April 1, 1969 C. R. M. MARTIN 3,435,756

MAGNETIC HOLDING MEANS FOR TYPE MEMBERS IN SELECTIVE PRINTING MACHINES

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FIG. 1

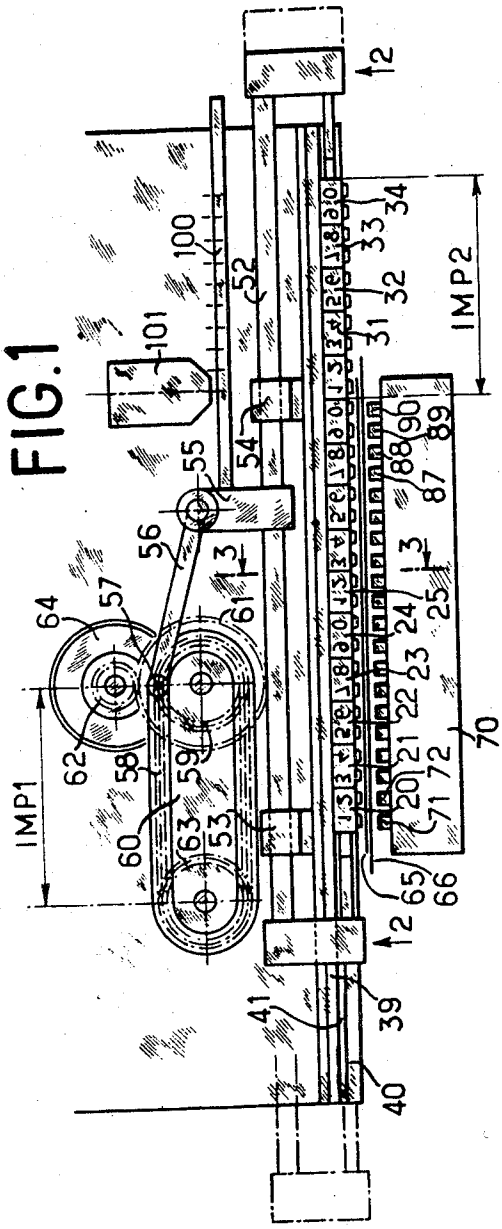
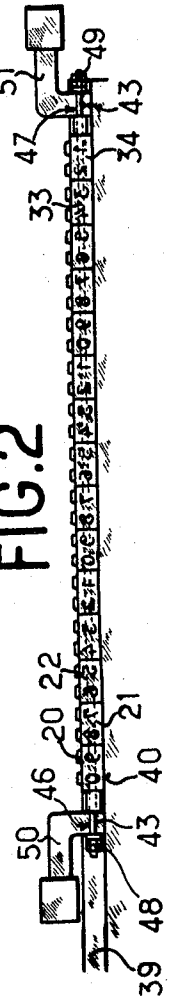


FIG. 2



Inventor:
Claude Raymond Marie Martin
By Baldwin Wight Diller & Brown
Attorneys

April 1, 1969 C. R. M. MARTIN 3,435,756
MAGNETIC HOLDING MEANS FOR TYPE MEMBERS
IN SELECTIVE PRINTING MACHINES
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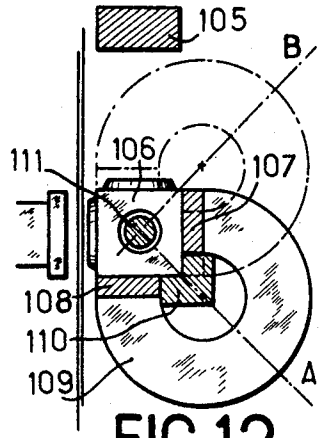


