April 18, 1967 C. R. M. MARTIN 3,314,359

ACTUATING MECHANISM FOR PRINTING HAMMERS

Filed June 21, 1965 4 Sheets-Sheet 1

FIG.1

FIG. 1.B	FIG. 1.A

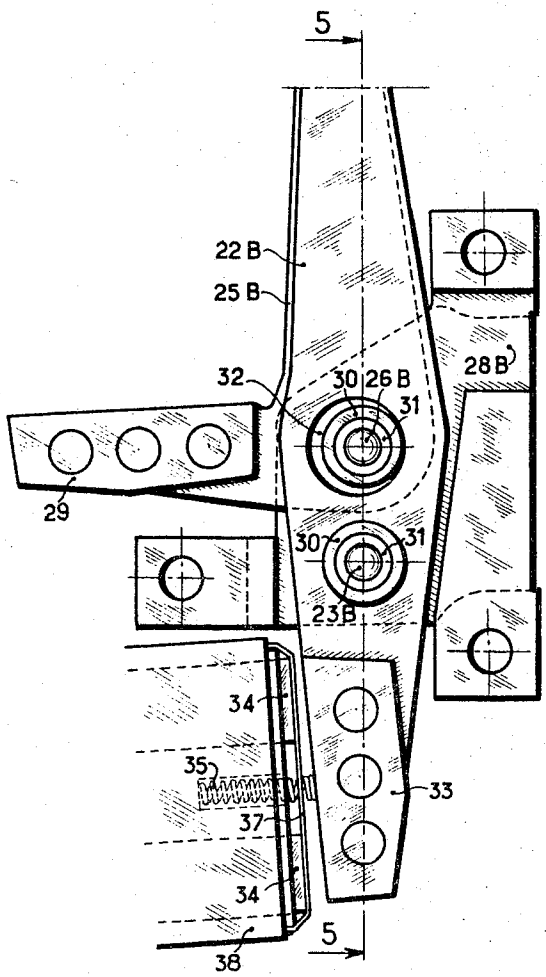


FIG.4

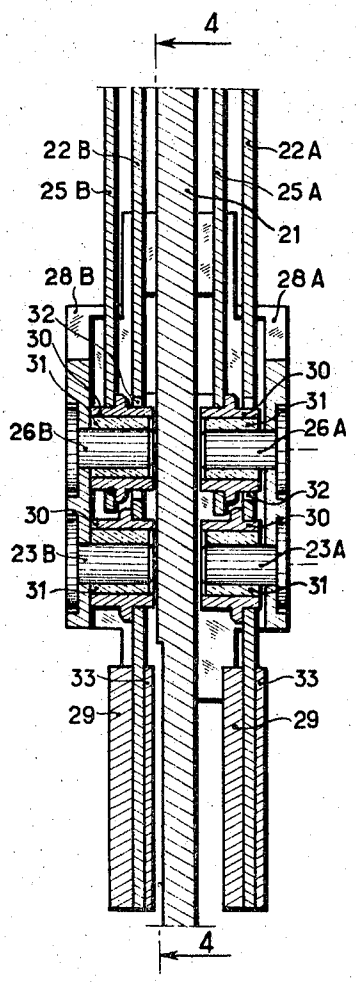


FIG.5

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April 18, 1967 C. R. M. MARTIN 3,314,359

