a stroke of the magnet carriage corresponding to the type size during a fixed time interval. Consequently, the speed at which the magnet carriage moves is altered with the larger type size, and the composing speed is, thus, constant for all type sizes.

The present photo-composing machine is designed with the characteristic feature that the scanning rod is slidably supported in a guide block which is movable forward and backward by a driving element. According to the relative set width value of the exposed letter, adjustable spacers are arranged opposite one face of the scanning rod or of a scanning pin secured to the scanning rod. By this arrangement of the scanning rod within the guide block, a positive coupling between the driving element and the scanning rod for a shifting movement is formed. The path of shifting is limited by the adjustable spacers. Consequently, the guide block can cover a constant stroke independent of the letter. The scanning rod driven by the guide block is stopped according to the spacers adjusted as required by the respective set width value. Due to the positive connection of the scanning rod to the guide block, it is taken back into its starting position at the end of a movement of stroke. Due to the safe stoppage of the scanning rod at the point of its maximum deflection for the respective letter, the speed of the guide block for achieving a high composing capacity can be chosen relatively high.

The photo-composing machine is, most favorably, designed in such a manner that the spacers are movable in the direction of the scanning rod, that the thickness of the spacers is graduated according to the series 1, 2, 4, 8, 16, 32, and that combinations of the spacers are insertable into the path of motion by lifting magnets in such a manner that they will be in tandem, and that the total thicknesses of the inserted spacers will equal the relative set width of the last exposed letter width. Thus, a large range of adjustment can be covered with sensitive subdivision. The spacers can be operated in parallel so that their adjustment is effected rapidly.

To achieve a simple and accurate adjustment for all spacers, an adjusting screw against which the spacers can be pressed by means of the scanning rod is provided on the side of the spacers averted from the front face of the scanning rod. Due to the aforementioned flexible suspension of the spacers in axial direction of the scanning rod, the adjusting screw is effective for all set values.

Another variant of the counting-value adjustment device lies in that the thickness of the spacers is graduated according to all possible relative set width values (counting values), and in that the spacers are circularly fixed on a rotary table which is rotatable in such a manner that one spacer each will get into a position opposite the front face of the scanning pin according to the relative set value of the exposed letter.

A pressure spring which is arranged between the front face of the guide block and a ring secured on the scanning rod and which is slipped over the scanning rod, serves for a suitable embodiment of the positive connection between the scanning rod and the guide block, whereas a driving ring is fitted on the scanning rod opposite the rear face of the guide block. The starting position of the scanning rod opposite the scanning block is determined by the driving ring. The pressure spring presents a safely guided, compactly arranged connecting element for making the frictional connection. Furthermore, it is desirable that a motor coupled with a cam disc serves as the driving element for the guide block, and that the cam disc is pressed against a roller supported on the guide block by means of a return spring. With this arrangement, the acceleration of the guide block with the scanning rod and of the elements connected with the scanning rod, particularly of the mechanical multiplier and of the cassette, is smoothly effected.

In order to permit manual displacement of the magazine corresponding to the position of a letter given on the layout, the photo-composing machine is most advantageously designed in that manner that the one adjusting ruler is directly connected with the cassette carriage, and that a cable is utilized for connection of the slide with the other adjusting ruler, one end of the cable being connected to the slide and the other end to the other adjusting ruler. Upon a displacement of the adjusting ruler connected to the cassette carriage, the record support will be moved in the same direction of motion as the adjusting ruler. Accordingly, while the motion of the one adjusting ruler is transmitted in the same direction to the cassette, the motion between other the adjusting ruler and the cassette is reversed. As the first mentioned adjusting ruler is moved from left to right in normal reading direction, the cassette will, likewise, move from left to right. Since the axis of the optical system is fixed, the line is exposed on the record support from right to left when viewed from the top, and from left to right when viewed from the bottom. Due to the reversal upon actuating the second adjusting ruler, the cassette moves from the front to the rear of the machine when the adjusting ruler is pulled

to the compositor in the usual line sequence, and the same sequence of the lines appears on the record support.

According to an improvement of the photo-composing machine, the easy movability of the cassette carriage and of the slide is utilized also for automatic line drawing. For this purpose, the present photo-composing machine has the features that the cassette carriage and the slide can be automatically transported from a rest position into an end position, at option, for line drawing.

It is possible with the present photo-composing machine, by simply exchanging the ruling copies, to expose lines of practically any length and of freely selected starting and end points and with practically any thinkable structure, e.g., interruptions, dash-and-dot lines, and the like. Since exposure of the record support will not commence until the slide has been accelerated to a uniform speed, all points of the line will be exposed with equal intensity so that undesirable fluctuations of the line thickness are definitely avoided.

In a further embodiment of the photo-composing machine, the cassette carriage is connected with a cable line, and this cable line as well as the cable line connected with the slide can, optionally, be coupled with a motor, thereby achieving a smooth transmission of the motor movement onto the slides at little expenditure.

A further design of the photo-composing machine is distinguished in that rectangular matrices showing a few superimposed letters are laterally provided with two replaceably attachable matrix centering pins for attachment on a cleat-shaped holder, and in the each matrix, in addition to the letters, bears the assigned set values in the form of mechanically readable marks. This permits extremely versatile and flexible employment of the photo-composing machine since rarely used special signs can also be employed in case of need without having to replace the entire magazine. Since on each matrix the relevant set values are firmly assigned to the letters, a perfect control of the feed of the record support is absolutely ensured. As a whole, this photo-composing machine thus offers versatility of the hand composition of type, but, with a considerably higher speed and accuracy.

A control of the exposed letters is most suitably achieved in that a magazine support carrying the cleat-shaped holder is coupled with a type selection device of a recording apparatus. This enables the compositor to convince himself at any time about which portions of a layout he has already composed.

In an advantageously simple embodiment, the recording apparatus features an index wheel fitted with rubber types which is connected via a cable line with a slide and guide angle pivoted at the magazine support, with an ink roller resting against the index wheel, and a paper strip for control printing which can be pressed against the index wheel.

Furthermore, it is desirable that the index wheel be slidable in axial direction and be connected with a reversing linkage so that one and the same type of the index wheel can be printed according to selection of the standard type or a display type with the reversing linkage on the paper strip in different positions. This provides the compositor with information regarding the standard or display type in which the letters, which are readable on the paper strip, have been composed.