FIG.12

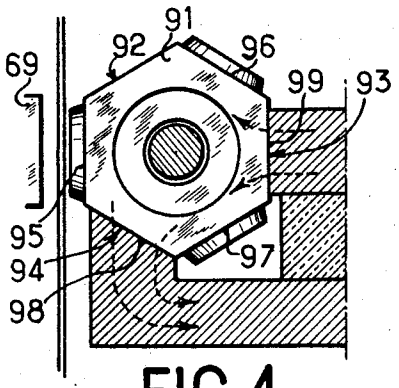


FIG.4

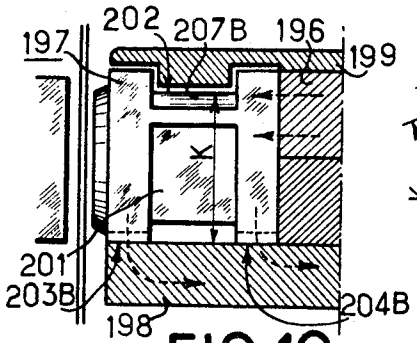


FIG.10

FIG.11

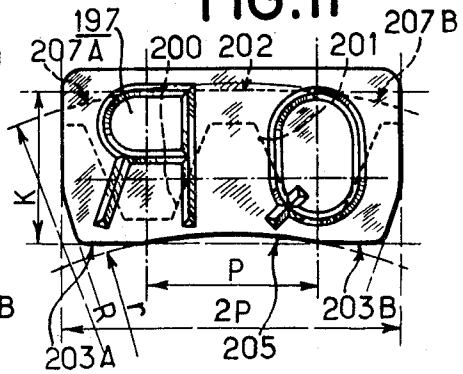
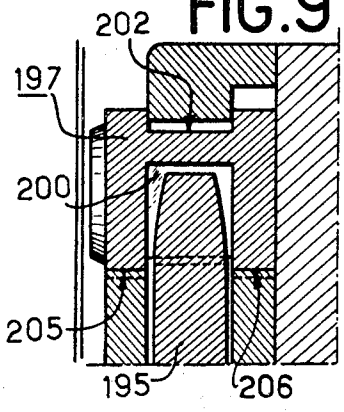
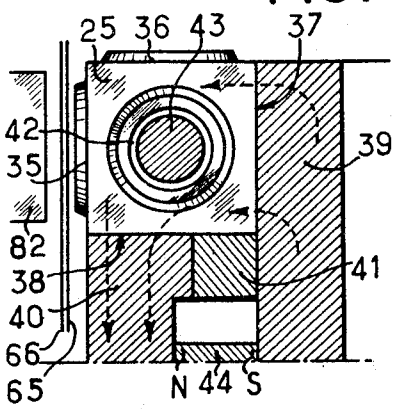


FIG.3

FIG.9





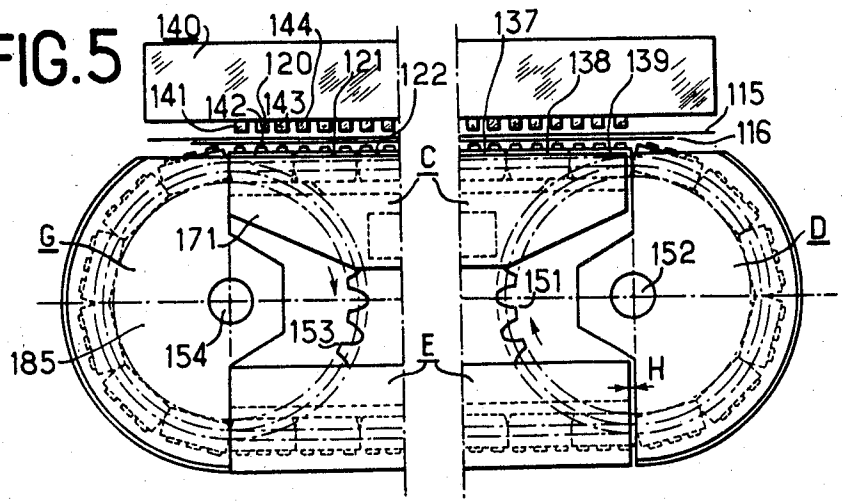
Inventor:
Claude Raymond Marie Martin
By Baldwin Wight Diller & Brown
Attorneys