ACTUATING MECHANISM FOR PRINTING HAMMERS

Filed June 21, 1965 4 Sheets-Sheet 2

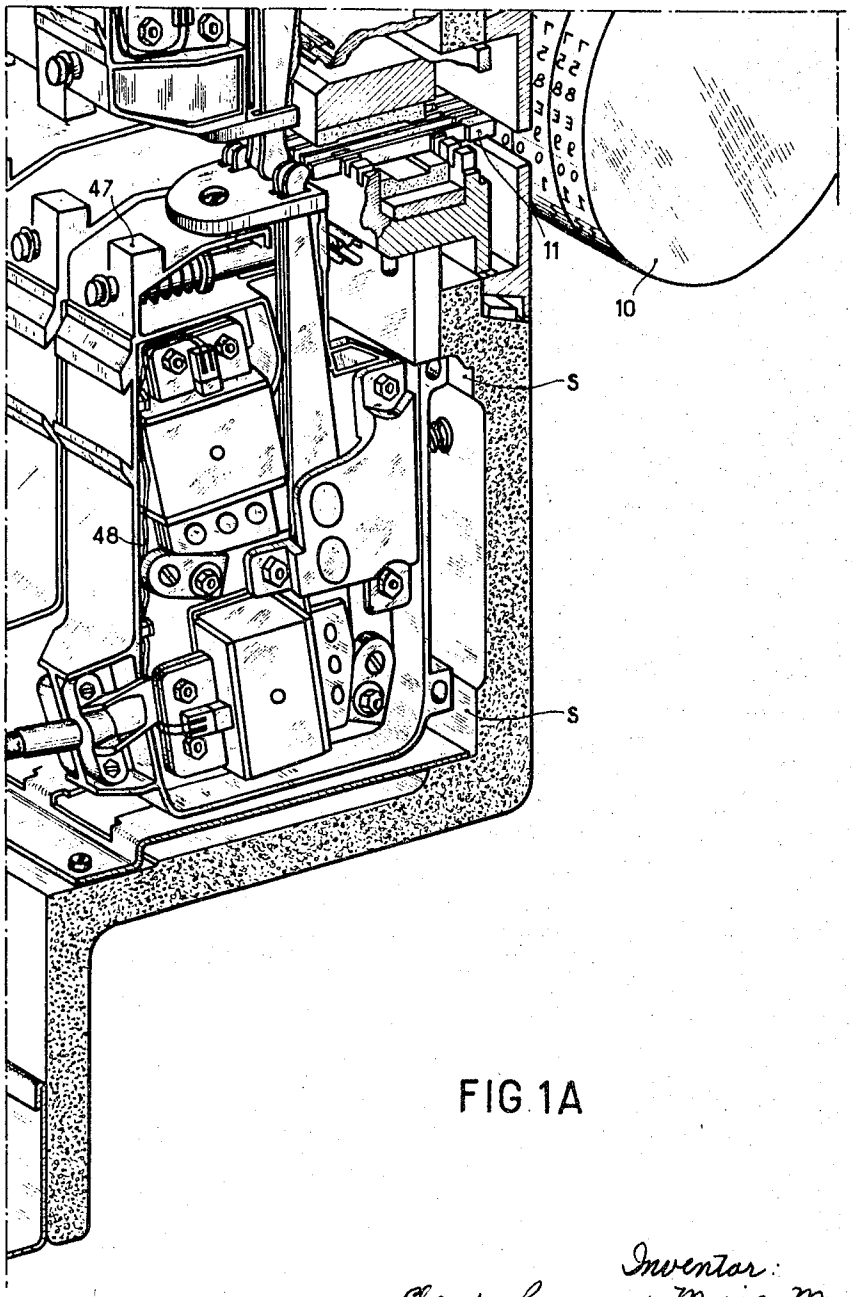


FIG. 1A

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April 18, 1967 C. R. M. MARTIN 3,314,359