Features and advantages of the present invention may be gained from the foregoing and from the description of a preferred embodiment of the invention which follows.

In the drawing:

FIG. **1** is a diagrammatic total view of the close-order photo-composing machine;

FIG. **2** is a diagrammatic partial view of the interior of the photo-composing machine, i.e., the support of the cassette, the means for automatic feed in line direction and the ruling arrangement;

FIG. **3** is a view of the front of the cassette carriage;

FIG. **4** is a view of the front of the cassette, partly in section;

FIG. **5** is the electromagnetic counting-value adjustment device shown in detail as a diagrammatic representation;

FIG. **6** is a detailed perspective view of the mechanical multiplicator;

FIG. **7** is another perspective partial view of the interior of the photo-composing machine, i.e., the support of the magazine carrier and the arrangement for selection of a letter;

FIG. **8** is a partial view of the magazine support with matrices;

FIG. **9** is a diagrammatic representation of the transmission elements for type size adjustment;

FIG. **10** is a side elevation of the optical system, of the means for centering the magazine support and of the selector system for Standard/Display Type;

FIG. **11** is a diagrammatic representation of a detail of the selector system for Standard/Display Type;

FIG. **12** shows the clear-recording apparatus in a side elevation;

FIG. **13** shows the clear-recording apparatus in a longitudinal section;

FIG. **14** shows a cutaway portion of a paper strip printed with the clear-recording apparatus;

FIG. **15** shows an electric switching arrangement for control of the photo-composing machine for feed in line direction;

FIG. **16** shows an electric switching arrangement for adjustment of the electromagnetic counting-value adjustment device, and

FIG. **17** shows an electric switching arrangement for line transport, and the ruling arrangement.

FIG. **1** illustrates the exterior of the photo-composing machine. The interior parts of the photo-composing machine are enclosed by a nearly desk-type casing with a supporting plate **1** and two bases **2** and **3**. An area **4** of the supporting plate is provided for accommodating a layout sheet. The layout sheet is a marked up copy of the desired display advertisement and it can be aligned and fixed in this area with fasteners, not shown. Slidable adjacent to this area **4** is an adjusting ruler **5** which is movable in the direction of the longitudinal edge, i.e., in the direction of line composition. A second adjusting ruler **6** which is likewise lying on supporting plate **1**, is slidable in vertical relation to the adjusting ruler **5** along a narrow side of the photo-composing machine. Ball handles **7** and **8** serve for manually shifting each of these rulers, respectively. For reading the measures of typographical position of each ruler, there are provided measure scales **9** and **10** in the shifting range of the adjusting rulers. Adjacent to the area **4** for the layout sheet there are, furthermore, provided a ruling copy **11** for the line direction and a ruling copy **12** for the direc-

tion in vertical relation hereto, which are suitable for being interchanged. Slidable along each ruling copy there is supported a test head **13** or **14**, respectively, which, as will be shown, are connected with a cassette for the record support inside the photo-composing machine the same as the adjusting rulers. For introduction of the cassette into the photo-composing machine, a flap **15** is cut out of the supporting plate **1**. Between the two bases **2**, **3**, on the side assigned to the workplace of the compositor, there is slidably supported a selector and release lever **16** on a guide bar **17** in parallel with the longitudinal edge of the photo-composing machine. The letter selected with the selector and release lever **16** is reproduced on the indicating panel **24**, and the exposed sign is printed on a paper strip **19** with the clear-recording apparatus **18** arranged on the right-hand side, partly on the supporting plate. This apparatus **18** will be more fully described hereinafter. On the front of the left base there can be seen a changeover button **20** for changing over from standard to display type, below which a control desk **21** for adjusting the desired function of the photo-composing machine is fixed. On the front of the right-hand bracket there is provided an adjusting wheel **22** for point size adjustment of the type image. From the right-hand side of the bracket **3** there is projecting an adjusting screw **23** for changing the letter spacing. A strip **24** arranged above the selector and release lever **16** reproduces the letters existing on the magazine support inside the photo-composing machine. The compositor can read the letter selected in each case from this strip. All elements which make a permanent control by the compositor desirable, especially the layout arranged in the area **4** with respect to the adjusting rulers **5**, **6**, and the paper strip **19**, as well as the essential operating elements, i.e., the adjusting rulers, the selector and release lever **16**, the changeover button **20**, the control desk **21** and the adjusting wheel **22** for point size adjustment, are arranged in such a manner that the compositor can conveniently overlook and actuate these control and adjusting elements from his workplace in front of the photo-composing machine. He need not leave his workplace for interchanging the record support, since the cassette accommodating the record support can readily be removed through the flap **15**. Due to the fact that all adjusting elements, particularly those for cassette displacement, can be operated with little effort, a high productivity for the layout set will also be achieved for difficult composing work.

In FIG. **2**, a frame of the photo-composing machine is designated as **26**. The frame carries a pair of guide bars **27** which serve for supporting a slide **28** and, indirectly, the cassette carriage **29**. The slide **28**, for its part, consists of two guide bars **30** running in parallel which are connected with each other at their ends by one each flange **31** or **32**, respectively. Sunk into the flanges are slotted sliding sleeves which are adjustable for easy-motion guide of the slide on the guide bars **27**. For locking the slide **28**, there is secured a holding magnet **34** on a cross traverse **35** of the frame, said magnet opposing a plane portion **36** at the flange **31**.

The cassette carriage **29** which is slidably supported on slide **28** is, substantially, composed of a frame **37** to which two easy-motion sliding sleeves **38** are fitted on the side facing the viewer, and a roller **39** on the opposite side. (See FIG. **3**) A cassette **40** with a record support can be loaded from the top into the frame of the cassette carriage, which record support can be exposed from below through the opening of the frame. The design of the cassette **40** with its frame **280** for accommodating a record support **281** for a sheet of sensitized material follows from FIG. **4**. Underneath the record support there lies a plate **282** of a lightweight, glass-like plastic. The record support can be covered by means of a slide **283**.