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FIG.5



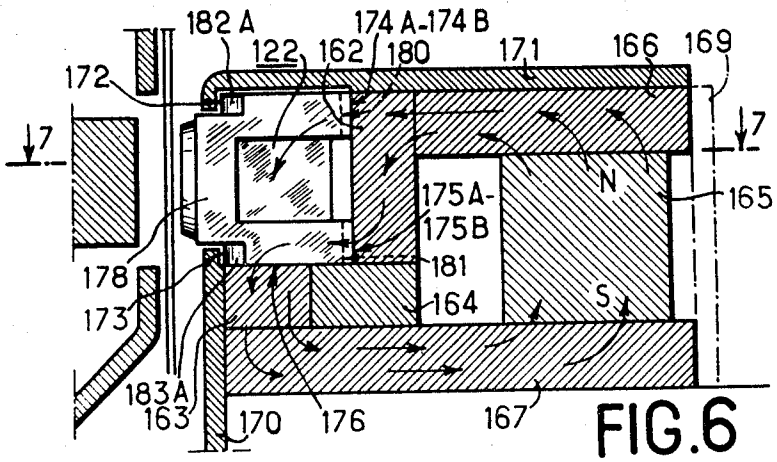


FIG.6

FIG.13

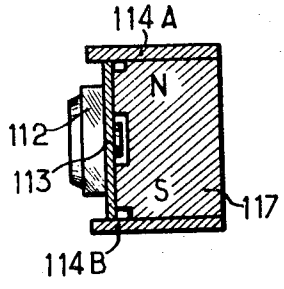
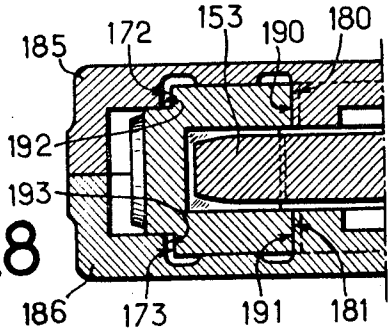


FIG.8



Inventor:
Claude Raymond Marie Martin
By Baldwin Wight Diller & Brown
Attorneys

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MAGNETIC HOLDING MEANS FOR TYPE MEMBERS IN SELECTIVE PRINTING MACHINES

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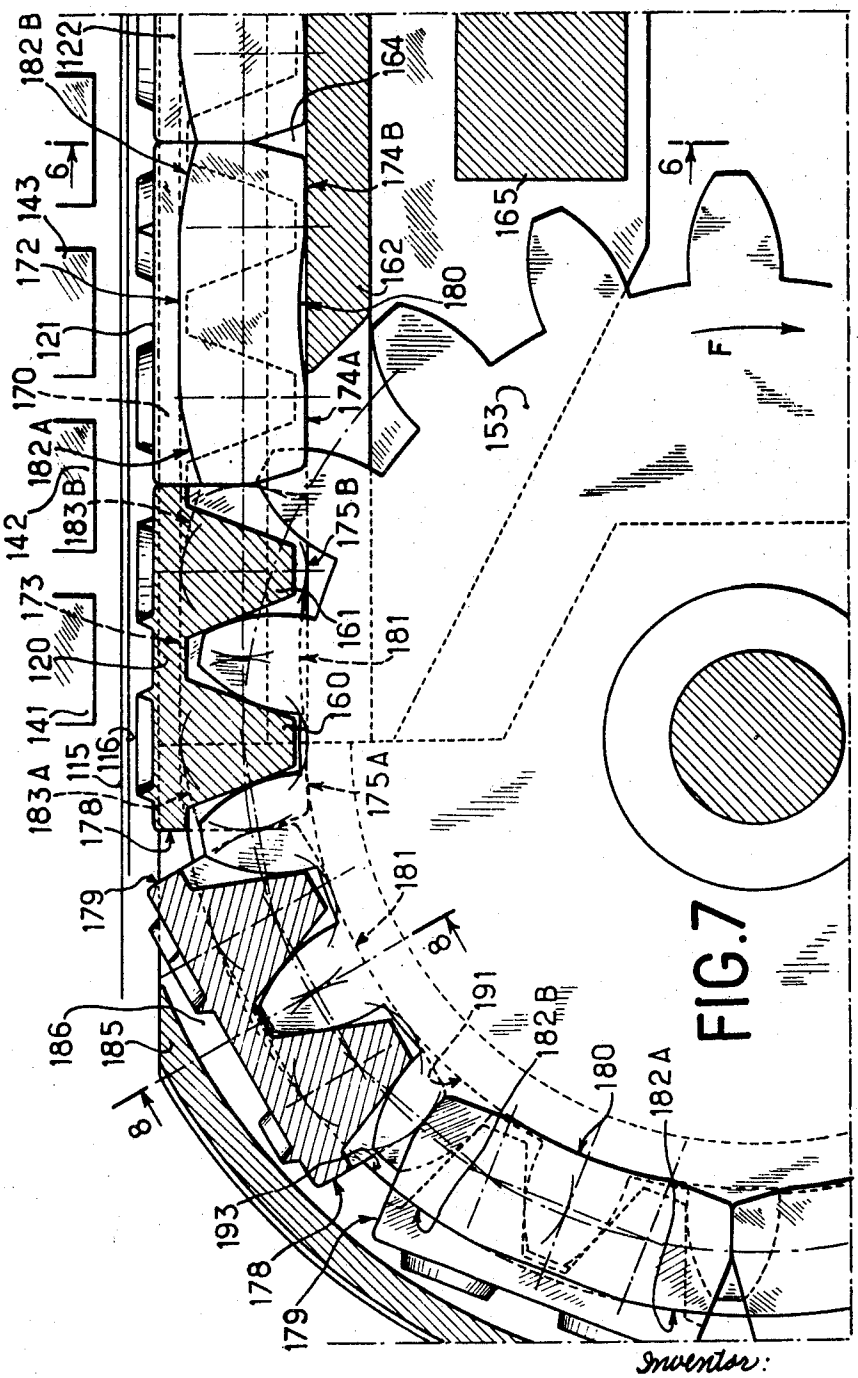