ACTUATING MECHANISM FOR PRINTING HAMMERS

Filed June 21, 1965 4 Sheets-Sheet 3

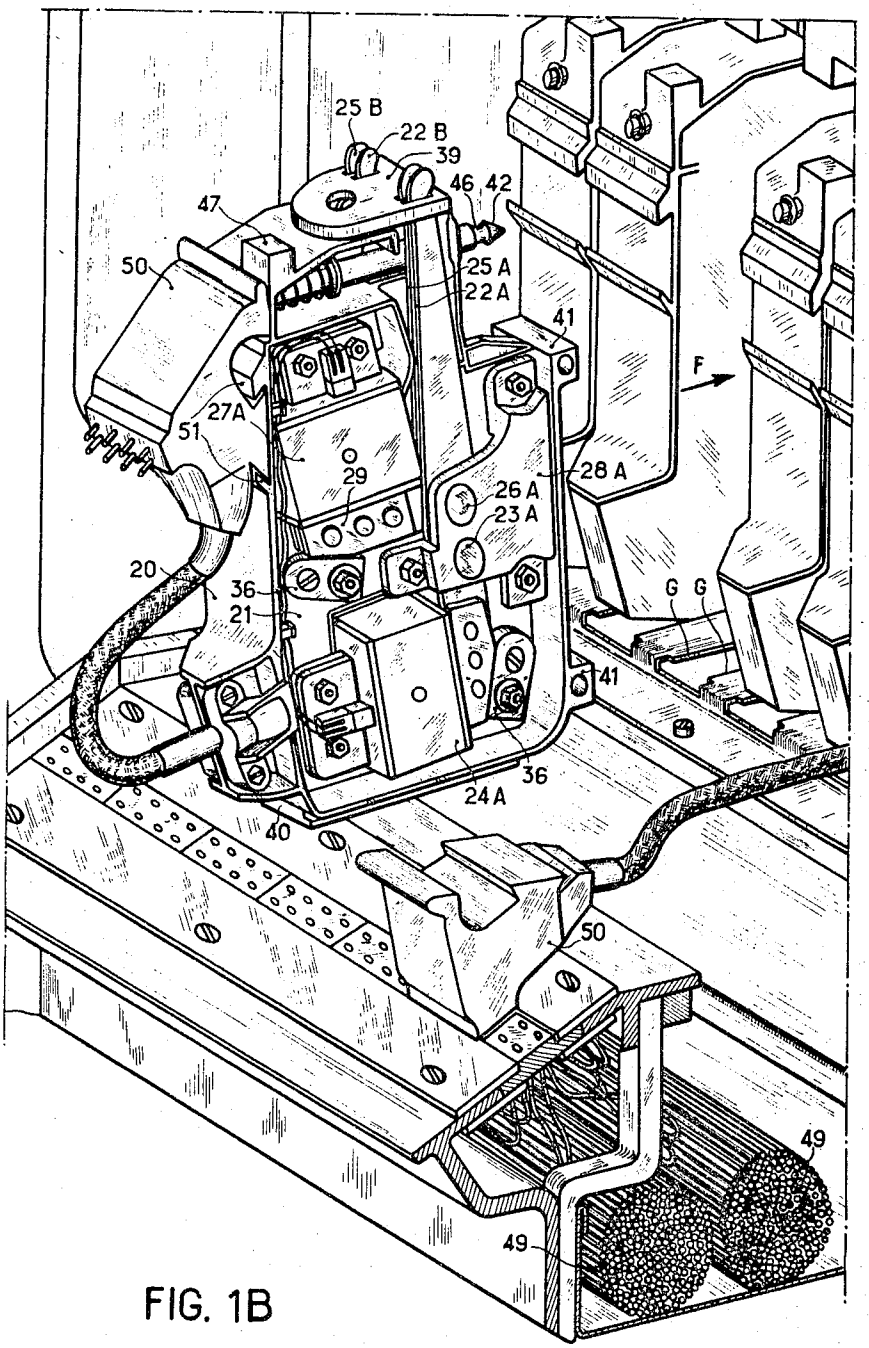


FIG. 1B

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April 18, 1967 C. R. M. MARTIN 3,314,359

ACTUATING MECHANISM FOR PRINTING HAMMERS

Filed June 21, 1965 4 Sheets-Sheet 4

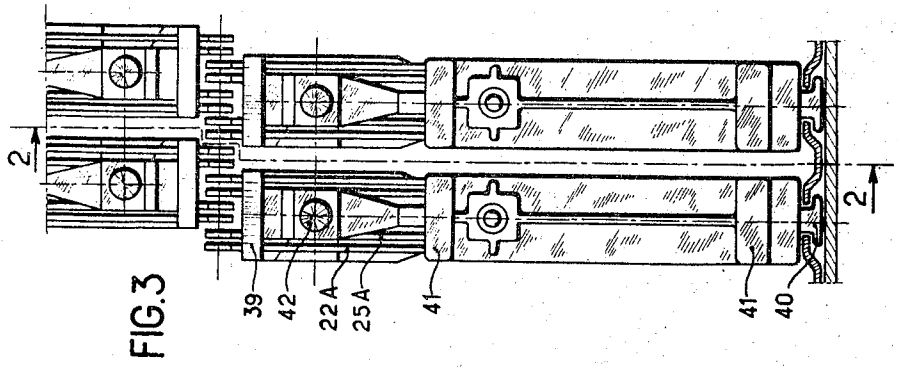


FIG.3

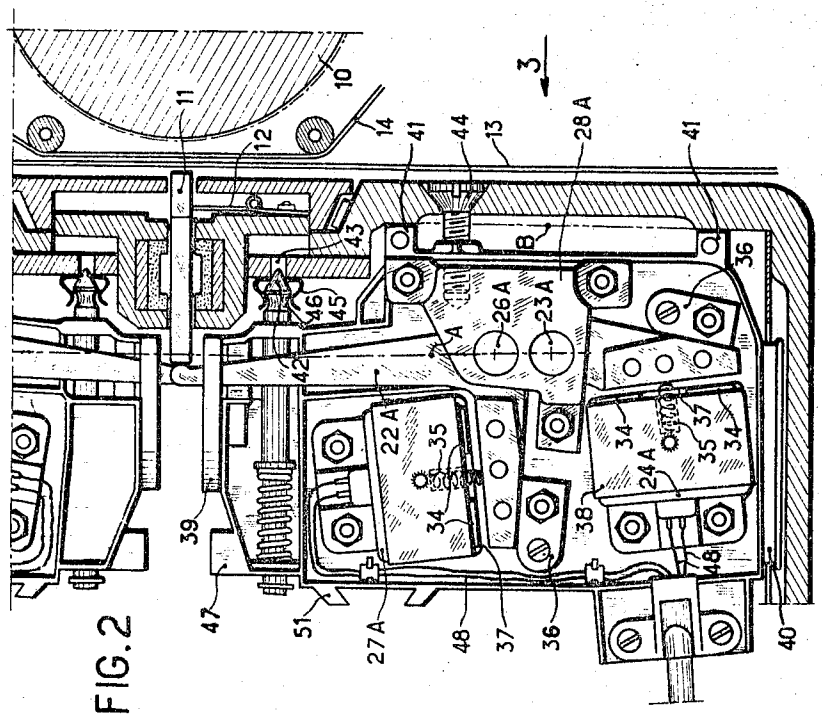


FIG.2

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United States Patent Office

3,314,359

Patented Apr. 18, 1967

3,314,359

ACTUATING MECHANISM FOR PRINTING HAMMERS

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Filed June 21, 1965, Ser. No. 465,567
Claims priority, application France, July 10, 1964, 981,399
1 Claim. (Cl. 101—93)

ABSTRACT OF THE DISCLOSURE

An electro-mechanical module for actuating the striker hammers of a type drum printing machine is provided with positioning and centering means which afford the advantage that it can be rapidly and accurately positioned in the machine, or replaced by another one when it is worn.