A cable line **41** guided via two cable pulleys **42**, **43** serves for driving the slide **28** for transport in lines or for feed in transverse relation to the line direction, respectively. A second slide **44** is connected with the first slide **28** and can be easily moved in parallel therewith along a guide rail **45**. It carries the adjusting ruler **6** and the test head **14**. For feeding the slide **28** in vertical relation to the line direction, the cable pulley **43** is coupled via a magnetic clutch **222** with a stepping motor **215**, unless the feed is effected by manual shifting of the adjusting ruler **6**.

The adjusting ruler **5**, which is firmly connected with the cassette carriage **29**, as is the test head **13** and thrust rail **46** serve for transport of the cassette carriage **29** in line direction. The adjusting ruler **5** is supported on the frame **26** by means for a roller **47**. An additional reenforcing member is designated **48**. The drive of the cassette carriage is effected via a cable line **49** which is guided via two cable pulleys **50** and **51**. A magnetic clutch **221** and the stepping motor **215** are used for driving the cable pulley **50**. As distinguished from the cable line **41**, the cable line **49** has the same strand connected with the cassette carriage and the associated test head.

FIG. **3** reveals in detail in which manner the thrust rail **46** is meshed with the cassette carriage. The underside of the cassette carriage **29** has a sliding bar **52** sunk into it in parallel with the narrow side of the carriage. On the sliding bar, a sliding sleeve **53** secured on the thrust rail **46** is easily movable. The thrust rail is guided by means of two small rollers **54** along a guide bar **55**. The guide bar is fastened to the traverse **35** in FIG. **2**. With this arrangement it is achieved that the cassette carriage can be transported in line direction by means of the thrust rail which is moving in the same path of motion, but that, in addition, it is also movable in transverse relation to the line composing direction with very little effort.

It also appears from FIG. **2** that underneath rail **46** there are provided a holding magnet **56** and a thrust magnet **57**. The holding magnet **56** is fitted to the end of a pair of magnet carriage rails **58** which is secured to a traverse **59**. The magnet carriage **60** carrying the thrust magnet **57** can be shuffled on the magnet carriage rails. The magnet carriage is coupled with the outlet of a mechanical multiplier **62** via a connecting rod **61**. A block **63** into which the thrust rail will slide when the cassette carriage is moved relatively far to the right can be recognized above the multiplier on the frame.

A geared motor **64** is provided as the driving element for automatic feed in line composing direction. The geared motor is in connection, not shown in FIG. **2**, with an electromagnetic counting-value adjustment device **65** (FIG. **5**) from which a scanning rod **66** slidable according to the relative set value of the exposed letter is projecting. A feed lever **67** which is unilaterally fitted to the frame and a link rod **68** serve for transmission of the movement of the scanning rod onto the mechanical multiplier (FIG. **6**) in which the type size is allowed for.

The adjusting screw **23** for subtracting constant values from the feeding movement is provided adjacent to the mechanical multiplier **62.**

On the right-hand side of the frame there is arranged a limit switch **220** at the block **63** in such a manner that it will be in the path of motion of the thrust rail **46.**

FIG. **5** illustrates the electromagnetic counting-value adjustment device in detail, the casing surrounding the counting value adjustment device as per FIG. **2** being removed and, in addition, some parts which would interfere with the view of essential elements of the counting-value adjustment device being broken away. The counting-value adjustment device is connected with the geared motor **64** via a toothed belt **69** which serves for driving a cam disc **70** supported on a shaft **72** which is sunk into the carrier plate **71.** Adjacent to the cam disc there is provided a slidable guide block **73** into which slide rails **74** connected with the carrier plate are sunk. The guide block is pulled away from the viewer by means of a return spring **74***a*, so that a roller **75** supported at the guide block will always rest against the cam disc. A scanning rod **66** is sunk into a bore of the guide block running in parallel with the slide rails. Under the force of a pressure spring **77** which rests against the guide block on the one hand, and against a ring **78** secured to the scanning rod on the other, the scanning rod is pushed forward as long as no other forces are acting on it. On the other hand, the scanning rod is not shown in its rest position in FIG. **5,** in order to show the ring **79** which butts against the rear face of the guide block in the rest position. At the rear of the scanning rod, which is illustrated broken away, there is provided an actuating element **80** of a set of contact springs **81.** Another actuating element **82,** which interacts with a microswitch **83** arranged on the carrier plate, is attached to the guide block.

For counting value adjustment there are provided spacers **84** through **89,** which can be brought into the path of motion of a scanning pin **90** secured at the front face of the scanning rod **66.** The thickness of the spacers **84** through **89** is graduated according to the binary series 1, 2, 4, 8, 16, 32. All spacers are movable in the direction of motion of the scanning pin so that they can be pressed against an adjusting screw **76** which is sunk into a carrier plate **91.** For this purpose, the heavier gauge spacers **84, 85** are fitted to one each pair of toggle joints **92** or **93,** respectively. The lighter gauge spacers **86** through **89** are provided at the outer ends of leaf springs **94** through **97.** In order to design the pairs of toggle joints so as to be engageable without collision, each pair of toggle joints is pulled by a spring, e.g., **98,** against a tappet roller **99** or **100,** respectively. Each pair of toggle joints **92** or **93,** respectively, and each of the leaf springs **94** through **97** is respectively attached to one of the angle levers **101** through **106.** To the angle lever **101** or **102,** respectively, there is furthermore fitted opposite each pair of toggle joints a retaining pin **107** or **108,** respectively, which is arranged for supporting the roller **99** or **100,** respectively, and for fitting of the associated spring. Three angle levers are separately swingable about each axis **234** and **235,** respectively, which are sunk into the carrier plate **91.** For the swinging of angle lever, one each lifting magnet **109** through **114** is pivoted to each lever. Furthermore, one pressure spring is acting upon each of the toggle joints, of which pressure springs only the ones designated as **115** through **117** are shown in the drawing, although equal pressure springs are assigned to angle levers **102, 104** and **106.**