FIG. 7

Inventor:
Claude Raymond Marie Martin
By Baldwin Wight Diller & Brown
Attorneys

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3,435,756

MAGNETIC HOLDING MEANS FOR TYPE MEMBERS IN SELECTIVE PRINTING MACHINES

Claude Raymond Marie Martin, Maisons-Laffitte, France, assignor to Societe Industrielle Bull-General Electric (Societe Anonyme), Paris, France

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Claims priority, application France May 25, 1966, 62,833
Int. Cl. B41j 1/20
U.S. Cl. 101—93 5 Claims

ABSTRACT OF THE DISCLOSURE

An improvement for enhancing the quality of the printing in mechanisms in which type holders are successively advanced along a guide path past a row of striker hammers adapted to be seelctively actuated for the printing, the improvement consisting in that the guide path is provided with guide means against which the type holders are applied by magnetic attraction in order to prevent rebounding and vibratory movements of the said type holders in the guide path during the printing.

The present invention relates to improvements in guide means for type holders in movable-type printing mechanisms employed in printing machines such as "type-chain" machines, "type-bar" printing machines, also called "reciprocating-bar" machines, and like machines.

In "type-chain" printing mechanisms, one or more series of types formed in relief on movable supports are shifted in succession with a continuous translational movement past a row of striker hammers disposed along the printing line of the printing mechanism in a proportion of one striker hammer to each printing position of a line. A paper sheet and an inked ribbon are disposed and advanced in known manner between the movable types and the row of striker hammers, which can each be separately actuated in known manner at particular instants in order to print selected characters along a line of the paper.

In some "type-chain" machines which are employed in the field of mechanographic equipment, the types of the type chain are formed in relief on type holder blocks each provided with one or more types. These blocks are assembled and articulated together to form an endless chain which is stretched around two driving sprockets by means of which the types are continuously advanced along the printing line. In other mechanisms, the type holders are fixedly or detachably mounted on the links of an endless chain or on a support consisting of a flexible metal or plastics band formed with driving teeth or perforations. These devices have certain disadvantages which become apparent after they have been in service for some time, more especially elongation of the chains, which results from the wear on the pin joints and which causes irregularities in the spacing of the characters printed on a line. The action of the striker hammers on a type chain causes local stressing of the chain during the printing of a line, which ultimately results in breakage. Replacement of a deteriorated type chain generally necessitates were more less lengthy stoppage of the machine. This disadvantage has been partly obviated by designing printing mechanisms in which the type chain, its guide means and the type-driving wheels are assembled to form a detachable block which can be fairly rapidly replaced. There have also been produced printing mechanisms, also called type-chain mechanisms, in which the type holder blocks are not mechanically connected, but are nevertheless pushed along a guide path in a closed circuit by means of toothed wheels whose teeth are adapted to mesh with serrations formed in the type holder blocks. By this

means, breakage of chains has obviously been eliminated, but the problems encountered in ensuring correct guiding of the type holders, both in the straight portions and in the curved portions of a guide path have not found any satisfatcory solution, especially in the guiding of the type holders along the printing line. It is observable that the quality of the printing gradually deteriorates as the friction surfaces of the type holders or of their supports and the friction surfaces of the latter on the guide path become worn. This is explained by the fact that the type holders are not perfectly guided in their guide path, with the result that vibration and rebounding phenomena occur at the type holders at the instant of the striking and these then produce increasingly blurred printing, especially at high printing speeds. From the viewpoint of the invention, there will also be considered the so-called "type-bar" or "reciprocating-bar" printing mechanisms of modern design which, to some extent, have similar disadvantages to "chain-type" mechanism. "Bar-type" mechanisms were originally provided with series of types formed in relief on one of the faces of a rigid prismatic bar, which was longitudinally shifted with a regular movement in alternate directions along a printing line. In these mechanisms, the printing of a line takes place during the shifting of the bar, with a uniform movement in one direction, whereafter the paper is advanced to bring another line on to the printing line during the change of the direction of movement of the bar. In order to be able to provide the various combinations of the types required by users, it has been found necessary to construct printing mechanism in which the type bar consists of type holder blocks assembled together and shifted along a guide path. Like chain-type printing mechanisms, these mechanisms require correct guiding of the type holders along the printing line.

