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Guerrini et al.

[11] **3,770,095**

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[54] **PRINTING MECHANISM HAVING A SINGLE PRINTING ELEMENT**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **197/18**, 197/52, 197/55

[51] **Int. Cl.** **B41j 23/04**

[58] **Field of Search** 197/16, 17, 18, 52, 197/55

[56] **References Cited**

UNITED STATES PATENTS

3,420,350	1/1969	Decker	197/55 X
3,620,344	11/1971	Clancy	197/18
3,618,735	11/1971	Bleau	197/16
3,343,642	9/1967	Weidanz et al.	197/18
3,330,398	7/1967	Hylan	197/16
3,175,671	3/1965	LaPointe et al.	197/18 X
3,286,806	11/1966	Schoenfelder	197/16
3,233,715	2/1966	Flieg	197/16 X
3,050,170	8/1962	Dodge et al.	197/52
3,467,233	9/1969	Jablonski	197/18 X

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[57] **ABSTRACT**

A printing mechanism is provided with a substantially horizontal barrel-shaped type carrier. The type carrier is rotatable by means of an articulated joint and gears on a yoke for selecting a row of characters. The yoke is rotatable on a bail by means of a pin and slot of a slider, for selecting a line of characters. The bail is moreover horizontally swingable on a carriage by a spring controlled by the line of characters, for printing the selected character. The carriage is transversely movable with respect to the platen and carries rotatably two hollow shafts driven by a pair of prismatic shafts parallel to the platen and selectively rotatable on the machine frame.

17 Claims, 9 Drawing Figures

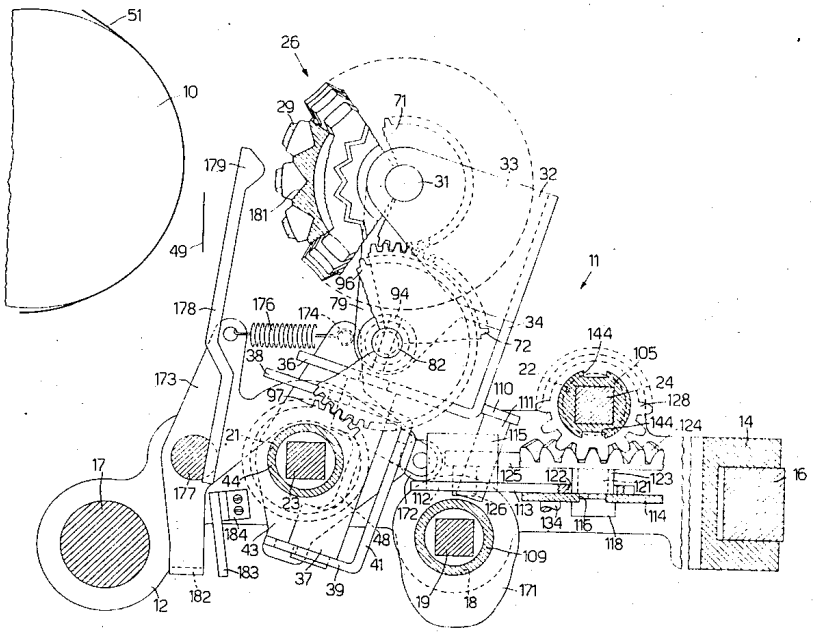
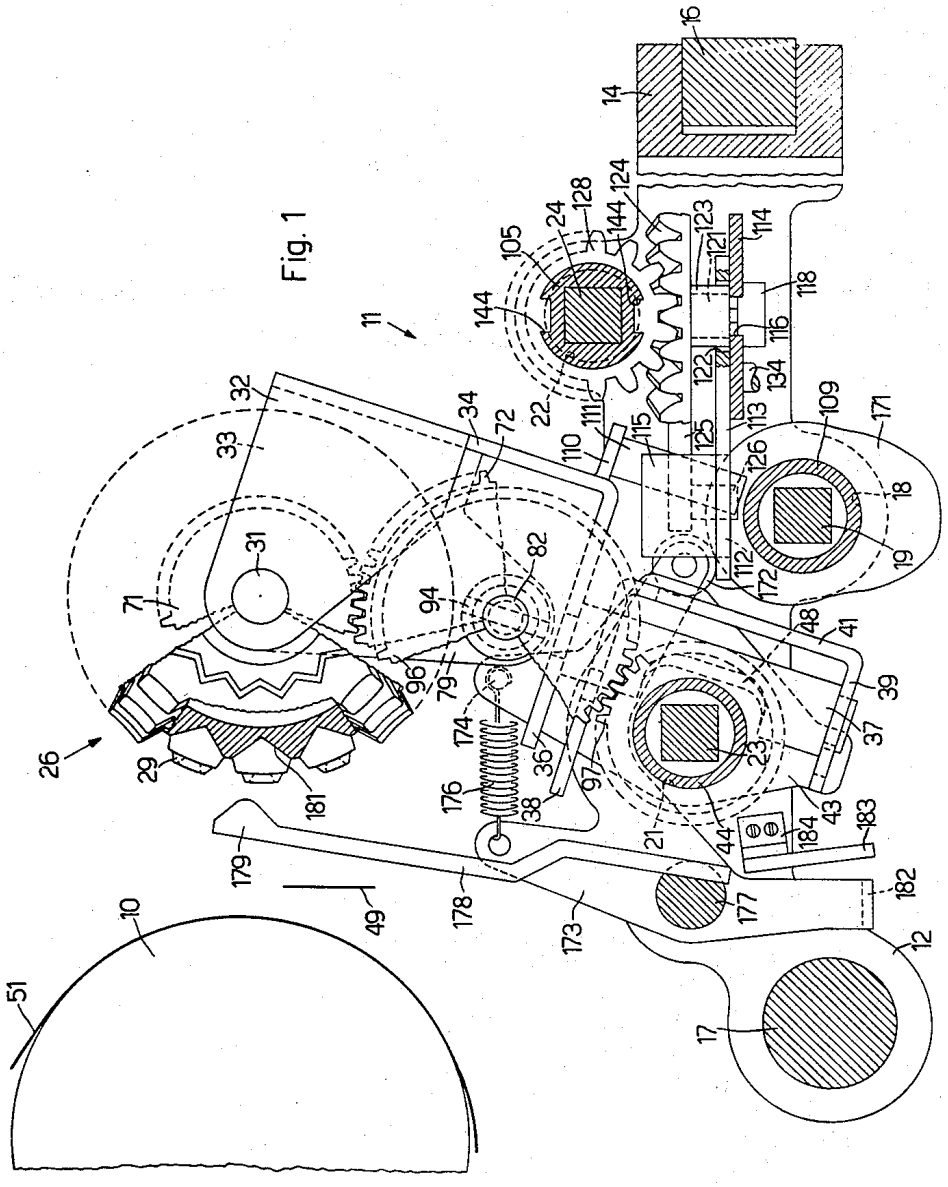