As is immediately obvious from FIG. **5,** the electromagnetic actuating elements and transmission elements of the spacers **84, 86, 88** are arranged in an upper row, whereas the corresponding actuating elements and transmission elements for the spacers **85, 87, 89** are grouped in an opposite, bottom row. In FIG. **5** there are illustrated all spacers in the path of motion of the scanning pin **90,** from which they would have been swung out under the action of the pressure springs with magnets de-energized. The spacers are arranged with spaces in relation to each other which are always effective as long as the scanning pin does not rest against the spacers, so that these can, optionally, be swung into or out of the path of motion of the scanning pin without hindrance. As will be described later, the output quantity of this electromagnetic counting-value adjustment device is a path displacement of the scanning rod **66,** the rear of which is supported in the central range of the feed lever **67** as shown in FIGS. **2** and **6.** As is furthermore obvious from FIG. **4,** the feed lever **67** is connected with the mechanical multiplier via the link rod **68,** the casing of which multiplier being removed in FIG. **6.**

In detail, the link rod **68** is pivoted to a slide **119** which is supported to be slidingly movable in a carrier block **120** secured to the frame in the direction of shifting of the scanning rod. The slide is guided on a sliding rod **122** sunk into the carrier block by means of a sliding sleeve **121** fitted to the slide. Further guidance is imparted to it by the guide bolt **123** which is arranged in the carrier block and against which rollers **124** are resting; the rollers are rotatably mounted on slide **119.** A forced guiding element **127** which is swingable about the screw **126** is connected with slide **119** via a connecting flap **125.** The screw, thus, represents the swivel axis of the forced guiding element. From the interior of the forced guiding element **127** there is recessed a slideway with two sides **128, 129** running in parallel with each other. The slideway features an enlargement **130** at the front end in way of side **129.** In the slideway there is provided a forced guiding roller **131** which is pivoted on the tie rod **61** for the magnet carriage **60.** For facility of inspection, the forced guiding roller is shown outside its rest position at the front end in way of the enlargement **130** in FIG. **6.** On the opposite end of the forced guiding element **127** there is supported a guide roller **132.** This guide roller is guided by a connecting link guide element **133** in parallel with the slide **119.** The connecting link guide element is movable in transverse relation to the guiding direction of the guide roller **132** opposite the carrier block **120.** The shifting path is determined by the fitting of a roller **134** against a slope of the lens holder **135.** The connecting link guide element **133** is constantly pressed in the direction toward the slope by a spring which is not shown in the drawing, whereas a spring **136** is fitted to the connecting rod **61** which pulls the connecting rod in the same direction. Therefore, the forced guiding roller **131,** is normally lying at the side **128** of the slideway. Moreover, the starting position of the connecting rod can be determined by means of the adjusting screw **23** which can be turned round opposite a threaded flange **138** and which carries the connecting rod along to the right via a ring, so that the forced guiding roller moves from the side **128** of the slideway to the enlargement **130.**

FIG. 7 shows another partial view of the interior of the photo-composing machine, especially the means for selection of a letter to be exposed. For facility of inspection, practically all parts and devices shown in FIG. 2 for shifting the cassette carriage have been omitted in this representation. In FIG. 7 it is indicated that the changeover button **20** for changing over for standard to display type as well as the adjusting wheel **22** for type size adjustment are supported in frame **26.** A guide bar **143** on which a fork **144** can be moved is provided in parallel with the front side of the frame and is arranged thereon. A depressable, curved selector and release lever **145** is fitted in the fork. At its end remote from the front side, the selector and release lever carries a drop-in pin **146** for engagement into a stop rod **147** which is toothed in parallel with the guide rod on the back. The fork is coupled via a slide and guide angle **148** with a magazine support **149.** For this purpose, a fork **150** is fastened to the magazine support, and the slide and guide angle engages with this fork. Furthermore, a roller **151** which rides on a carrier bar **152** is supported in the fork **150.** Opposite roller **151** two sliding pieces **153** with which the magazine support can be moved opposite a guide bar **154** are secured to the magazine support. The guide bar can be swung nearly in a horizontal plane by means of a lifting linkage **155,** whereas the carrier bar **152** is movable in substantially vertical relation via a pair of centering rods **156.** The support of the lifting linkage of the centering rod is held by the main carrier **140** which can be adjusted opposite two vertical guide columns **141, 142.** For changing over from standard to display type, the changeover button **20** is connected with a shifter rod **158** via a reversing linkage **157.**

As is obvious in detail from FIG. **10** and **11,** the shifter rod **158** engages with a link fork **159** which is part of a gate **160** movable in parallel with the magazine support. The gate slides within the link bracket **161.** It features three bearing areas **162, 163,** and **164** which are connected by inclined surfaces. On one of these bearing areas there is resting a runner **165** which is pivoted in the lifting linkage **155.** It can be noted from FIG. **10** that the magazine support **149** can be pushed into one of three positions in approximately the same plane via the lifting linkage **155** connected with it and being swingable with shaft **239,** i.e., according to the bearing areas **162** through **164** at which the runner **165** is adjusted. Upon shifting the magazine support in the horizontal plane, the roller **151** will slide on the carrier bar **152.** Under the action of a tension spring **166** between the lifting linkage and the main carrier, the runner will always be pressed downward onto the gate **160,** so that the magazine support tries to take a position which is as far to the right as possible in FIG. **10.**

A cutaway portion from the magazine support is illustrated in FIG. **8** to which reference will be made, before the centering device is explained subsequently on the basis of FIG. **10.** It can be noted from FIG. **8** that narrow, rectangular strips which may be of glass or of a transparent plastic with similar optical properties are provided as matrices **167.** At each end of a matrix there is inserted a centering pin **169.** In the middle of each matrix there is provided a letter in the standard roman face, below it the same letter in italic face, and above it the same letter in medium face. Below each letter a mark is laid down on the matrix, giving the associated relative set width value in the form of points. These marks **168** are coded to a binary system. A cleat-shaped holder **170** for the matrices consists of two perforated rails not designated in detail which are connected by a guide plate which, likewise, is not designated. The matrices can be inserted individually into one each pair of holes of the cleat-shaped holder. The cleat-shaped holder, for its part, is slipped over cylindrical pins **171** of the magazine support **149** of which merely the right-hand cylindrical pin can be seen in FIG. **8.**

For point size adjustment, the main carrier **140** and the lens holder **176** can be adjusted either jointly, or independently of each other. For this purpose, there are provided two cam discs **183** or **184,** respectively, according to FIG. **9,** which can be turned by actuating the adjusting wheel **22** (FIG. **7**) via shaft **185** and cable lines **186, 187.** The cam disc **183** is connected via a roller **188** resting against its circumference and an adjusting lever **189** fitted to the frame with a hinged adjusting screw **190***a* which is pivoted on the lens holder **176.** The lens holder can, thus, be moved along the guide bolt **191** together with its lens guide column **190.** In order to achieve a relative movement of the matrix opposite the lens in a certain dot size range, the second cam disc **184** is brought into connection with an approach angle **194** attached to the main carrier **140** via a roller **192** and an adjusting lever **193.** This permits variation of the distance between the main character carrier and all elements fitted thereto, especially of the inserted matrix on the one hand, and of the cassette carriage with the record support, on the other.