The present invention relates to improvements intended to obviate these disadvantages, by improving considerably the conditions under which the type holders are guided at least along the printing line and proposes means which prevent vibration and rebounding of the type holders in their guide means at the instant of the striking, even after the mechanism has been in use for a long time, that is to say, even with appreciable wear of the friction surfaces of the said type holders or of their support and their guide surfaces. The present invention also relates to improvements more particularly applicable to printing mechanisms in which type holders are advanced along a guide path in a closed circuit, comprising rectilinear portions and curved portions which have a particular radius of curvature. These improvements make it possible to ensure correct guiding of the type holders along the whole of the said guide path and to minimise the wear on the surfaces in frictional relation in the mechanism.

In a printing mechanism designed in accordance with the invention, the type holders or their support are necessarily made at least partly of a material having high magnetic permeability, and are advanced along a guide path provided, at least over a part of its length, with guide members in contact with the type holders or their support, at least one of the said guide members consisting at least partly of a material permeable to a magnetic field and connected to one of the poles of a magnet or an electromagnet, so that the type holders or their support, disposed in the said guide path, close a magnetic circuit with at least one of the said guide members and are firmly applied against the said member or members by magnetic attraction. In principle, at least one of the magnetic guide members is arranged to afford to the type holders a rigid support when the striker hammers are actuated during the printing. In a particularly advantageous arrangement, one of two magnetic guide members is arranged to undergo the striking, while the second guide member is disposed

perpendicularly to the first, in order to retain the type holders or their support in the guide path by magnetic attraction and to prevent them from shifting, during the striking, in a direction perpendicular to the direction in which they are advanced along the guide path. In the following description, it will be seen that the angle formed by magnetic guide surfaces in a guide path may also be different from 90°.

In so-called chain-type printing mechanisms, and more particularly in mechanisms comprising a succession of independent type holders advanced along a guide path in a closed circuit, the said guide path comprises rectilinear portions succeeding curved portions of determined radius. In accordance with the invention, the type holders are advantageously provided, in this case, with sliding surfaces specially adapted to ensure correct guiding of the said type holders when the latter are advanced along a curved portion of the guide path, and are also provided with sliding surfaces specially adapted to ensure a correct guiding of the said type holders when the latter are advanced along a rectilinear portion of the said guide path, at least one portion of the said surfaces also being adapted to present a good magnetic contact of the said type holders when the latter are advanced along magnetic guide surfaces along the printing line.

Further advantages and features of the invention will become more clearly apparent in the course of the following description, with reference to the accompanying drawings, which illustrate diagrammatically various manners of putting the invention into practice.

FIGURE 1 is a plan view of the main mechanical elements of a so-called "reciprocating-bar" printing mechanism.

FIGURE 2 is a view along a part of the mechanism indicated by the arrows **2**—**2** of FIGURE 1.

FIGURE 3 is a view in section along the line **3**—**3** of FIGURE 1.

FIGURE 4 illustrates a constructional variant of FIGURE 3, adapted to the use of type holders having three faces provided with types and three sliding faces.

FIGURE 5 is a fragmentary view of the main elements of a mechanism for driving and guiding type holders designed in accordance with the invention for a so-called "type-chain" printing mechanism and provided with independent type holders.

FIGURE 6 is a view in section along the line **6**—**6** of FIGURE 7.

FIGURE 7 is a view in section along the line **7**—**7** of FIGURE 6.

FIGURE 8 is a view in section along the line **8**—**8** of FIGURE 7.

FIGURE 9 is a view in section through the centre of a type holder advanced along a curved portion of a mechanism of the type illustrated in FIGURE 5, but adapted for advancing the type holders through a plane parallel to that of the printing sheet.

FIGURE 10 is a view through the guide path of the type holders along the printing line, in a mechanism designed in accordance with FIGURE 9.

FIGURE 11 is an external view of a type holder block for a mechanism designed in accordance with FIGURES 9 and 10.

FIGURE 12 is a view through a rocking guide path designed for a so-called "reciprocating-bar" printing mechanism of the type illustrated in FIGURES 1 and 2.

FIGURE 13 illustrates a magnetic guide adaptation for a chain-type (ribbon) mechanism.