Fig. 1



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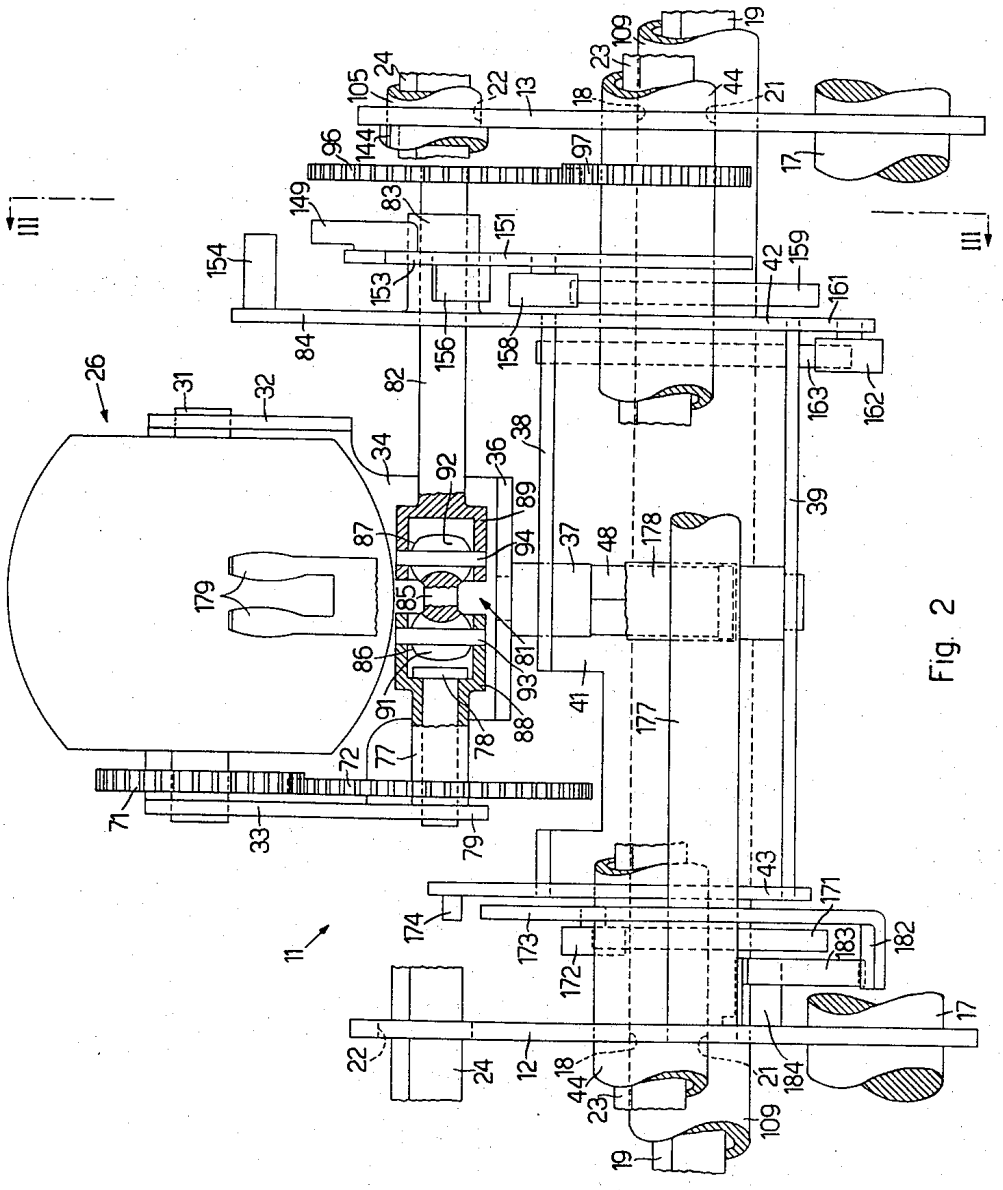

Fig. 2

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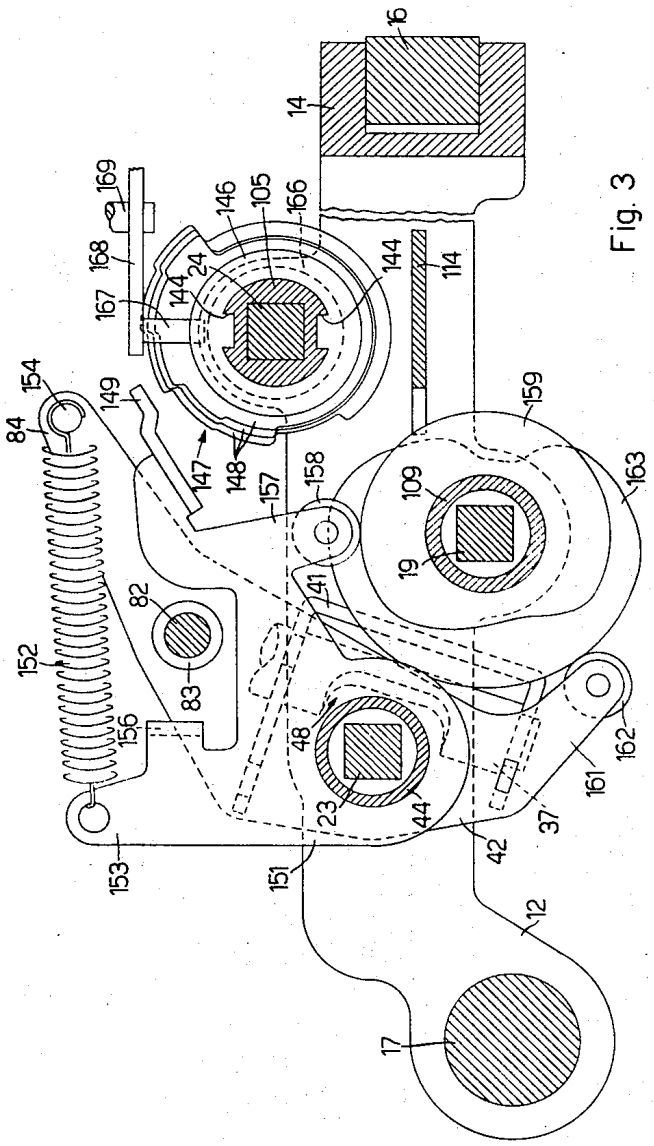

Fig. 3

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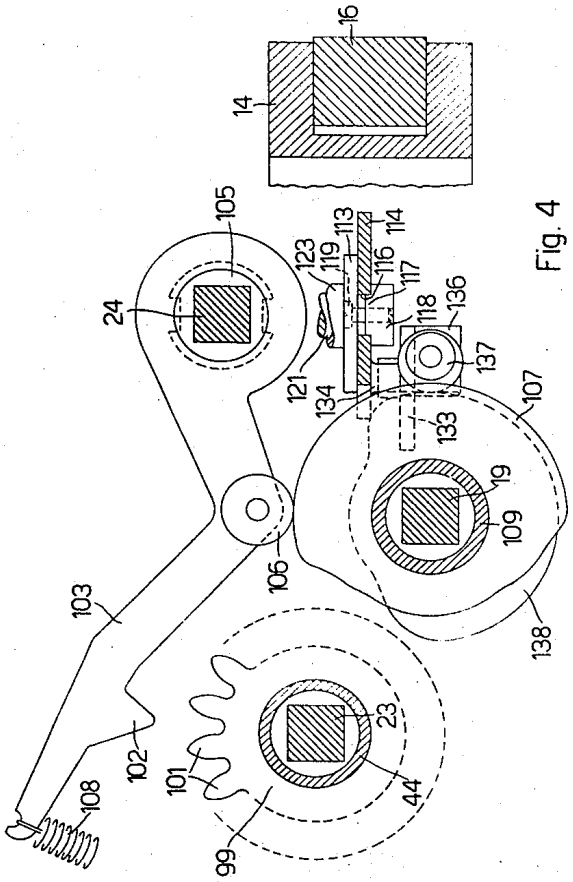