It can be noted from FIG. **10** that the centering pins **169** of the matrix selected in each case can be pressed into a centering plate **172** which, for this purpose, is provided with three juxtaposed centering holes **173** according to the three possible positions of the magazine support in this direction, and with a centering slot **174.** In the centered position of the matrix as shown, magazine lifting magnet **197** in FIG. **15** is energized, lifting the magazine support and, thus, the matrix holder via roller **151,** carrier bar **152,** and centering rod **156.** The centering plate is fitted to a centering plate support **175** which, for its part, is screwed to the main carrier. A lens holder **176** is movable in bearings **177** opposite the centering plate support **175,** which bearings are arranged on the main carrier **140.** In the optical axis of a lens **178** fastened to the lens holder, a shutter **179** is arranged underneath the matrices, said shutter closing a lamp housing **180** in the optical axis. In a lamp housing provided at the main carrier, a lamp **181** and a mirror **182** are discernible. FIG. **7** illustrates those elements which serve for coupling the clear-recording apparatus **18** with the slide and guide angle **148** and the selector and release lever **145.** The coupling elements are the cable line **240** which is guided via a cable pulley **241** and two guide pulleys **242** and **243.**

The design of the control printer follows in detail from FIG. **12** and **13,** the former showing a paper strip in the control printer. It can be seen from these figures that the cable pulley **241,** an index wheel **245,** a magazine paper roll **246,** a driving mechanism **247** for the paper strip **19,** and a swing-away ink roller **270** are carried by a sheet bar **244.** The ink roller which is soaked with ink is constantly being pressed against the rubber types **250** of index wheel **245** by means of a tension spring **271.**

The index wheel **245** is positively connected with the cable pulley. The outer rim **248** of the index wheel is interchangeable. It is positively retained on the index wheel by spring elements **249.** Rubber types **250** on which the letters are embossed are sunk into the rim. The rubber types are accommodated on the index wheel in such a manner that their sequence corresponds with the origin of the matrices on the magazine support so that, upon adjustment of a certain matrix, the corresponding rubber type will get before the face **251** of the paper strip support. In axial direction index wheel **245** is movable via its shaft **252** by means of a lever **253** opposite the front side of the paper support. For this purpose, the lever **253** which can be swung about the bearing **254** engages at its opposite end into a groove **256** of shaft **252** by means of a pin **255.** The coupling of the lever **253** with the arrangement for changing over from standard to display type is not shown in the drawing; it engages with the lever at point **257.**

The driving mechanism for the paper tape **19** features an electromagnet **258** which is connected with a slide **261** via a pressure spring **259** and a two-armed lever **260.** The slide is movably supported within a guide element **262,** i.e., by means of rollers indicated by the reference symbols **263.** The slide is pulled to the left in rest position by a spring **264.** It carries the remaining elements which are required for feeding the paper strip, and the paper strip support having its front side designated as **251.** For transport of the paper strip this is passed between a driving wheel **265** with a rubber sheathing and a proof roller **267.** The driving wheel and the proof roller are supported on the slide. Connected with the driving wheel is a pawl wheel **266** with which an upper stop pawl **269** which is likewise supported on the slide, and a lower feed pawl **269** which is fixed opposite the slide are meshing. The pawls are pressed toward the center of the pawl wheel by means of springs not shown in detail. The paper strip is passed from the magazine paper roll **246** between the slide and a guide element **272** via the front side **251** of the slide and onward between the proof roller **267** and the driving wheel **265.**

The electrical equipment of the photo-composing machine with its assemblies which are essential for the functional sequence is described on the basis of FIG. **15, 16** and **17.** It is obvious from FIG. **15** that the contact **195** fitted to the selector and release lever is connected to the clear-recording apparatus **18** and to a setting input of a bi-stable trigger **196.** The setting output of trigger **196** is connected with a magazine lifting magnet **197** and the input of a mono-stable trigger **198.** The setting output of trigger **198** is carried via an OR gate **199** (the second input of OR gate **198** is the output of the AND member **218** in FIG. **17**) to an exposure magnet **200** for actuating the shutter **197.** From the resetting output of the mono-stable trigger **198,** a line branches off to the resetting input of bi-stable trigger **196,** and to the setting input of a bi-stable trigger **201** and to the setting input of a bi-stable trigger **202.** The resetting input of the bi-stable trigger **201** is connected to the set of contact springs **81,** whereas the resetting input of the bi-stable trigger **202** is connected with the microswitch **83.** The setting output of the bi-stable trigger **201** is carried to the thrust magnet **57;** the holding magnet **56** receives current from the resetting output. The setting output of the bi-stable trigger **202** is connected with the geared motor **64.**

FIG. **16** schematises the switching arrangement of the electromagnetic counting-value adjustment device. The counting values are graduated according to the binary series 1, 2, 4, 8, 16, 32. For each step of the counting value there is provided the same assembly, of which only one assembly is shown in FIG. **16.** The assembly shown includes a light-sensitive element **203** which is in light-conducting connection with the mark provided for a set width value of the centered matrix **167.** On the outlet side, the light-sensitive element **203** is connected to the setting input of a bi-stable trigger **204,** the resetting input of which is connected with the microswitch **83.** The setting output of the bi-stable trigger **204** is carried to the lifting magnet **109.** As already mentioned, one similar arrangement of a light-sensitive element and a bi-stable trigger is available for the remaining lifting magnets **110** through **114,** the centered matrix being located between the arrangement of the light-sensitive elements and a light source **205.**