FIGURES 1 and 2 illustrate the main elements of a so-called "reciprocating-bar" printing mechanism, in which the type bar consists of a stack of type holders **20** to **34** threaded on a spindle **43**. The said type holders have both high magnetic permeability and good resistance to friction. They are formed by moulding and sintering under pressure of a mixture containing mainly iron powder and an appropriate binder. A type holder block **25** is provided (FIGURE 3) with two faces **35** and **36** with types, and two friction surfaces **37** and **38** adapted to slide respectively on magnetic guide members **39** and **40** mechanically connected together by a nonmagnetic member **41**. The type holders (FIGURES 1, 2 and 3) are threaded on to a spindle **43** which extends through a hole **42** therein. In principle, this spindle is not absolutely necessary for maintaining the type holders in their guide path, but it is very useful for manipulating an assembly constituting a "type-bar." The magnetic guide members **39** and **40** are formed of soft iron or any appropriate alloy having sufficient magnetic permeability, but may also be made of an alloy having high magnetic remanence and appropriately magnetised to form magnets. The magnetic guide members **39** and **40** are magnetically connected (FIGURE 3) to the poles N and S of a permanent magnet **44** which supplies a sufficiently intense magnetic field to maintain the type holder blocks in their guide path. This magnetic field could equally well be provided by an electromagnet. In FIGURES 1 and 2, the spindle on which the type holders are mounted is disposed in slots **46** and **47** in the arms **50** and **51** of a bow, of which the bar **52** is adapted to slide in fixed guides **53** and **54**. The spindle is held fast on the arms of the bow by means of nuts **48** and **49**, but it is preferable for the type holders to be relatively free on the said spindle in order to be able to apply it completely satisfactorily, independently of one another, against the guide surfaces under the action of the magnetic field. One end of a connecting rod **56** is pivotally connected to one end of an arm **55** fast with the bar **52** of the bow, the other end of the said connecting rod being pivotally connected to a pin **57** fast with an endless chain **58** which is stretched around two sprocket wheels **59** and **63** and guided in a guide path **60**. The wheel **59** is rotated by a motor **64** through gear wheels **61** and **62**. By this means, the bow is driven and drives the type bar with a reciprocating movement along the printing line past a paper sheet **66** and an inked ribbon **65**, behind which are disposed the hammers **71** to **90** of a striking mechanism **70**. For printing a line, it is sufficient in these mechanisms, as in endless-chain printing mechanisms, for a complete set of types to travel past the striking hammer of each printing position. In the mechanism of FIGURE 1, the pin **57** of the connecting rod **56** travels with a rectilinear uniform movement through a path IMP1 in one direction and then in the opposite direction, the type bar moving at the same time through a path IMP2 equal to IMP1 and corresponding at least to the length of a complete set of types on the "type bar." The "pitch" of the types on the "type bar" is not necessarily the same as the "pitch" of the hammers along the printing line. Various means of controlling the actuation of the said hammers from a memory, taking into account these differences, are known. The bow is provided with a synchronising bar **100** fast with the arm **55** and provided with synchronising marks which are adapted to be read photoelectrically, magnetically or in any other manner, by a fixed reader **101** whose indications are transmitted in known manner to the striking control devices for synchronising the actuation of the hammers with the displacement of the types past the striking mechanism. Between the printing of two lines, the pin **57** of the connecting rod **56** travels along a curved path, during which the paper is advanced to bring a succeeding line into position on the printing line. It is obvious that the movements of the printing bar along the printing line may be obtained by means other than those which have been described. Thus, there may be employed hydraulic means or the like, or even electromagnets, for a step-by-step advance of the character bar. In the above-described construction, it is sufficient to disengage the type holder spindle from the slots in the arms of the bow and to return it gradually by pivoting it through 90° about its axis in order to bring the types moulded on the second face of the type holder into the printing position. FIGURE 4 shows a constructional variant comprising a guide path provided with magnetic guide surfaces **98** and **99** adapted to receive type holders **91** provided with types on three faces **95**, **96** and

97, separated from one another by sliding surfaces 92, 93 and 94, any one of which may be used, depending upon which face of the type holder is in the operative position on the printing line. In the case illustrated in FIGURE 4, the magnetic guide surfaces are at an angle of 60° to one another, the face 99 affording to the type holders a direct support in opposition to the action of the striking hammers 69.

FIGURE 12 relates to another constructional form of a guide path, by means of which either one of two sets of types may be very rapidly brought into the printing position simply by rocking the guide path. In this arrangement, type holders 106 are mounted on a spindle 111 to form a type bar similar to that illustrated in FIGURES 1, 2 and 3, but with a different distribution of the types on the type holders. The guide path comprises two magnetic guide member 107 and 108 magnetically connected to the poles of a magnet 109 and connected together by a nonmagnetic member 110. This unit is so mounted as to be able to pivot through 90° about the axis of the spindle so as to pass from a position A to a position B or vice versa. The type bar is between the arms of a bow whose bar 105 slides in fixed guides, while the type holders are adapted to turn about the spindle. The magnetic attractive force exerted on the type holders is in principle sufficient to retain the said type holder in their guide path, when the latter is completely turned over, even in the absence of a spindle. It will be observed that in this arrangement, depending upon which set of types is brought into the printing position, the shocks exerted by striker hammers on type holders are taken up either by the magnetic guide member 107 or by the magnetic guide member 108.