Fig. 4

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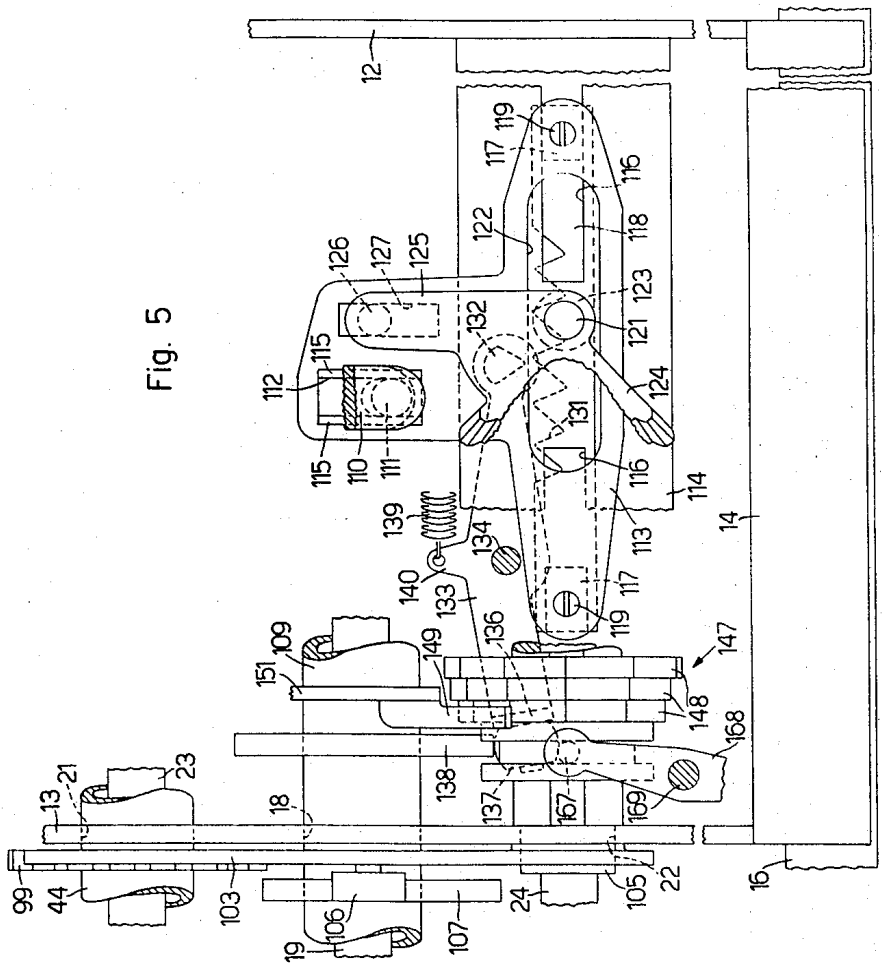
Fig. 5



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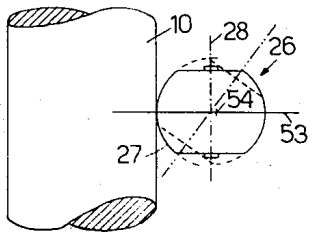

Fig. 6

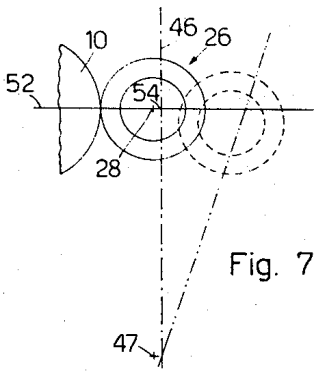

Fig. 7

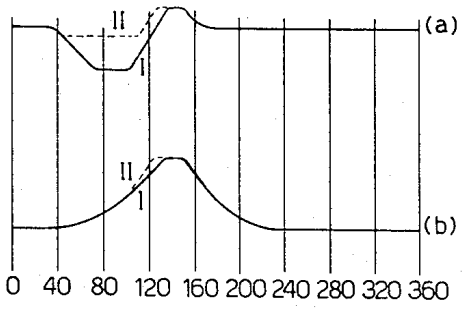

Fig. 8

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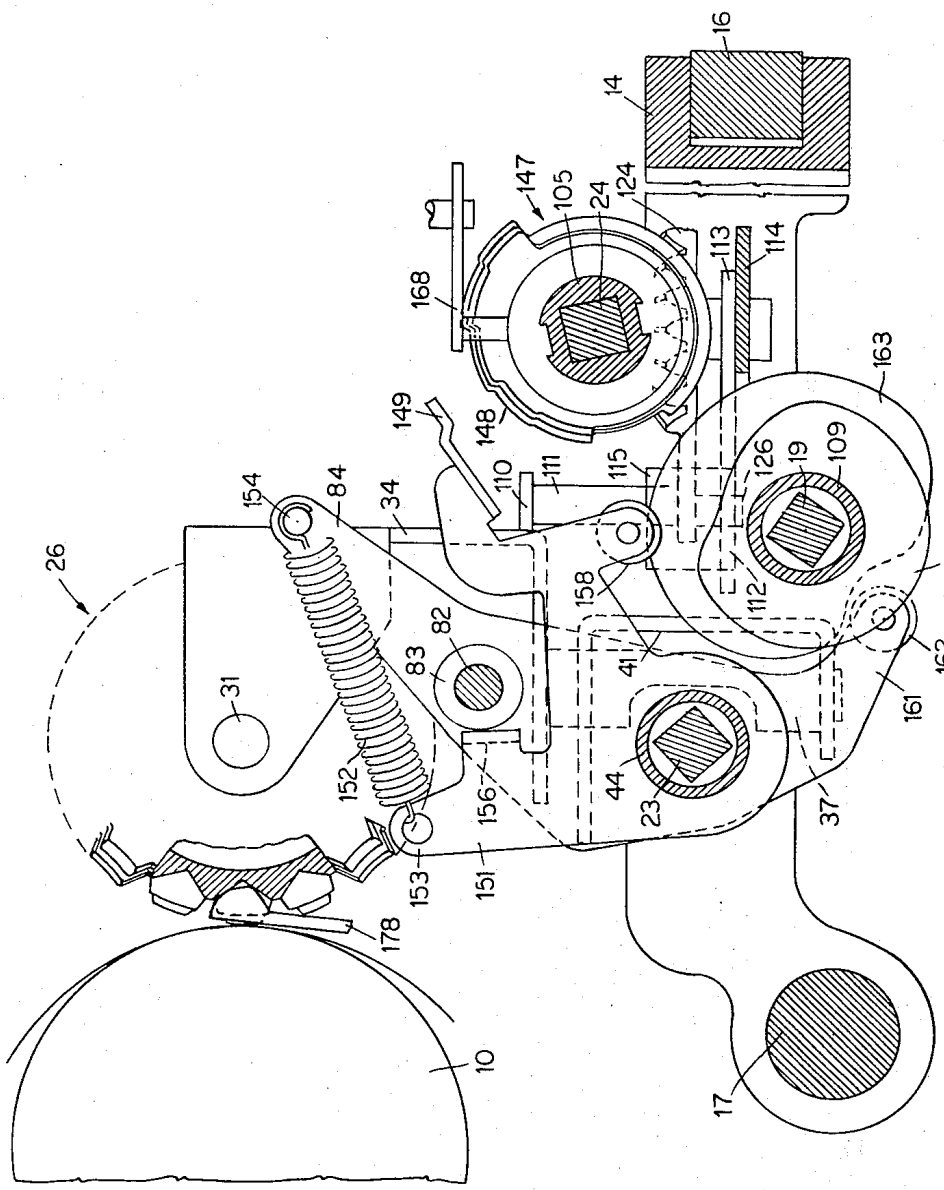
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Fig. 9

PRINTING MECHANISM HAVING A SINGLE PRINTING ELEMENT

BACKGROUND OF THE INVENTION

1. Field of the invention

The present invention relates to printing mechanisms for typewriters, teleprinters, accounting and similar machines for processing data, in which all type faces are carried by a single printing element having a spheroidal form.