The ruling device and the arrangement for line transport are shown in FIG. **17.** The ruling device contains the test heads **13, 14** for horizontal and vertical lines in which each one light source **206** or **207,** respectively, and, on the opposite side, one light-sensitive element **208** or **209,** respectively, are accommodated. Between the light source and the light-sensitive element there is respectively provided the ruling copy **210** or **211,** respectively. The ruling copy is in the form of a stencil strip on which the light transmitting portion is coextensive in length with the desired line or rule. Each light-sensitive element is connected via an intensifier **212** or **213,** respectively, with an OR gate **214** which is connected to the exposure magnet via an AND gate **218.**

A stepping motor **215** which can be coupled, at option, via a magnetic clutch **221** for the horizontal direction or a magnetic clutch **222** for the vertical direction with the respective cable pulley which is connected with the cassette carriage, serves for transport of the cassette carriage during line drawing. The motor is connected to a pulse generator **216.** For releasing the exposure of a line, resort is again had to contact **195** at the selector lever and the bi-stable trigger **196,** see FIG. **15.** The resetting input of trigger **196** is connected to the limit switch **220** in the path of motion of the thrust rail **46.** The setting output of the trigger **196** is carried via a selector switch **217** to one of the magnetic clutches **221, 222,** at option. Furthermore, a line is conducted from the setting output of trigger **196** to the AND gate **218** in the signal path to the exposure magnet **219.** The holding magnet **34** is connected to the contact for the horizontal direction of the selector switch **217** via a switch not shown, and the holding magnet **56** is likewise, connected with a contact for the horizontal direction of the selector switch **217** via a switch.

The contact **195** at the selector lever is, furthermore, connected with the setting intake of another bi-stable trigger **226** via a selector switch **225** for selection of the mode of operation "LINE DRAWING" or the mode of operation "LINE FEED." At a second contact of the selector switch **225** there is connected a starting switch **231.** The resetting input of trigger **226** is connected to the limit switch **220.** Another connection is carried from a comparator **227** to the resetting input. The set-

ting output of the trigger **226** is connected with the pulse generator **216**, in order to connect or disconnect it according to its output signal. From the pulse generator a line is carried to a multi-step counter **228**, the steps of which are connected with the comparator **227**. On the other hand, the comparator receives signals from an input pushbutton **229** which is coupled with the input member **230** for line drawing.

The operation of the photo-composing machine will now be described, first with regard to the adjustment of the record support to a desired point of the layout, then to the exposure of characters and the transport of the cassette in line direction, and thereupon the line feed and the line drawing.

It is supposed that a holder with matrices which bears the desired types is slipped onto the magazine support **149**. The index wheel **245** of the clear-recording apparatus **18** is adjusted in harmony with the arrangement of the types in the magazine. The cassette accommodating the record support has been inserted into the cassette carriage **29**.

A layout sheet has been laid in area **4** of the support plate **1**. The switches to the holding magnets **34** and **56** are opened so that the adjusting rulers **5** and **6** can easily be adjusted in such a manner that the inner edges of the rulers will intersect at a certain point of the selected letter on the layout. This will, simultaneously, move the cassette carriage into the optical path of the device in such a manner that an exposure of the record support can be effected exactly at that point which corresponds to the selected point of the layout. By closing the associated switches, this position will be fixed by means of holding magnets **34** and **56**.

Prior to the exposure of a letter, the adjusting wheel **22** must have been adjusted to the selected type size. This will adjust the main carrier **140** and the lens holder **176** according to the required scale of reproduction via the cam discs **183, 184**. At the same time, the connecting link guide element **133** of the mechanical multiplicator is shifted via the slope **135** and the roller **134**, which mechanical multiplicator will effect the correct feed of the record support in line direction after exposure of the letter. According to the position of the changeover button **20**, the position of the magazine support **149** in vertical relation to the line direction is determined via the reversing linkage **157** and the shifter rod **158**. Thus it is given whether a letter will be laid down as standard roman, italic or medium. Then the magazine support **149** is moved in line direction on the carrier bar **152** and the guide bar **154** by shifting the selector and release lever **145** via the slide and guide angle **148**, so that the proper matrix will get into the optical path of the device. This adjusting movement is simultaneously transmitted onto the index wheel of the control printer via the cable line **240**. The photo-composing machine is now ready for exposure of the desired letter.

For exposure the selector and release lever **145** is depressed causing the drop-in pin **146** to engage between two teeth of the stop rod **147** and center the selected matrix via the slide and guide angle **148** in the optical path. As depressing of the selector and release lever progresses, the contact **195** actuated by this lever will then be closed. This will adjust the bi-stable trigger **196** and energize the magazine lifting magnet **197**. Under the action of force of the magazine lifting magnet, the centering rod **156** will swing upwardly, one centering pin **169** of the matrix will get into the centering slot **174**, while the second centering pin **169** is pressed into a centering hole **173**. This will align the matrix perfectly. In addition, the matrix will be pressed against the centering plate **172** under the effect of the centering rod.

Furthermore, the mono-stable trigger **198** will trip the exposure magnet **200** by way of OR gate **199** in consequence of the signal going out from the bi-stable trigger **196**. It is presupposed that the release will not become effective until after completion of the centering procedure. Since the lamp **181** is illuminated continuously during operation of the photo-composing machine, the image formation of the letter on the record support is effected by actuating the exposure magnet **200** and, thus, the shutter **179**.

The duration of the pulse at the setting output of mono-stable trigger **198** corresponds to the period of exposure time of the record support since lamp **181** is continuously illuminated in the lamp housing. After expiration of the pulse duration, the bi-stable trigger **196** is reset, and the bi-stable triggers **201** and **202** are reset. This will switch off the holding magnet to permit transport of the cassette in line direction and switch on the thrust magnet **57**. At the same time, the geared motor **64** which is connected with the electromagnetic counting-value adjustment device will start.

During the exposure of the letters, the magnets **109** through **114** for adjustment of the spacers will be energized according to the relative set of the selected letters since, during opening of the shutter, the light-sensitive elements **203** will be subjected to a luminous flux according to the marks of the letter as adjusted. Each light-sensitive element triggers bi-stable trigger **204** by which one of the combinations of the magnets **109** through **114** is energized. Consequently, one or several spacers will be swung into the path of motion of the scanning pin **90** according to the marks, and the feed of the cassette carriage will be limited in the following manner in one of the possible graduations of 1/72-units.