FIGURES 5, 6, 7 and 8 show various arrangements which may be employed in a so-called "type-chain" printing mechanism, although in the described example the type holders are independent of one another.

In FIGURE 5, type holders 120, 121, 122 . . . 137, 138, 139 . . . are advanced in a continuous series through a guide path in a closed circuit, in a plane perpendicular to the plane of a paper sheet 115 engaged in the printing mechanism. The guide path is composed of a number of parts: a first part C along the printing line of the machine, in which the paper sheet 115 is engaged with an inked ribbon 116 in front of the striker hammers 141, 142, 143 . . . of the striking mechanism 140; a curved part D, in which the type holders are brought into and maintained in engagement with the teeth of a driving wheel 151 which is keyed on a driving shaft 152. The type holders are pushed by this wheel into a rectilinear guide path E which conducts them to a second curved part G in which they are in engagement with the teeth of a second toothed wheel 153 which is keyed on a driving shaft 154 coupled, with the shaft 152, to a driving mechanism not shown. FIGURE 7 shows a portion of the mechanism of FIGURE 5, in which the type holders 120, 121 . . . are each internally provided with teeth 160 and 161 adapted to mesh with teeth of either one of the toothed wheels 151 and 153 (FIGURE 5). FIGURE 6 shows a type holder 122 engaged in the part C of the guide path and in contact with a magnetic guide member 162 and a magnetic guide member 163, which, in combination with a nonmagnetic guide member 164, guide the type holders along the printing line. The guide surfaces in contact with the type holders are at an angle of 90° to one another. The magnetic members 162 and 163 are respectively magnetically connected to the poles N and S of a magnet 165 through members 166 and 167 permeable to the magnetic field. Under the action of the magnetic field, the type holders permeable to the said magnetic field are applied against the guide members 162 and 163. In FIGURE 6, there are shown additional nonmagnetic plates 170 and 171 which protects the type holders from dust and do not guide the type holders, but would maintain them in the guide path in the absence of a magnetic field if the permanent magnet 165 were replaced by an electromagnet which was not continuously energised. For replacing the type holders, the upper plate 171 is removed and the magnet 165 shunted by a permeable plate 169 arranged to reduce temporarily the magnetic attraction on the type holders. The type holders are provided in FIGURES 6 and 7, with friction surfaces adapted to guide the said type holders in the rectilinear portions of the guide path and with surfaces adapted to effect this guiding in the curved portions. Surfaces 174A and 174B, 175A and 175B rub against the rectilinear guide member 162 and establish magnetic contact with this member. The lower face 176 of the type holder rubs against the magnetic guide member 163 and against the member 164. Guide surfaces 172 and 173 (FIGURES 6, 7 and 8) participate in the guiding of the type holders in the rectilinear portion E of the guide path in which there is no magnetic action, but serve no practical purpose in the portion C extending along the printing line. The type holders are driven in the curved portions by the teeth of the wheels, but transmit one to the other a thrust in the rectilinear portions through plane surfaces 178 and 179. In the portion C of the guide path, along the printing line, the magnetic adhesion of the type holders on the magnetic guide surfaces exerts on the latter a braking action which contributes to the stabilisation of the spacing between the characters printed on a line. In the curved portions of the guide path, the type holders are guided (FIGURES 7 and 8) between two half-shells 185 and 186 made of a nonmagnetic material. The type holders are each provided with inner friction surfaces 180 and 181 adapted to slide on guide surfaces 190 and 191 and are provided with outer friction surfaces 182A, 182B and 183A, 183B adapted to slide on guide surfaces 192 and 193 (FIGURES 7 and 8). In order to simplify the references employed to denote various parts of the type holders, the same references are used to denote like parts on different type holders. In accordance with the foregoing, the type holders are provided with friction surfaces especially adapted for the various parts of the guide path, in order to minimise the wear on the said friction surfaces and to ensure long useful life of the mechanisms, in contradistinction to devices in which the type holders are only provided with rounded surfaces which serve both in the straight portions and in the curved portions of the guide path, but in fact bear only on a line in which the very rapid wear sets up play which is harmful to the good operation of the mechanisms. In FIGURE 5, the curved portion D of the guide path is separated from the portions C and E by a space H which is adjustable for varying the longitudinal gripping of the type holders in the rectilinear portions of the guide path.