The present invention relates to improvements in high-speed printing machines and more particularly in the electromechanical devices intended for the actuation of the striker hammers.

High-speed printing machines generally comprise a printing device consisting of a printing drum bearing characters in relief on its periphery and continuously rotating at a relatively high speed, of the order of several hundreds of revolutions per minute. The characters are disposed in circular columns on the periphery of the drum and each column contains, regularly spaced apart, all the characters of a complete series which may have to be printed.

A row of striker hammers, comprising one hammer per column, is disposed along the drum, in parallel relationship to the axis of the latter, along a so-called printing line. A printing support (paper in sheet or web form) is moved past this printing line, between the hammers and the periphery of the drum, so that the characters on the drum then travel past the paper sheet to be printed on. The actuation of a hammer at the instant when a character of the corresponding column reaches the printing line has the effect of applying the paper to the said character and thus causes the latter to be printed on the paper. Generally speaking, the inking is effected by an interposed ribbon or carbon paper. It is also possible to ink the drum.

In high-speed printing machines, correct alignment of the characters printed on the paper requires absolute synchronism between the rotational movement of the drum and the movement of the striker hammers, in order that the latter may apply the paper to the drum at the precise instant when the characters chosen arrive opposite the printing line. The required precision is higher in proportion as the drum rotates at a higher speed. This result has been successfully achieved, on the one hand by limiting to a small value the length of the travel of the hammers, and on the other hand by using hammers of relatively small mass which, since they are in contact with an electromechanical actuating device when they are in the inoperative position, travel with an accelerated rectilinear movement under the action of the said actuating device, reach the paper and the drum as a result of the acquired speed, return rapidly to their inoperative position under the rebound effect and are maintained in this position by means of a spring.

In addition, owing to the fact that the paper remains stationary at the time of the printing, while the drum rotates rapidly, it is necessary that the time for which the hammer applies the paper to the drum should be as

short as possible in order to ensure complete clarity of the printing. In order to achieve this result, a powerful mechanical impulse is required, which is capable of projecting the hammer towards the paper at a sufficient speed. This impulse, which is imparted by the electromechanical actuating device, must be applied for a very short time, owing to the short length of travel of the hammer. Since the electromechanical device can have only a limited movement, owing to the fact that the hammer travels only a short distance, it is necessary to employ electromagnets of relatively large dimensions in order to obtain impulses of appropriate strength.

In known printing machines which are capable of printing up to 8 to 10 characters per inch on one line, it is relatively difficult to dispose the electromagnets correctly by reason of their size and the small amount of space remaining available owing to the small spacing existing between the hammers. For this purpose, it is known to dispose the electromagnets on either side of the printing line, along a section of a helix, each electromagnet being connected to a corresponding hammer by flexible wires, bars, rods or levers. This arrangement is of complex construction and costly, requires delicate adjustments during the assembly of the parts and their positioning in the machine, and needs frequent maintenance.

The present invention has for its object to obviate the defects of the prior art, by providing an electromechanical device for actuating the striker hammers, which is particularly characterised by great robustness, by virtue of which it has high resistance to wear and can have operating characteristics which remain substantially unchanged in the course of time. Moreover, owing to particular means ensuring its correct positioning within the machine, the said device affords the advantage that it can be rapidly positioned in the machine by any person even without specialised training. Finally, there is provided in this device a self-lubricating pivotal connection which obviates all maintenance and which does not present the dangers of breakage of a joint consisting of a member of which the deformation is utilised.

The present invention concerns, in a printing machine comprising on the one hand a printing device comprising a character drum and striker hammers mounted in a frame, and on the other hand a series of actuating mechanisms grouped in modules, and in which each striker hammer receives a mechanical impulse supplied by an actuating mechanism consisting of a lever actuated by means of an electromagnet, a module characterised in that it consists of a frame comprising a rigid partition which serves as a support for two groups of actuating mechanisms disposed symmetrically on either side of the said partition, each group of mechanisms consisting of two separate mechanisms, of which one comprises a straight lever pivotally mounted on a first pivot pin secured perpendicularly to the plane of the said partition, the said straight lever being actuated by means of a first electromagnet supported by the said partition, and of which the other comprises a lever bent at an angle of about 90° and pivotally mounted on a second pivot pin secured perpendicularly to the plane of the said partition and in parallel relationship to the first pivot pin, the said bent lever being actuated by means of a second electromagnet supported by the said partition, the said electromagnets being disposed substantially at 90° to one another, the said frame also being provided with positioning and securing means by which the said module can be readily and accurately positioned, and also secured, within the said machine.