2. Description of the prior art

Various printing mechanisms having a spherical printing elements are known. In a first type of mechanism, the sphere is rotatable on a vertical spindle to which it is articulated in such manner as to be variably tiltable. This articulation renders the mechanism very delicate and costly.

In another type of mechanism, the sphere is rotatable about a horizontal axis. These mechanisms, however, present difficulties as regards transmission of the selective rotation to the sphere.

SUMMARY OF THE INVENTION

The object of this invention is to provide a printing mechanism with a spheroidal type-bearing element in which the selection movement is transmitted to the spherical type-bearing element with great simplicity and accuracy.

According to the present invention, there is provided a printing mechanism having a single printing element which is of spheroidal form and is rotatable selectively on a substantially horizontal axis, comprising in combination a platen, a forked support carrying said printing element and rotatable selectively about a substantially vertical axis, a base member mounting said support and swingable about a horizontal axis to cause said printing element to strike the platen, a first shaft rotatable in said base member and parallel to said platen, an articulated joint connecting said first shaft to a second shaft rotatable in said forked support, said second shaft being parallel to the axis of the printing element, and gears connecting said second shaft to said printing element.

The invention will be described in more detail, by way of example, with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view from the left, partly in section, of a printing mechanism embodying the invention;

FIG. 2 is a partial front view of the mechanism;

FIG. 3 is a partial section on the line III—III of FIG. 2;

FIG. 4 is another partial view of the mechanism from the left;

FIG. 5 is a partial plan view of the mechanism;

FIG. 6 is a diagrammatic plan view of a number of details of the mechanism;

FIG. 7 is a diagrammatic view of the details of FIG. 6 from the left;

FIG. 8 is a diagram used in explaining the operation of the mechanism.

FIG. 9 is a view from the left in section of the mechanism embodying the invention showing the head rotated to a position for striking the platen.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The printing mechanism to be described can be used both in a typewriter operated directly from a keyboard and in a teleprinter operated by code combinations being transmitted or received. The printing mechanism may moreover by used as an output device of an accounting machine or a data processor.

The mechanism includes a transversely fixed platen **10** (FIG. 1) and a type carriage **11** which is movable transversely parallel to the platen **10.** The carriage **11** is constituted by two side pieces **12** and **13** (FIG. 2) connected by a channel bar **14** (FIG. 1) slidable on a bar **16** fixed to the sides of the machine. The two side pieces **12** and **13** are moreover slidable on a fixed shaft **17** and are provided with a hole **18** through which extends a square shaft **19** which can rotate by means of two cylindrical ends in the fixed frame of the machine and is clockwise turned cyclically through 360° in known manner on the printing of each character.

The side pieces **12** and **13** are moreover each provided with a pair of holes **21** and **22** through which two corresponding square shafts **23** and **24** extend, these being also rotatable by means of cylindrical ends in the frame of the machine. The shafts **23** and **24** are rotated selectively at each cycle to select the character to be printed and remain from time to time in the selected angular position, for example as in the machine described in our British Pat. No. 1,069,429.

On the carriage **11** there is mounted a spheroidal printing head **26.** The head **26** has a barrel-shaped outer surface, that is a shape generated by the rotation of an arc of a circle **27** (FIG. **6**) about an axis **28** parallel to the chord of the arc. From this surface there projects a set of characters and other symbols **29** (FIG. 1) which are disposed in 16 equidistant rows coplanar with the axis of surface. The characters **29** are moreover disposed in six circular lines perpendicular to the axis of rotation of surface and spaced equally with respect to the rows. The distribution of the characters is such that their impression area increases from the left line to the right line of FIG. **2.** More particularly, the symbols of smaller area (. , + −) are arranged in the first line and those of larger area (M, W, %, ½) in the sixth line.

The head **26** is fixed to a shaft **31** coaxial with the outer surface substantially horizontal and adapted to be slightly inclined with respect to the platen **10.** The shaft **31** is rotatable between two arms **32** and **33** of a fork **34** (FIG. 1) for aligning in front of the platen **10** the row of the character to be printed. The fork **34** is fastened in turn by means of a bent portion **6** thereof, with a substantially vertical shaft **37** rotatable between two bent portions **38** and **39** of a bail **41.** The shaft **37** is adapted to cause the head **26** to assume a series of different orientations for selecting in front of the platen **10** the line in which the character to be printed is located.

To the bail **41** (FIG. 2) there are fixed two arms **42** and **43** which can turn on a hollow shaft **44** parallel to the platen. The hollow shaft **44** is rotatable in turn in the holes **21** with which the side pieces **12** and **13** of the carriage **11** are provided and is moreover angularly fixed and axially slidable on the selector shaft **23.** The axis of the shaft **37** indicated by the reference **46** in FIG. 7 lies in a vertical plane which is perpendicular to

the axis, indicated by the reference 47, of the hollow shaft 44. In the proximity of the shaft 44, the shaft 37 (FIG. 1) has a transverse notch 48 (See also FIG. 3), surrounding the shaft 44 such that the shaft 37 is able to adopt in response to the movement of the bail 41, the angular positions corresponding to the six lines of the head 26 without touching the shaft 44. In its turning action about the shaft 44, the bail 41 is adapted to bring the selected type 29 into engagement for printing through the medium of an inked ribbon 49 on a sheet of paper 51 disposed on the platen 10. The ribbon 49 is supported by the carriage 11 and the feed thereof, like that of the sheet 51, takes place in a known manner which is not an object of this patent.

On the striking action, the row of the type or character selected (FIG. 7) lies substantially in a horizontal plane 52 extending through the axis of the platen 10 and through the axis 28 of the head 26. The axis 46 of the shaft 37, during its rotation about the axis 47, describes a vertical plane 53 (FIG. 6) which encounters the platen 10 at the intersection with the plane 52 in correspondence with the point of impact. The axis 46 moreover encounters the plane 52 at a point 54 which coincides with the centre of the generating arc which aligns the six characters belonging to the row in which the selected character is located. For each orientation of the head 26 about the axis 46 for selection of the line, the various characters 29 in the same row are brought to the same striking point. When these characters arrive at the striking point, they are all equally spaced from the axis 46 and they are oriented with respect to the platen 10 in a manner which does not depend on the line occupied.

Keyed to the shaft 31 (FIG. 2), between one side of the head 26 and the arm 33 of the fork 34, is a toothed wheel 71 which is in mesh with a second toothed wheel 72 integral with a hollow shaft 77. This shaft is rotatable on a pivot 78 fixed to an extension 79 of the arm 33 and the axis of which is perpendicular to the axis 46 of the shaft 37. The hollow shaft 77 is connected by means of an articulated joint indicated generally by the reference 81 to a shaft 82 rotatable in a sleeve 83 fixed to an extension 84 of the arm 42. The axis of the sleeve 83 is parallel to the shaft 44 and meets the axis of the pivot 78 at the point where this pivot axis meets the axis 46 of the shaft 37.