FIGURES 9, 10 and 11 show various parts of a construction in which the type holders are advanced along a guide path situated in a plane parallel to the plane of the sheet which receives the impression in the printing mechanism of a machine.

In FIGURE 10, a type holder 197 is advanced along a guide path comprising magnetic guide members 196 and 198 connected respectively to the opposite poles of a magnet. A nonmagnetic cover plate 199 protects the type holders along the printing line. FIGURE 11 shows in detail, in front view, the type holder 197, which exhibits differences and analogies as compared with the type holders illustrated in FIGURES 5, 6, 7 and 8. Like the latter, it is provided (FIGURES 9, 10 and 11) with driving teeth 200 and 201 disposed at a pitch P adapted to the teeth of the driving wheels, the length of the type holder being substantially equal to 2P. This type holder is provided with plane sliding surfaces 202, 203A and 203B, 204A and 204B for guiding it in a rectilinear guide path of height K. The curved sliding surfaces 205, 206 and 207A, 207B are cylindrical surfaces having radii of curvature R and *r* respectively adapted to the curvature of the guide surfaces of a curved guide path (FIGURE

9) in which the type holders are driven by a toothed wheel **195**.

It is obvious that the features described have no limiting character and that some modifications and adaptations could be made in accordance with the cases and applications without departing from the invention. Thus, FIGURE 13 shows in section a very simple adaptation of a guide means with magnetic action for a chain-type printing mechanism in which the type holders **112** are fixed in known manner on a flexible ribbon advanced between two lateral guides **114A** and **114B** and maintained by magnetic attraction against a magnetised guide member **117**. With a support ribbon **113** consisting of metal of high magnetic permeability, the action of the magnet **117** is exerted directly upon the said ribbon, but the ribbon **113** may also consist of thin rolled bronze and the type holders may have sufficient magnetic permeability to close, at least partially, a magnetic circuit through the said ribbon **113**. In FIGURE 13, the letters N and S on the member **117** indicate that this member is magnetised in the vertical direction, so that the magnetic field which it produces is at least partially closed by the ribbon **113** or by the type holder, through the ribbon which is in both cases vigorously applied against the guide member **117** by magnetic attraction.

The member **117** may also be magnetised perpendicularly to the direction indicated in FIGURE 13, i.e., in the horizontal direction. In this case, the flux lines of the magnetic field extend through the ribbon and the type holders are closed by the ambient air. The magnetic attraction thus exerted on the flexible ribbon and the type holders is less vigorous than in the preceding case, but may be very sufficient, depending upon the circumstances. Likewise, there could be retained in the guide path independent type holders having sufficient magnetic permeability.

I claim:

1. In a printing mechanism comprising a plurality of type holders successively advanced along a guide path, past a row of striker hammers adapted to be selectively actuated and disposed along a printing line for the printing of characters on a printing medium disposed between the type holders and said striker hammers, the combination comprising: said plurality of type holders which are made of a magnetic material, and holder guide means which include two magnetic guide members fixed along said printing line and magnetically coupled with at least a magnet member, said guide members supplying two guide surfaces at an angle of substantially 90° to one another, the guide surface of one of said guide members being substantially perpendicular to said striker hammers and the guide surface of the other guide member being substantially parallel to said striker hammers whereby said type holders are magnetically applied against both said guide surfaces during their displacement.

2. A printing mechanism according to claim **1**, wherein separate type holders are successively advanced under the action of one or more toothed wheels in a guide path in a closed circuit comprising curved portions and rectilinear portions, of which at least one extends past a row of striker hammers along said printing line.

3. A printing mechanism according to claim **1**, wherein separate type holders are successively advanced in a rectilinear guide path and actuated with a reciprocating rectilinear translational movement by a driving mechanism, past a row of striker hammers arranged along said printing line.

4. A printing mechanism according to claim **3**, wherein each of said type holders comprises two perpendicular faces, each provided with one or more types and with two perpendicular sliding faces for the sliding of the type holders in said guide path, the latter being disposed in the guide path to present the types of one or the other of the faces provided with types, along said printing line.

5. A printing mechanism according to claim **4**, wherein each type holder is formed with an axial hole and wherein a spindle extends through all the type holders disposed in the guide path, the said spindle enabling all of the type holders to be positioned in the guide path or to be withdrawn therefrom in order to change the type holder face which the type holders present on said printing line.

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WILIAM B. PENN, *Primary Examiner.*

U.S. Cl. X.R.

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