The guide block **73** is pushed forwardly in the direction towards the spacers against the tension of the spring **74a** together with the scanning rod **66** and the scanning pin **90** under the effect of the cam disc **70** resting against roller **75**. During this phase of movement, the scanning rods and the scanning pin are moved until the scanning pin strikes against the spacers, pressing these on the adjusting screw **76**. After the scanning pin has run into resistance in such a manner, the guide block is first advanced still farther according to the shape of the cam disc when a relative movement will take place between the scanning pin and the guide block during which latter movement spring **77** will be compressed. As soon as segments of smaller radii of the cam disc **70** are again resting against the roller, the guide block will return into its starting position by means of the return spring **75**. The frictional connection between the scanning pin **90** and the spacers will become effective so that the scanning rod **66** can gradually take its normal rest position within the guide block again by the action of the pressure spring **77**. At that moment at which the guide block is returning into its starting position, the microswitch **83** is actuating by element **82** at the guide block, and the stepping motor comes at rest. The stepping motor thus drives the cam disc independent of the relative set of the exposed let-

ter always be one full revolution. The entire duration of cycle during the adjustment of a letter is independent of the relative set of the letter; the duration within the cycle duration is dependent of the set value, however, while the cassette carriage is advanced, as still remains to be described.

According to the shifting of the scanning lever **66**, the slide **119** of the mechanical multiplicator is advanced, FIG. **6**, via the feed lever **67**. Thereby the forced guiding roller **131** will get to the left side **128** of the forced guiding element **127** and take along the connecting rod **61** to the right by a distance which corresponds to the relative set of the exposed letter. The second factor coming into the shifting of the connecting rod **61** to the right is in the adjusted point size of the exposed letter, according to which the connecting link guide element **133** is forced into the receiving block. The larger the type size, the farther will the connecting link guide element move to the right, and the sharper will be the slope of the forced guiding element **127**. If the sides **128, 129** of the forced guiding element run nearly in parallel with the connecting rod **61**, the path of the slide **119** will, practically, be deflected completely and transmitted in full onto the connecting rod **61**. If, however, the sides of the forced guiding element run in a nearly vertical relation to the connecting rod **61**, the forced guiding roller and connecting rod **61** will not be taken along upon a shifting of the slide **119**.

If a constant value is to be subtracted from the result of relative set times dot size, to which the adjustment of connecting rod **61** corresponds, then adjusting screw **23** can be actuated prior to energization of the thrust magnet in such a manner that the forced guiding roller **131** is pulled into the enlargement **130** of the forced guiding element. Upon the advance of scanning rod **76** and of slide **119**, the forced guiding element is first displaced by a distance corresponding to the clear spacing between the forced guiding roller and the left side **128** of the forced guiding element **127**, until the forced guiding roller rests against the left side **128** and is taken along. To this free movement of the forced guiding roller corresponds a path element by which the connecting rod **61** is moved less than according to the result of relative set times dot size.

In each case, during the advance of the scanning rod **66**, the cassette carriage has been moved via the thrust rail **46**, the thrust magnet **57** and the connecting rod **61** by the distance corresponding to the set width value of the exposed letter. If, as described, the scanning rod is now striking against the spacers, thereby suspending the frictional connection between the scanning rod and the guide block, the actuating element **80** secured to the scanning rod will effect a changeover of the set of contact springs **81**. This will reset trigger **210** in FIG. **15**; the thrust magnet **57** will be de-energized and the holding magnet **56** will be energized so that the cassette carriage is retained in the new position. Braking of the cassette carriage which is moved nearly uniformly, i.e., at a speed corresponding to the adjusted type size by the connecting rod **61** during transport in line direction, is accomplished when forced guiding roller **131** strikes against the right side **129** of the slideway.

After expiration of the described operations of the counting-value adjustment device and of the mechanical multiplier as well as of the control of the geared motor and of the magnets, the cassette is ready for a new feed as per the next exposed letter.

Prior to this, the electromagnet **258** has been energized simultaneous with the closing of the contact **195** at the selector lever, said electromagnet moving the slide **261** of the control printer to the right via the pressure spring **259** and the two-armed lever **260**, so that paper strip **19** will be pressed through the front side **251** of the paper strip support against a rubber type corresponding to the exposed letter. During this movement, the feed pawl wheel **266** which is prevented from turning by the stop pawl **268**. Upon releasing the selector lever **145**, the electromagnet **258** will be de-energized, and the slide **261** will be pulled back to the left under the action of spring **264**. The pawl wheel **266** will then be turned further by one pitch by the feed pawl **269** since the feed pawl cannot slip over the adjoining tooth upon a shifting of the pawl wheel to the left, whereas the stop pawl **268** will slip over a tooth during this phase of movement. Due to the feed of the paper strip, the letter just printed appears on the top of the paper support so that the compositor can control the exposed letter.

Depending on whether the magazine support has been adjusted in the direction in vertical relation to the line direction by means of the changeover button **20** in such a manner that a letter is exposed either in standard roman type, or italic, or medium, the index wheel is displaced in axial direction by a clutch with the magazine support so that the rubber types are either moved approximately into the center of the paper strip, or to the top or bottom. The compositor can then recognize, for instance, if the letters are printed in the upper portion of the paper strip, that he has exposed these letters in medium face or, if the printing types of the control printer appear at the lower portion of the paper strip, that an exposure of italic-cut letters has been effected. A section of such a recorder chart is illustrated in FIG. **14**.

For line drawing, the selector switch **225** must be adjusted correspondingly. The selector switch **217** will determine whether a horizontal or a vertical line is to be drawn. A matrix on which a letter from which the line is produced is stored is brought into the optical path of the photo-composing machine by means of the selector and release lever which then is depressed. This will adjust the bi-stable trigger **196** so that an output signal will appear at its setting output.