Further features and advantages of the invention will become more clearly apparent in the course of the following description, given with reference to the accompanying drawings, in which:

FIGURES 1A and 1B are two views in perspective, and partly in section, which show the relative positions of the modules in the printing mechanism of a printing machine;

FIGURE 1 illustrates how FIGURES 1A and 1B should be assembled;

FIGURE 2 is a view partly in section through the printing device of a printing machine, along a line corresponding to the line **2**—**2** of FIGURE 3;

FIGURE 3 is a view, in the direction of arrow **3** of FIGURE 2, of a number of neighboring modules showing the relative positions which they occupy in the printing machine;

FIGURE 4 is a view along a line corresponding to the line **4**—**4** of FIGURE 5, which shows the positions of two levers in relation to their pivot pins, and

FIGURE 5 is a view in section along a line corresponding to the line **5**—**5** of FIGURE 4, showing how the four levers are mounted in a module.

Referring now to FIGURES 1A and 2, which show a part of a high-speed printing machine, partly in section, there will be seen a printing drum **10** bearing on its periphery characters in relief which are disposed in circular columns, each column containing, regularly spaced apart, all the characters of a series which may have to be printed. Associated with each column is a striker hammer **11**, so that the printing machine comprises as many striker hammers as there are character columns on the periphery of the drum. The striker hammers are disposed along the drum, in a row parallel to the axis of rotation of the drum. As may be seen from FIGURE 2, each hammer, when in the inoperative position, is maintained at a distance from the periphery of the drum by a spring **12**. Each hammer can move in a direction perpendicular to the axis of rotation of the drum to enable a paper sheet **13** (not shown in FIGURE 1A) to be applied to a chosen character in the column associated with the said hammer, whereby the said character is printed on the paper. FIGURE 2 shows that an inking ribbon **14** is disposed between the paper and the surface of the drum. The hammers are regularly spaced apart and their spacing varies from about two and a half millimeters to about three millimeters, depending upon the printing styles, so that from eight to ten characters can be printed per inch of line, depending upon the styles. In the inoperative position, each hammer is in contact, at its rear face, with an actuating device which will be described a little later. When the said device is actuated with the aid of means which will hereinafter be indicated, it propels the aforesaid hammer towards the paper. Owing to the speed reached, the hammer continues its movement and its rear face then ceases to be in contact with the actuating device. The hammer then strikes the paper by its forward face, rebounds and returns to the inoperative position, in which it is finally maintained by means of its spring.

According to the invention, the hammer actuating devices are so grouped as to constitute a number of units, called modules, each module being capable of being positioned in the printing machine and replaced by another one when it is worn, so that it is unnecessary to change all the actuating devices when some of them are considered defective.

FIGURES 1A and 1B, when assembled, show a series of identical modules, some of which have been diagrammatically illustrated and which have been positioned in a printing machine to show the manner in which these modules are disposed in relation to one another. One of the said modules has been shown in the withdrawn position in FIGURE 1B in order that the details of its construction may be more readily seen.

According to the invention, four electromechanical devices each consisting of a lever pivotally mounted on a pin and actuated by an electromagnet are combined in a module. Referring to FIGURE 1B, it will be seen

that a module designed in accordance with the invention comprises a rigid frame **20** of appropriate moulded material, such as metal or plastic, the mass of which is sufficient to damp substantially the vibrations produced by the shocks inherent in the operation. The frame is of such form that its interior constitutes mainly a rigid partition **21** which extends substantially through the plane of symmetry of the said module. Two groups of actuating mechanisms are symmetrically disposed on either side of the said partition. One of the said groups, which can be seen in FIGURE 1B, comprises a straight lever **22A** mounted on a pivot pin **23A** and adapted to be actuated by means of an electromagnet **24A**, and a bent lever **25A** mounted on another pivot pin **26A** and adapted to be actuated by means of another electromagnet **27A**. The electromagnets **24A** and **27A** are fixedly mounted on one face of the partition **21**, while the two pins **23A** and **26A** are connected to a support **28A** forming a bridge, which is in turn secured to the said face of the partition **21**. Each lever is flat and is terminated at one of its ends by a rounded portion intended to be brought into contact with the rear face of a hammer. The other end is provided with a member **29** which forms part of an armature intended to close the magnetic circuit of the electromagnet for the actuation of the said lever. A second group of mechanisms, similar to the preceding one, is secured to the other face of the partition **21**. This second group also comprises a straight lever **22B** and a bent lever **25B**, of which only the rounded portions can be seen in FIGURE 1B.