The articulated joint 81 solves the complex technical problem of connecting an indexing shaft to a printing element rotating on a forked support and comprises an oblong body 85 with two truncated spherical heads 86 and 87 which co-operate with the inner surfaces of two corresponding hollow ends 88 and 89 of the shaft 77 and the shaft 82, respectively. The two heads 86 and 87 are respectively provided with two axial and parallel slots 91 and 92 which are slidably engaged by two respective transverse keys 93 and 94 fixed in the hollow ends 88 and 89 of the shafts 77 and 82. The articulated joint 81 is thus adapted to transmit a rotation of the shaft 82 unchanged to the shaft 77 irrespective of the angle which is formed by their respective axes. To the shaft 82 there is fixed a toothed wheel 96 which meshes with a toothed wheel 97 so as to achieve, with the toothed wheels 71 and 72, a unitary transmission ratio between the wheels 97 and 71. The toothed wheel 97 is fixed on the hollow shaft 44, which is in engagement in turn with the square shaft 23, which thus becomes adapted to select the row of the character to be printed.

To the shaft 44 there is moreover fixed a toothed wheel 99 having 16 teeth 101 at its periphery. A tooth 102 on a lever 103 (FIG. 4) which can turn on a sleeve 105 fixed angularly and slidable axially on the shaft 24 and turning in its turn in the hole 22 in the side piece 13 can engage between the teeth 101. A roller 106 is rotatable on the lever 103 and is adapted to co-operate with a cam 107 through the action of a spring 108 stretched between the end of the lever 103 and the side piece 13. The cam 107 is keyed on a hollow shaft 109 fixed angularly and slidable axially on the square shaft 19 and turning in the holes 18 in the side pieces 12 and 13 of the carriage 11.

Means are provided to allow for successive character selection without awaiting each time restoration of the type head to its original position. To a projection 110 of the fork 34 (FIG. 1) there is fixed a pin 111 parallel to the shaft 37 and guided by a slot 112 and two lugs 115 of a slider 113. FIG. 5 shows clearly the interrelationship of these elements. The slider 113 is adapted to slide on a crosspiece 114 fixed to the side pieces 12 and 13 of the carriage 11 and having two transverse slots 116 aligned with one another and parallel to the platen 10. The slots 116 (FIG. 5) are slidably engaged by two blocks 117 integral with the ends of an elongated plate 118 on the opposite side to the slider 113 with respect to the crosspiece 114. The blocks 117 are fixed by means of a pair of screws 119 to the slider 113, which is therefore guided by the blocks 117 and by the slots 116. On the crosspiece 114, between the slots 116 and on the same side as the slider 113, there is fixed a pin 121 which projects from a slot 122 in the slider 113. The hub 123 of a sector 124 having conical teeth can turn on the pin 121. The sector is provided with an arm 125 to which there is fixed a pin 126 engaged in a corresponding slot 127 in the slider 113. The selector 124 (FIG. 1) is in mesh with a sector 128 having conical teeth and fixed to the sleeve 105. As has already been described, this sleeve is in slidable engagement with the square-section shaft 24, which is thus adapted to select the line in which the character to be printed is located.

The elongated plate 118 (FIG. 5) has six notches 131 which are adapted to engage a tooth 132 fixed to a rocking lever 133 (See also FIG. 4). This rocking lever can turn on a pin 134 fixed to the crosspiece 114 and has at one end a bent portion or lug 136 on which a roller 137 is rotatable. This roller is adapted to co-operate with a cam 138 fixed to the hollow shaft 109 through the action of a spring 139 stretched between a projection 140 of the rocking lever 133 and the crosspiece 114.

Fixed angularly and slidable longitudinally on the sleeve 105 (FIG. 3) by means of a pair of longitudinal grooves 144 is another sleeve 146 integral with three cams 147 which are similar to one another and of different dimensions. The profile of the cams 147 is divided into six sectors 148 in the form of steps with a constant radius of curvature. The cams 147 are adapted to arrest a bent end 149 of a rocking lever 151. This rocking lever can turn on the hollow shaft 44 and is adapted to pivot clockwise through the action of a spring 152 stretched between a projection 153 of the rocking lever 151 and a pin 154 fixed to the end of the extension 84 of arm 42. The rocking lever 151 also has a lug 156 which is adapted to be arrested against the sleeve 83 of the arm 42 which also carries extension 84. The rocking lever 151 is provided with an arm 157

which normally follows by means of a roller **158** the profile of a cam **159** fast with the hollow shaft **109.** In turn, the arm **42** of the bail **41** is provided in its lower portion with an extension **161** on which there is rotatable a roller **162** co-operating with the profile of a cam **163** which is also fixed to the hollow shaft **109.** The spring **152** normally ensures contact between the rollers **158** and **162** and the respective cams **159** and **163** and, in the striking phase, as will be described hereinafter, provides for the impulsion of the head **26** for the printing of the selected character.

For each line of characters selected, the shaft **24** has, in front of the end **149** of the rocking lever **151,** a corresponding sector **148** of the cams **147.** More particularly, to the line from left to right of FIG. **2** which are selected on the head **26** there correspond the six steps **148** of progressively increasing radius.

The arrest of the end **149** (FIG. **3**) on one or the other of the sectors **148** adjusts the tension of the spring **152,** which increases with the increase in the radius of curvature of the sectors **148.** The sleeve **146** has an annular groove **166** in which there engages a pin **167** fixed in turn to one end of a lever **168** fulcrumed at **169** on the carriage **11.** The lever **168** can be actuated manually and is adapted to bring one or the other of the three cams **147** into correspondence with the rocking lever **151** to adjust the tension of the spring **152** in an overall manner.

On the hollow shaft **109,** in the proximity of the side piece **12** (FIG. **1**), there is also fixed a cam **171** which co-operates with a roller **172** fixed to a rocking lever **173.** Between one end of the rocking lever **173** and a pin **174** fixed to the arm **43** there is stretched a spring **176** which causes the roller **172** to follow the cam **171** and the action of which is always much smaller than that of the spring **152** (FIG. **3**). The rocking lever **173** (FIG. **1**) is fixed to a shaft **177** parallel to the platen **10** and rotatable between the side pieces **12** and **13** of the carriage **11.** To the shaft **177** there is moreover fixed a lever **178** having a forked end **179** (FIG. **2**) the axis of which lies in the plane **53** (FIG. **6**) described by the axis **46** of the shaft **37** during the striking action. The ends of the arms of the fork **179** (FIG. **1** are substantially wedge-shaped and are adapted to engage two corresponding notches **181** which are also wedge-shaped and interposed between the types in the same row during the approach of the head **26** to in platen **10.** Moreover, by means of a bent portion **182** on theend of a leaf spring lever **173** is adapted to act in the striking phase by means of a bent portion **182** on the end of a leaf spring **183** fixed to a lug **184** fixed in turn to the side piece **12.**

The printing mechanism operates in the following manner.