The output pulse of trigger **196** reaches the magnetic clutch **221** via the selector switch **217** which, in the drawing, is in a position for horizontal line drawing. By this magnetic clutch, the shaft of the stepping motor **215** is connected with the cable line **49** by which the cassette carriage is driven in horizontal direction. Furthermore, a signal reaches the holding magnet **34**, which locks the cassette carriage in its vertical direction of motion, from the outlet of the selector switch **217**. At the same time, the pulse transmitted from the contact **195** to the selector lever reaches the intake of trigger **226** via the selector switch **225**, the output quantity of which trigger will cause the pulse generator **216** to start. The output pulses of the pulse generator **216** are fed into the motor **215** and into the counter **228**. The cassette carriage is driven by the stepping motor in horizontal direction until it is determined by the comparator that the position of the counter **228** corresponds with the value of the input pushbutton **229**. Since, according to a preliminary requirement, this equality should never occur in line drawing, the

cassette carriage runs through until the limit switch **220** is actuated by the thrust rail **46.** The limit switch **220** will reset triggers **196** and **226,** thereby de-energizing the magnetic clutch **221** and causing the pulse generator **216** to complete the feeding of pulses into the stepping motor **215.** During the advance of the cassette carriage, the test head **13** gets into the light-transmissive area of the stencil and the output signal of the light-sensitive element **208** reaches by way of intensifier **212,** the OR gate **214** and the AND gate **218.** The exposure magnet **219** keeps the shutter open until the test head reaches an opaque section of the stencil, whereupon the output signal of the light-sensitive element **208** will disappear. These processes can repeat during the forward movement of the cassette carriage so that, for instance, an uninterrupted line on the record support can be exposed. The AND gate **218** ensures that the shutter will be opened only during the advance of the cassette carriage, and not during the manual resetting. When effecting the resetting, the cassette carriage is easily movable in any direction since the holding magnets **34** and **56** are deenergized.

For line feed with the arrangement shown in FIG. **17,** the selector switch **225** is brought into a corresponding position, and the line spacing is adjusted with the input pushbutton **229.** Thereupon, the starting switch **231** can be actuated, by which trigger **226** reaches its setting position, and the pulse generator **216** for feeding the stepping motor **215** is working until the position of the counter **228** corresponds to the value set by input pushbutton **229** into the comparator. Then the described process is completed by an output signal of the comparator **227** which resets the bi-stable trigger **226.** The AND gate **218** ensures also in this case that no undesired exposure of the record support will take place.

Having thus described the invention it is apparent that many changes could be made to the preferred embodiment disclosed without departing from the spirit and scope of the invention, and, therefore, it is intended that the foregoing description and the drawing be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A photocomposing machine intended especially for display composition, said machine comprising a fixed work station on which a layout sheet can be mounted in view of a machine operator, a first ruler means located above said work station and movable in a line composing direction, a second ruler means located above said work station and transverse to said first ruler means and movable in a second direction transverse to the linecomposing direction moved by said first ruler means, a film holder mounted within the machine for movement in a line composing direction and in a second direction transverse thereto, first means connecting said film holder directly to said first ruler means so that said film holder moves in the same direction as said first ruler means, second means connecting said film holder to said second ruler means so that said film holder moves in a direction opposite to that moved by said second ruler means, a font of characters to be imaged, each of said characters having associated therewith machine readable marks corresponding to the width of the character, means for manually selecting a character to be photographed, means for photographing a character selected from said font of characters, electro-mechanical means for moving said film holder in a line composing direction in discrete steps corresponding to character widths, means for connecting and disconnecting said film holder from said electro-mechanical moving means, and means for locking said film holder in a position to which it had been moved.

2. A photocomposing machine according to claim **1** including a slide on which said film holder is mounted for movement in a line composing direction, and a pair of guides on which said slide is mounted for movement of said film holder in a direction transverse to said line composing direction.

3. Photo-composing machine according to claim **1** including a plurality of rectangular matrices each being provided with two replaceably attachable matrix centering pins and each matrix having more than one character thereon and, in addition to the characters, the assigned set width values for the characters in the form of machine readable marks.

4. Photo-composing machine according to claim **3,** including a magazine support for said matrices, and a character printing apparatus coupled to said magazine support so that as said magazine support is moved to bring a selected character to a photographic position the character printing apparatus is actuated to bring the same character to a printing position, and means for printing a character when the corresponding character is photographed, whereby a record can be made of the characters photographed.

5. Photo-composing machine as claimed in claim **4,** characterized in that the character printing apparatus includes an index wheel fitted with rubber types arranged around the periphery of said wheel, an ink roller for inking the rubber types, and means for pressing a paper strip against the index wheel.

6. Photo-composing machine as claimed in claim **5,** characterized in that the index wheel is provided with a plurality of rubber types for each letter, said types being arranged axially next to each other and each such type being in a different style of the same letter, e.g. roman and italic, and including means for sliding said index wheel in an axial direction so that for each rotary position of the wheel a letter can be printed in the letter style desired.

7. A photocomposing machine according to claim **1,** including a slide on which said film holder is mounted for movement in a line composing direction, said slide being movable in a direction transverse thereto for moving said film holder in said transverse direction, characterized in that said film holder can be mechanically driven for a horizontal line drawing operation and that said slide can be mechanically driven for a vertical line drawing operation, and including first motor means for driving said film holder, second motor means for driving said slide, a first test head connected with said film holder, a second test head connected with said slide, each test head adapted to receive a stencil of opaque and transparent sections for controlling the extent of line drawing in the machine, a shutter, electromechanical means for controlling said shutter, and means for optically scanning a stencil placed in a test head as the film holder or the slide is driven and for energizing said electro-mechanical means to open said shutter when a transparent section of the stencil is scanned and for closing said shutter when an opaque section of the stencil is scanned.

8. Photo-composing machine as claimed in claim **7,** characterized in that a light-sensitive element and a

light source oppose each other in each test head, between which the stencil with transparent and opaque sections is arranged.

9. Photo-composing machine as claimed in claim **8**, characterized in that said second ruler and the test head for said slide are arranged on a common second slide which is movable on a guide rail arranged in parallel with the guide bars for said slide.

10. A photocomposing machine according to claim **3** in which the mechanically readable marks represent the relative set width values of the characters, and including point size setting means for mechanically adjusting the electro-mechanical means for moving said film holder in accordance with the point size to be photographed.

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