FIG. 5 shows how the four levers of one module are disposed in relation to the partition of the frame. It should be noted here that, in order to facilitate the understanding of the description, like parts have been denoted by the same references in the various figures. Thus, in FIGURE 5, there will be seen the support **28A**, the levers **22A** and **25A** and the pivot pins **23A** and **26A** of FIGURE 1B, all these parts being disposed on the same face of the partition **21** and being partially shown, in FIGURE 5, in section along a plane extending through the pivot pins of the levers. FIGURE 5 shows that, on the other face of the partition **21**, two pivot pins **23B** and **26B** serve for the pivotal connection of the levers **22B** and **25B** respectively, these pins being connected to a support **28B** forming a bridge, which is in turn secured to the said other face of the partition **21**. Except for the levers, the parts whose references terminate in the letter A are symmetrically disposed, about the partition **21**, with respect to the parts whose reference terminates in the letter B. On the other hand, the levers are mounted on their pins in such manner that one straight lever belonging to one of the groups of mechanisms and one bent lever belonging to the other group are disposed symmetrically about the partition **21**. This arrangement, which has been adopted for the purpose of facilitating the assembly and reducing the diversity of the parts manufactured, makes it possible to reduce the cost of production of a module.

FIGURE 4 is a view along a line corresponding to the line **4**—**4** of FIGURE 5, showing the relative positions of the levers **22B** and **25B** and of their pivot pins **23B** and **26B**. Referring now to FIGURES 4 and 5, it will be seen that each of the levers is provided with a bearing surface **30** which enables it to be mounted on its pivot pin. This bearing surface extends entirely over that portion of the pin which is situated between the partition **21** and the internal face of the support connected to the said pin and its ends are machined to permit axial guiding of the lever on its pins. Each bearing surface is internally lined with a self-lubricating ring **31** of appropriate material, for example oil-impregnated sintered iron which ensures lifelong lubrication of each lever on its pin and thus considerably reduces the maintenance of the printing machine. FIGURES 4 and 5 further show that each of the straight levers **22A**

and 22B is formed with a circular hole 32 to permit the passage of the bearing surface of the bent lever whose pivot pin is secured to the same support as the pin of the said straight lever. The diameter of the said hole is so adjusted that the said straight lever can pivot about its pin without being impeded, between two predetermined operating limits. Thus, since each lever possesses its own pivot pin, the pivoting of each lever about its pin between these two limits can take place without producing any mechanical interaction on another lever. Moreover, the presence of the hole 32 makes available to each lever a great length of pin, which not only ensures greater robustness of the lever, but also further improves its resistance to wear. FIGURE 4 shows that the length of each bearing surface is greater than the distance between two like faces of two neighbouring levers and is slightly less than twice this distance.

FIGURES 4 and 5 further show that the armature secured to the end of each lever comprises not only the member 29, but also the web of the lever and another member 33, the members 29 and 33 being disposed on either side of each lever. It will further be noted that the members 29 and 33 have different thicknesses and that they are differently disposed, depending upon whether the lever on which they are mounted is close to or distant from the partition 21. This arrangement enables the corresponding actuating electromagnet to be offset in relation to the web of the lever. Owing to this offset, the electromagnets which are secured to the same face of the partition 21 are situated substantially in a common plane and are so positioned that, when the module of which they form part is positioned in or extracted from the machine, they are not likely to strike against any of the members of a neighbouring module. Consequently, the modules need not be engaged one within the other when they are positioned in the machine.

Referring now to FIGURES 2 and 4, it will be noted that each lever can take either one of the following two states by pivoting about its pin between its two limits. In a first state, the armature of each lever, attracted by the corresponding electromagnet, comes into contact with the pole pieces 34 of the said electromagnet. In a second state, or inoperative state, the armature is removed from the pole pieces 34 under the action of a return spring 35 disposed between these pole pieces and then comes into contact with a rest abutment 36. Referring to FIGURE 2, which shows the levers in the inoperative state, it is also to be noted that the pivot pins of the levers are preferably situated in a plane perpendicular to the direction of movement of the hammers and extending through the mean position of the path of the point of contact of a lever with its hammer, and under these conditions the friction between the said lever and the said hammer is minimised. In FIGURE 2, this plane is represented by a dash-dotted line bearing the reference letter A. By the aforesaid arrangement of the pivot pins, rapid wear on the levers and the hammers is thus avoided.

It is also to be noted that, in order to enable the mechanisms of a module to retain substantially constant operating characteristics in the course of time, the pole pieces 34 of each electromagnet are coated with an anti-remanence element 37 (also shown in FIGURE 4), which consists of a strip of non-magnetic material. For this purpose there may with advantage be employed a flexible plastic material known under the trade name "Mylar."

It will further be noted from FIGURE 2 that, owing to the fact that a straight lever and a bent lever belonging to the same group of mechanisms each possess a separate pivot pin, the lever arms of these levers are different. In order that the operating time may be the same for these two levers, it is necessary that the rest abutments 36 of each of the levers be correctly and carefully adjusted and that their adjustment should not change with time. For this purpose, it is proposed to make the rest abutments of a material of high mechanical strength which, in addition, affords sufficient stability and hardness to satisfy the necessary conditions. By way of example, a plastic material such as an acetal resin known under the trade name "Delrin" may be employed.