On the depression of the key corresponding to the character to be printed, the shafts **23** (row selecting shaft) and **24** (line selecting shaft) position themselves for the selection of the character to be printed and a cycle of the shaft **19** starts in the manner already described. This shaft undergoes a 360° rotation in printing each character, and is the main timing shaft. Referring generally to FIG. **1,** and to the other figures for particular details, to select the line in which the character to be printed is located and place it in the striking position, the rotation of the shaft **24** is transmitted through the sleeve **105** and the sector **128** with conical teeth to the sector **124,** which shifts the slider **113** transversely of the carriage **11** by means of the pin **126** and the slot **127.** (FIG. **5**) through the medium of the slot **112** and the pin **111,** this shifting causes the rotation of the shaft **37** (FIG. **1**) through an angle corresponding to the rotation of the shaft **24.** By means of the fork **34,** the head **26** is then oriented with respect to the platen **10** until the line of characters in which the character to be selected is located is positioned in front of the striking point (as diagrammatically defined by the plane **53** of FIG. **6**). At the same time, through the sleeve **146** (FIG. **3**), the shaft **24** causes the three cams **147** to rotate, positioning the corresponding sector **148** of one of the cams **147** in front of the end **149** of the rocking lever **151.**

To select the row in which the character to be printed is located and bring it to the printing position, the hollow shaft **44** is turned by shaft **23** and turns the toothed wheels **97** and **96.** The rotation of the shaft **23** (FIG. **1**) thereby causes a rotation of the shaft **82,** which is transmitted to the shaft **77** (FIG. **2**) through the medium of the articulated joint **81.** Owing to the presence of this joint, the transmission ratio between the shaft **77** and the shaft **82** is not affected by the particular orientation of the head **26** with respect to the platen. Therefore, owing to the unitary transmission ratio existing between the wheels **97** and **71,** the rotation of the shaft **31** is equal to the rotation of the shaft **23.** Through the toothed wheels **72** and **71** (FIG. **1**), the shaft **77** causes the shaft **31** to rotate, and therefore the head **26,** until the character to be printed is positioned in front of the striking point.

For reasons of clarity, it has been assumed that the selection of the row of the character has been completed while the selection of the line has not yet been completed. The head **26** has thus been shown with the shaft **31** parallel to the platen **10.** This position is not a rest position, but may be regarded as a transitional position for the selection of one of the two central lines of characters **29.** The selection of the character terminates when the shaft **19** has rotated through about 30°. This shaft, acting through the hollow shaft **109,** produces the simultaneous clockwise rotation of the five cams already described, which first correct the positioning of the character to be printed and finally produce the impression thereof on the paper.

More particularly, at the beginning of the cycle, the cam **107** (FIG. **4**) presents to the roller **106** the decreasing portion of its profile, which follows the constant portion of greater radius of the inoperative phase. The lever **103** then begins to turn anticlockwise owing to the action of the spring **108,** bringing the tooth **102** towards the teeth **101** of the wheel **99.** The cam **138** also presents to the roller **137** the decreasing portion of its profile, so that owing to the action of the spring **139** the rocking lever **133** begins to turn clockwise (FIG. **5**) and brings the tooth **132** up to the notches **131** of the plate **118.** After the shaft **19** has rotated through about 30°, with the selection of the character effected, the tooth **102** (FIG. **4**) engages between the teeth **101** of the wheel **99** and the tooth **132** (FIG. **5**) engages in one of the notches **131** of the plate **118.** Correction of the positions of the toothed wheel **97** and the fork **34** is then obtained, aligning the character to be printed with the striking point.

The lever **168** is normally preset in a position corresponding to the intensity desired for the striking action. It then positions the corresponding cam **147** in the path

of the bent end **149.** During the selection of the character, the cam **159** (FIG. **3**) presents the high portion of its profile to the roller **158** and holds the rocking lever **151** still in the position shown in the drawing. At the same time, the shaft **24** brings the sector **148** of the cam **147** currently disposed in the plane of the rocking lever **151** into correspondence with the end **149** of the rocking lever **151.** At the end of the selection, the rocking lever **151,** following the cam **159** owing to the action of the spring **152,** turns clockwise until it brings its end **149** to bear on the sector **148** corresponding to the line in which the character to be selected is disposed. The diagram of FIG. **8** (*a*) represents the rotation of the rocking lever **151** as a function of the rotation of the shaft **19.** The amplitude of the rotation of the rocking lever **151** depends on the cam **147** that is preset manually and on the sector **148** selected by the shaft **19.** More particularly, this rotation is greatest for the sector **148** of smallest radius selected from the smallest cam **147** (solid-line curve I). The rotation of the rocking lever **151** is smallest for the sector **148** of greatest radius selected from the largest cam **147** (broken-line curve II).

When selection has taken place, the cam **163** (FIG. **3**) allows the bail **41** to turn anticlockwise under the action of the spring **152,** bringing the head **26** nearer to the platen **10** and thus initiating the striking movement. The first part of the law of motion of the head **26** (FIG. **8** (*b*)) for a rotation of the shaft **19** between about 40° and 90° is controlled by the profile of the cam **163.** Thereafter, this profile declines so abruptly that, at the working speed of the shaft **19** (FIG. **3**), owing to the inertia of the head **26,** the roller **162** no longer follows the cam **163** and parts from it. (FIG. **10**) the bail **41** is then subjected solely to the action of the spring **152** and the movement of the head **26** is accelerated. In the course of the phase of approach of the head **26** to the platen **10,** the sleeve **83** strikes against the lug **156** of the rocking lever **151.** The end **149** of rocking lever **151** then leaves the sector **148** on which it has been bearing and the rocking lever **151** begins to turn anticlockwise, following the rotation of the extension **84.** There is then no relative movement between the rocking lever **151** and the arm **42.** The spring **152** now remains stretched between the projection **153** and the pin **154,** but no longer exerts any effect on the movement of the head **26.** This head then moves at a substantially constant speed depending on the intensity and the duration of the action previously exerted by the spring **152.**

More particularly, for the greatest rotation of the rocking lever **151** and, therefore, for the smallest tension of the spring **152** which corresponds to the first line of the head **26,** the contact between the sleeve **83** and the lug **156** occurs after a very brief acceleration phase and the speed of the head **26** is smallest (curve I of FIG. **8** (*b*)). For the smallest rotation of the rocking lever **151** and, therefore, for the greatest tension of the spring **152** corresponding to the sixth line of the head **26,** the contact between the sleeve **83** and the lug **156** occurs after the longest acceleration phase and the speed of the head **26** is greatest (curve II of FIG. **8** (*b*)). For the other lines, intermediate conditions occur and the striking speed of the head **26** is then proportional to the area of the character to be printed and produces an intensity of impression independent of the character selected.

During the first part of the movement of approach of the head **26** to the platen **10,** between a rotation of about 40° and 90° of the shaft **19,** the cam **171** (FIG. **1**) allows the rocking lever **173** to turn clockwise. The lever **178** then approaches the head **26** until the forked end **179** is engaged in the notches **181** adjacent the selected character when the shaft **19** has rotated through about 95°. The lever **178,** carried along by the head **26** in the anticlockwise movement of rotation of the latter, then reverses the sense of rotation and follows the law of movement of the head **26.** The spring **176** no longer has any effect on the movement of the lever **178,** but prevents any rebound after the contact between the fork **179** and the head **26** and ensures that this contact is kept firm until the type has struck. In the course of the movement of the head **26** towards the platen **10,** the ribbon **49** is raised from the inoperative position to the printing line in a manner known per se.

During the striking movement of the head **26,** the toothed wheel **96** carried by the extension **84** of the arm **42** rolls on the toothed wheel **97,** which is kept locked by the action of the tooth **102** on the wheel **99** (FIG. **4**). The toothed wheel **96** (FIG. **1**) then causes the shaft **82** to rotate anticlockwise in the sleeve **83** and transmit this rotation through the articulated joint **81** and the shaft **77** to the toothed wheel **72.** This toothed wheel now causes a clockwise rotation of the toothed wheel **71** with respect to the fork **34** which is equal to the angle through which the shaft **37** has turned anticlockwise for the striking of the head **26** against the platen **10.** Moreover, the pin **111,** parallel to the shaft **37,** is guided by the slot **112** and the lugs **115** of the slider **113,** which is kept locked by the action of the tooth **132** on the notch **131.** The head **26** can therefore move only in a plane parallel to that described by the axis **46** of the shaft **37.** The orientation of the head **26** with respect to the platen **10** is then kept constant in the course of the striking movement and the character selected moves in the plane of the axis of the shaft **37** independently of the line occupied.

The movement of the selected character towards the platen **10** is therefore the resultant of the rotation of the bail **41** with respect to the axis **47** of the hollow shaft **44** and of the rotation of the head **26** in the opposite sense about the axis of the shaft **31.** In the proximity of the striking point, this movement may be regarded substantially as simple translation which does not depend on the line in which the character selected is located. The printed character is therefore uniformly clear irrespective of the line and the thickness of the paper **51.** The fork **179,** in turn, guides the type **29** precisely during the movement thereof towards the platen **10.** When close to striking, the assembly constituted by the lever **178,** the head **26** and the fork **34** may be regarded as an articulated quadrilateral of which the head **26** constitutes the linkage. The selected character is thus aligned perfectly with the printing line by taking up the plays existing between the various kinematic elements owing to machining tolerances or wear.

In the proximity of the striking point, the bent portion **182** (FIG. **1**) of the rocking lever **173** strikes against the leaf spring **183.** This spring absorbs part of the kinetic energy of the head **26,** restoring it immediately after the striking action. The time of contact of the head **26** with the platen **10** is thus reduced and the impression of the character **29** is clearer.

Immediately after the striking of the head **26** against the platen **10** and the elastic withdrawal thereof, after a rotation of the shaft **19** through about 135°, the cam **163** (FIG. 3) resumes contact with the roller **162** and causes clockwise rotation of the bail **41**, bringing the head **26** back into the inoperative position indicated in FIG. **1**. The rocking lever **151**, pulled by the spring **152**, turns clockwise, causing the roller **158** to resume contact with the cam **159**, which presents its profile of greatest radius. The rocking lever **151** is then brought back into the position indicated in the drawing, with the end **149** at a distance from the cams **147**.

Moreover, after the shaft **19** has rotated through 160°, the roller **172** (FIG. 1) resumes contact with the cam **171** in the high and decreasing zone of its profile. The fork **179** is thus released from the notches **181** and is finally brought back into the inoperative position shown in the drawing. After a rotation of the shaft **19** through 170°, through the action of the cam **107** on the roller **106** the lever **103** (FIG. 4) turns clockwise, as a result of which the tooth **102** moves away from the teeth **101** of the wheel **99**. Similarly, the cam **138** causes the rocking lever **133** (FIG. 5) to turn anticlockwise, moving the pin **132** away from the notches **131**. The toothed wheel **99** and the slider **133** are thus released. Since the transmission elements are in constant engagement, it is therefore possible to select a fresh character after the shaft **19** has rotated through 180° and before the head **26** has returned to rest through the action of the cam **163**.

After the striking action, the ribbon **49** is lowered vertically, uncovering the impressed character, and the advancing device shifts the carriage **11** to the right by one step in a manner known per se.

We claim:

1. A printing mechanism, having a single printing element, for typewriters, teleprinters, accounting and similar printing machines, wherein said printing element is of spheroidal form and has an axis of symmetry which is substantially horizontal, said element being rotatable selectively thereon, said mechanism comprising in combination a cylindrical platen, a forked support carrying said printing element and rotatable selectively about a substantially vertical orientation axis, a base member mounting said support and swingable on corresponding supporting means about a horizontal axis parallel to said platen to cause said printing element to strike said platen, an indexing shaft rotatable on said supporting means and parallel to said platen, a first shaft rotatable in said base member and parallel to said platen, a first train of mutually meshing toothed wheels to connect said indexing shaft to said first shaft, said wheels being in mesh during the swinging of said base member, an articulated joint connecting said first shaft to a second shaft rotatable in said forked support, said second shaft being parallel to the axis of the printing element, said articulated joint comprising an intermediate element and guiding means included on said first and second shafts for pivotally connecting said first and second shafts to said intermediate element, and a second train of meshing toothed wheels connecting said second shaft to said printing element.

2. A printing mechanism for typewriters, teleprinters, accounting and similar machines, comprising in combination a supporting paper platen, a barrel-shaped type head rotatable about an axis of said barrel, said type head having circumferential lines of types forming rows in axial planes, a type carrier supporting said type head rotatably about said barrel axis, so that during rotation of said type head said rows are successively positioned in a printing position, a base member supporting said carrier for an angular movement about an orientation axis laying in a plane of symmetry of said type head which is perpendicular to said barrel axis, driving means for selectively rotating said type head on said carrier for placing one of said rows in front of said platen, supporting means pivotally mounting said base member about a swinging axis to cause said type head to strike said platen, a slider selectively movable on said supporting means with respect to said orientation axis along a direction parallel to the swinging axis, a pin fixed to said carrier and having an axis parallel to said orientation axis, and a slot provided on said slider, said slot being perpendicular to said swinging axis and slidingly engaging said pin so that a predetermined shifting of said slider on said supporting means corresponds to a rotation of said carrier for selecting the line of type to be printed, said pin engaging said slot also during the swinging movement of the base member.

3. A printing mechanism according to claim **2**, wherein said barrel axis is substantially horizontal, and wherein said orientation axis is substantially vertical and is located in a striking plane which is perpendicular to said platen, said swinging axis being horizontal and parallel to said platen.

4. A printing mechanism according to claim **3**, wherein said type head is selectively rotated by said driving means which comprises a first shaft rotatable in said base member and parallel to said swinging axis, a second shaft rotatable in said carrier and parallel to said barrel axis, an articulated joint connecting said first shaft to said second shaft, and gears connecting said type head and said first shaft.

5. A printing mechanism according to claim **4** wherein said first shaft is fixed to a first toothed wheel engaging a second toothed wheel rotatable on said base member supporting means coaxially with a substantially horizontal striking axis, said base member swinging about said striking axis to cause said printing element to strike said platen, whereby a constant engagement relation between said first and said second toothed wheels is maintained during said swinging movement of said base member, said gears comprising a third toothed wheel fixed to said second shaft, and a fourth toothed wheel fixed coaxially to said printing element and engaging said third toothed wheel for a unitary transmission ratio between said second toothed wheel and said printing element.

6. A printing mechanism according to claim **1**, wherein said intermediate element comprises an oblong element connected at its two ends by means of two articulations to hollow ends of the first and second shafts respectively, the two articulations comprising two pins parallel to one another.