FIGURES 1A, 1B and 2 show that the two electromagnets for the actuation of the levers of one mechanism, such as the electromagnets 24A and 27A, for example, are disposed substantially at 90° to one another and in a common plane. The winding and the magnetic circuit of each electromagnet are so designed that magnetic saturation is reached even with an open air gap, so that the influence of the fluctuations of the control voltage and of the electrical resistance of the winding of each electromagnet on the response time of those electromagnets can be reduced. In addition, in order to avoid disturbing effects due to magnetic flux leakages, each electromagnet is covered with a magnetic shielding 38, which may also be seen in FIGURE 4.

FIGURES 1A, 1B and 2 furthermore show that each module is provided with a guide comb 39 which serves as a guide for each of the levers of this module, so as to ensure correct positioning of each of them in relation to the hammer which it is to actuate.

FIGURE 3 is a view in the direction 3 of FIGURE 2, but illustrating only the modules, and showing the relative position occupied by the latter in the printing machine. FIGURE 3 shows that, in each module, the levers are so positioned that two levers constituting one of the two groups of mechanisms of a module are separated from the two levers of the other group of mechanisms of this same module by a space which is sufficiently large to receive two levers of a group of mechanisms of another module, these two modules being staggered in relation to one another and disposed on either side of the printing line, while the points of contact of the various levers with their respective hammers are disposed substantially on a common line. In this way, each module has one of its two groups of levers disposed between two groups of levers belonging to an opposed module, and the other group of levers disposed between two groups of levers belonging to two contiguous modules and opposed to the aforesaid module. It is possible by means of this arrangement to give the partition 21 of each module a relatively great thickness, which assists in further increasing the rigidity of a module and thus makes it possible to obtain high stability of the adjustments of the mechanisms of a module, regardless of the number of times that they are positioned in and extracted from the machine.

It will also be seen from FIGURE 3 that all the component parts of each module are so disposed as to form a flat unit, the overall thickness of which is substantially equal to seven times the distance between two like faces of two neighboring levers. The modules may therefore be disposed in the machine as indicated in FIGURE 1A and extracted without any of their parts touching the parts of the neighboring modules. This feature renders possible the positioning or extraction of a module without any necessity for touching the other modules.

Referring now to FIGURES 1A, 1B, 2 and 3, it will be seen that the frame 20 of each module is provided in its lower part with an engagement and orientation member 40 consisting, for example, of a tongue which serves for orienting this module when it is positioned in the machine. The said tongue is adapted to engage between two slideways G of the machine as shown in FIGURE 1B. In addition, the frame of each module comprises on its forward face two positioning studs or bosses 41 which serve to position this module perfectly in the machine, so that the point of contact of each of the levers of the said module with a corresponding hammer is exactly situated, when in the inoperative position, at a predetermined appropriate distance from the surface of the drum for obtaining a correct impression. When a module is

thus positioned in the machine, its positioning bosses **41** bear against two perfectly plane bearing surfaces S machined in the frame of the machine, as shown in FIGURES 1A and 2. These two perfectly trued bearing surfaces define a plane, called the reference plane and represented in FIGURE 2 by a dash-dotted line bearing the reference B, against which the positioning bosses bear in order to position the module appropriately. Each module is thus positioned in the machine in relation to the said plane. In addition, each module is provided with a spring-loaded centering point **42** situated as close as possible to the point of contact of the levers and of the hammers and co-operating with the engagement and orientation member **40** so as to ensure, by means of its conical tip, the correct positioning of the module in the said plane, so that the ends of the levers of this module, which are in contact with the hammers, are situated exactly opposite to the hammers which they are to actuate. It will be noted from FIGURE 2 that, in order to enable a module to be accurately centered by means of its centering point **42**, the printing machine is provided with a centering hole **43** in which there engages the conical tip of the centering point, and which is so disposed as to ensure correct positioning of the module in relation to the frame of the machine. FIGURE 2 further shows that the attachment of a module in the machine is effected by means of a single securing screw **44** situated between the two positioning bosses **41** and accessible from the forward face of the machine when the paper sheet **13** has been withdrawn. It will further be noted that the centering hole **43** is completed by a retaining device which, in the described example, consists of a resilient clip **45** engaging in a groove **46** in the centering point. The said retaining device is intended to prevent the module from falling when the screw **44** is withdrawn in the positioning of the said module in the machine or its extraction therefrom. In order that one of the modules disposed in the machine may be extracted, it is necessary to exert a sufficient grip, especially as the resilient clip **45** engaged in the groove **46** in the centering point exerts a strong retaining action on the said module. In order to facilitate the extraction, engagement means are provided at the rear of the module and close to the axis of the centering point. For this purpose, a projection **47** may be provided on the frame **20** of the module, close to the axis of the point **42**, which projection may be engaged by any appropriate means, such as a hook, for example, in order to effect the extraction. FIGURES 1A, 1B and 2 further show that the electromagnets of a module are electrically fed by means of conductors **48** which may be connected to current supply cables **49** by means of a connecting plug **50**. There is provided at the rear of each module a securing device **51** which has the object of maintaining each connecting plug assembled with the corresponding module and which thus prevents it from hanging down when the said module is withdrawn from the machine. The said securing device **51** may be of the mortise type as shown in the accompanying figures, and may then be employed, not only to secure the said connecting plug, but also, when a module is positioned in the machine, to engage any suitable means for extracting the said module from the machine.