7. A printing mechanism for typewriters, teleprinters, accounting and similar printing machines, comprising in combination:

a platen,

a barrel-shaped printing element rotatable about the axis of said barrel, said printing element having circumferential lines of characters forming rows in axial planes, said barrel axis being substantially horizontal;

a forked support supporting said printing element rotatably about said barrel axis, so that during rotation of said printing element said rows are successively positioned in a printing position,

a base member mounting said forked support rotatably about an orientation axis, so that during rotation of said forked support said lines of characters are successively positioned in said printing position, said orientation axis being substantially vertical,

striking means supporting said base member for a swinging movement about a striking axis to cause said printing element to strike against said platen, said striking axis being substantially horizontal, said orientation axis being moved on a striking plane perpendicular to said striking axis,

first selecting means for rotating said printing element to select a row of said rows of characters to be printed, and second selecting means for rotating said forked support to select a line of said lines of characters to be printed,

said first selecting means comprising:

a first toothed wheel rotatable on said base member supporting means coaxially with said striking axis,

a second toothed wheel rotatable on said base member parallel to said striking axis and engaging said first toothed wheel, whereby a constant engagement relation between said first and said second toothed wheels is maintained during said swinging movement of said base member,

a third toothed wheel rotatable on said forked support parallel to said barrel axis of said printing element, an articulated joint connecting said second toothed wheel with said third toothed wheel to prevent said second selecting means from affecting the rotation of said printing element about said barrel axis, and

a fourth toothed wheel fixed coaxially to said printing element and engaging said third toothed wheel, whereby a rotation of said first toothed wheel corresponds to a rotation of said printing element about said orientation axis for selecting the row of the character to be printed.

8. A printing mechanism according to claim **7**, wherein said second selecting means comprises:

a pin fixed to said forked support and having an axis parallel to said orientation axis,

a slider slidably mounted on said supporting means along a direction parallel to said striking axis, and a slot provided on said slider, said slot being parallel to said striking plane and slidingly engaging said pin so that a predetermined shifting of said slider on said supporting means corresponds to a rotation of said forked support about said orientation axis for selecting the line of the character to be printed, said pin engaging said slot also during the swinging movement of said base member.

9. A printing mechanism according to claim **8**, comprising:

a machine frame, a second slot provided on said slider parallel to said first slot, guiding means on said frame for guiding said base member supporting means for a transverse movement with respect to said platen,

said first selecting means comprising

a first prismatic shaft parallel to said platen and selectively rotating on said frame,

a first hub rotatably mounted on said supporting means and defining a first axial hole having a section corresponding to the section of said first prismatic shaft, said first shaft being slidable axially into said hole and bodily rotatable with said hub,

said first hub being fixed to said first toothed wheel, whereby a predetermined rotation of said first prismatic shaft corresponds to a selection of said rows on said printing element,

said second selecting means comprising

a second prismatic shaft parallel to said platen and selectively rotating on said frame,

a second hub rotatably mounted on said supporting means and defining a second axial hole having a section corresponding to the section of said second prismatic shaft, said second prismatic shaft being slidable axially into said second hole and bodily rotatable with said second hub,

a first bevel gear bodily rotatable with said second hub, and

a second bevel gear engaging said first bevel gear, said second bevel gear being provided with a pin parallel to said striking plane and cooperating with said second slot, whereby a rotation of said second prismatic shaft corresponds to a selection of said lines on said printing element.

10. A printing mechanism according to claim **8**, wherein each character in the same row of characters is flanked by a pair of wedge-like notches interposed between said characters, and also comprising:

a locating member disposed between said printing element and said platen,

pivoting means for pivoting said locating member about an axis parallel to said striking axis,

spring means for urging said locating member towards said printing element,

retaining means for retaining said locating member against the urging of said spring means,

said locating member being provided with a forked end located in a first position intermediate between said platen and said printing element on the striking path of said selected character for engagement by the pair of notches flanking the character to be printed for adjusting the position of said printing element,

said locating member being dragged by said printing element, whereby said spring means keeps said forked end in engagement with said pair of notches until the striking of said character to be printed on said platen.

11. A printing mechanism according to claim **10**, including a printing cam rotating on said base member supporting means, said retaining means comprising a locating cam angularly fixed to said printing cam, and said locating member including a cam follower contacting at rest a dwell portion of said locating cam under the action of said spring means so as to keep said forked end in said intermediate position, said cam follower leaving said dwell portion during the dragging movement of said locating member, said locating cam having a higher dwell portion to contact said cam follower according to a second position of said forked end closer to said platen than said first position, whereby said forked end disengages said notches adjacent said character immediately after the striking action.

12. A printing mechanism according to claim **9** comprising a third prismatic shaft rotatable cyclically on

said frame of the machine, a third hub rotatably mounted on said supporting means, said third hub being axially slidable on, and rotatable bodily with said third prismatic shaft, said striking means comprising a printing cam fixed on said third hub, and a cam follower of said base member cooperating with said printing cam to cause said base member to swing about said striking axis.

13. A printing mechanism according to claim **12**, wherein said third hub drives cam means for controlling a pair of locating elements after the selective rotation of the first and second prismatic shafts in such manner that one of said pair of locating elements engages said first toothed wheel fixed on said first hub, while the other of said pair of locating elements engages toothing fixed to the slider.

14. A printing mechanism for typewriters, teleprinters, accounting and similar printing machines, comprising in combination a supporting paper platen, a single type carrier located in front of said platen and carrying a plurality of characters, indexing means for selecting one of said characters, a base member mounting said type carrier, means supporting said base member for allowing said type carrier to strike said platen, a spring having an end fixed to said base member to pull said type carrier towards said platen, a cam follower rigidly connected to said base member, a first printing cam normally contacted by said cam follower under the action of said spring, said first printing cam having a low portion for rapidly releasing said cam follower at a predetermined angular position of said cam to cause said spring to strike the selected character of said type carrier against said platen, wherein the improvement comprises:

a second printing cam synchronously driven with said first printing cam,

a spring tensioning member fixing the other end of said spring, said tensioning member including a second cam follower normally contacting said second printing cam under the action of said spring,

a supporting member for guiding said tensioning member along a predetermined path, said second cam having a lower profile to cause said tensioning member to be shifted along said path with respect to said base member for modifying the tension of said spring, and

arresting means for said tensioning member, said arresting means comprising a number of steps each one associated with a group of said characters having substantially similar printing area, said steps being selectable by said indexing means simultaneously with the selection of any character of said associated group of characters so as to be disposed on said path at different distances from said tensioning member to arrest said tensioning member after different strokes for adjusting the action of said spring on said type carrier according to the printing area of said selected character.

15. A printing mechanism according to claim **14**, wherein said arrest means includes a set of stepped discs of different dimensions, each disc being associated with a corresponding intensity of the striking of said type carrier, said discs being axially slidable on and angularly fixed to a common shaft for being selectively rotated by said indexing means, and comprising a manually operated member for shifting said stepped discs along said common shaft for bringing the stepped disc corresponding to the desired intensity of striking into the path of said tensioning member.

16. A printing mechanism according to claim **14**, wherein said supporting means of said base member comprise a pivot member about which said base member and said second cam follower are individually rotatable, said first cam follower and said second cam follower including corresponding parts adapted to be mutually arrested in order to cause said first cam follower to drag said spring tensioning member after a predetermined stroke in correspondence with said striking action, so that a first part of the striking stroke of said type carrier is effected by the tension of said spring at accelerated speed in dependance on said selected character, and the remaining part of the striking stroke is effected through inertia at substantially constant speed.

17. A printing mechanism according to claim **16**, wherein said type carrier is rotatably mounted on a forked support means for rotating about a substantially horizontal axis, said forked support being rotatable on said base member, said supporting means causing said base member to swing about a horizontal axis, and wherein said indexing means include a first shaft rotatable in said base member and parallel to said platen, an articulated joint connecting said first shaft to a second shaft rotatable in the forked support, said second shaft being parallel to said substantially horizontal axis, and gears connecting said second shaft to said type carrier.

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