A module similar to that just described may be readily and rapidly positioned in the machine by any, even unskilled, person adopting the following procedure. When the connecting plug is disengaged from its securing device, the orientation tongue **40** of the module is then engaged between two slideways G in the printing machine, and the module is then pushed towards the striker hammers, in the direction indicated by the arrow F in FIGURE 1B, so as to bring the centering point **42** as close as possible to the corresponding centering hole in the printing machine. The module is then advanced until the centering point comes into contact with the resilient clip **45** at the said centering hole. At this instant, pressure is exerted on the rear of the module until the said resilient clip engages in the groove **46** in the centering point and thus sufficiently maintains the module to enable it to be released without danger of falling. In this position, the module is positioned almost correctly in the machine and its positioning bosses **41** are then close to the bearing surfaces S of the frame of the machine. At the same time, owing to the fact that the module is transversely positioned by means of its centering point and its tongue guided by its slideways, the levers of the module are situated substantially opposite to their respective hammers. It is then sufficient, in order to effect the final positioning and attachment of the module, to screw in the securing screw **44**. In the course of this operation, the positioning bosses **41** bear against their bearing surfaces S, while the point **42**, which is already centered on its centering hole **43**, compresses its spring. At the same time, the points of contact of the levers and of the hammers move in the direction of the drum and are finally positioned at a predetermined distance from the surface of the drum which is considered appropriate for obtaining a correct striking.

In order to withdraw a module from the printing machine, the paper sheet **13** is first removed to obtain access to the screw **44** and to unscrew it. In the course of the unscrewing, the spring of the centering point partially expands, which has the effect of forcing the module to the rear and substantially removing the positioning bosses from their bearing surfaces. However, it will be noted that the resilient clip **45** remains engaged in the groove in the centering point, so that the module is retained both by its point and by its tongue and is not likely to fall. The module can then be extracted by exerting a simple pull on it and using the projection **47** or the securing device **51** to enable the module to be more readily disengaged from the resilient clip.

It will be noted that, owing to the fact that the modules are not engaged one within the other, the positioning or extraction of a module can be rapidly effected by an unskilled person without any necessity for any subsequent delicate readjustment.

It will also be noted that the positioning of a module in the machine or its extraction therefrom takes place from that side of the frame of the machine which is further from the paper. This feature ensures that the module is substantially completely protected from the penetration of paper dust. Moreover, it renders possible separate dismantling of the set of striker hammers without the modules having to be moved.

The characteristic features of the invention will be more clearly apparent from the following claim.

I claim:

In a printing machine which comprises on the one hand a printing device comprising a movable character support and striker hammers mounted in a frame, and on the other hand a series of hammer actuating mechanisms, an actuating module comprising:

a frame with a single rigid partition extending substantially through a plane of symmetry, the said frame comprising two plane positioning bosses trued to bear against two bearing surfaces of the printing machine to permit positioning of the said frame, perpendicularly to a reference plane defined by the said bearing surfaces,

a first set of hammer actuating mechanisms disposed on one of the two faces of the said partition and comprising a straight lever pivotally mounted on a first pivot pin secured perpendicularly to the said partition, a lever bent at an angle of about 90° and pivotally mounted on a second pivot pin secured perpendicularly to the said partition, each of the said levers consisting of a thin web assembly with a relatively long hub by which it is pivotally mounted on its respective pivot pin, the said straight lever being formed with an aperture for the passage of

one end of the hub of the bent lever to permit oscillatory motion of the said straight lever, each of the said levers having one of its two ends profiled to constitute a surface of contact with a corresponding striker hammer, the said first set of mechanism comprising in addition a first electromagnet secured to the said partition and having pole pieces opposite to the other end of the said straight lever to attract the said other end of the straight lever, when the said first electromagnet is energised, and a second electromagnet secured to the said partition and having pole pieces opposite to the other end of the said bent lever to attract the said other end of the bent lever when the second electromagnet is energised,

a second set of hammer actuating mechanisms similar to the first set of mechanisms and disposed on the other face of the said partition, and

a retractable centering point disposed close to the profiled ends of the levers and perpendicularly to a plane extending through the said positioning bosses so as to be engaged in a centering hole in the frame of the machine to enable the said levers to be positioned exactly opposite to the corresponding striker hammers.

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WILLIAM B. PENN, *Primary Examiner.*