United States Patent [19]

Galaske

[11] **3,770,094**

[45] **Nov. 6, 1973**

[54] **PRINTING APPARATUS UTILIZING MAGNETIC SELECTION OF TYPE LEVERS FROM A CONTINUOUSLY ROTATING MAGAZINE**

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[22] Filed: **May 27, 1969**

[21] Appl. No.: **828,176**

[30] **Foreign Application Priority Data**

July 4, 1968 Germany..... P 17 61 764.0

[52] **U.S. Cl.**..... **197/18,** 197/53

[51] **Int. Cl.**..... **B41j 23/38**

[58] **Field of Search** 197/18, 53; 128/34

[56] **References Cited**

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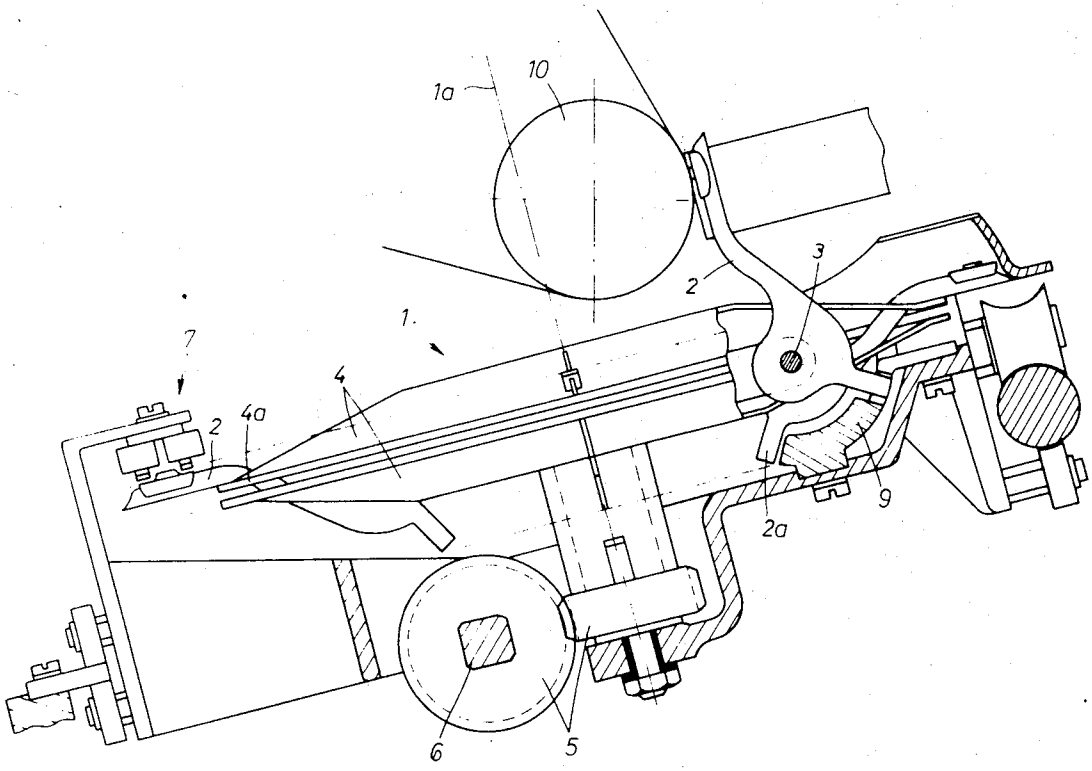
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[57] **ABSTRACT**

In a printing apparatus of the type having a continuously rotating type lever magazine, an arrangement is provided for effecting the contactless magnetic selection of individual type levers. Selection is accomplished by deflecting at a predetermined time the desired type lever out of its normal path of rotation into the printing track by means of an electromagnet positioned above the magazine. The pole surfaces of the electromagnet are inclined in the direction of rotation so as to impart to the selected type lever an inclined trajectory which, as a result of the continued rotation of the type lever assembly, carries the lever via free flight into the printing track.

6 Claims, 5 Drawing Figures

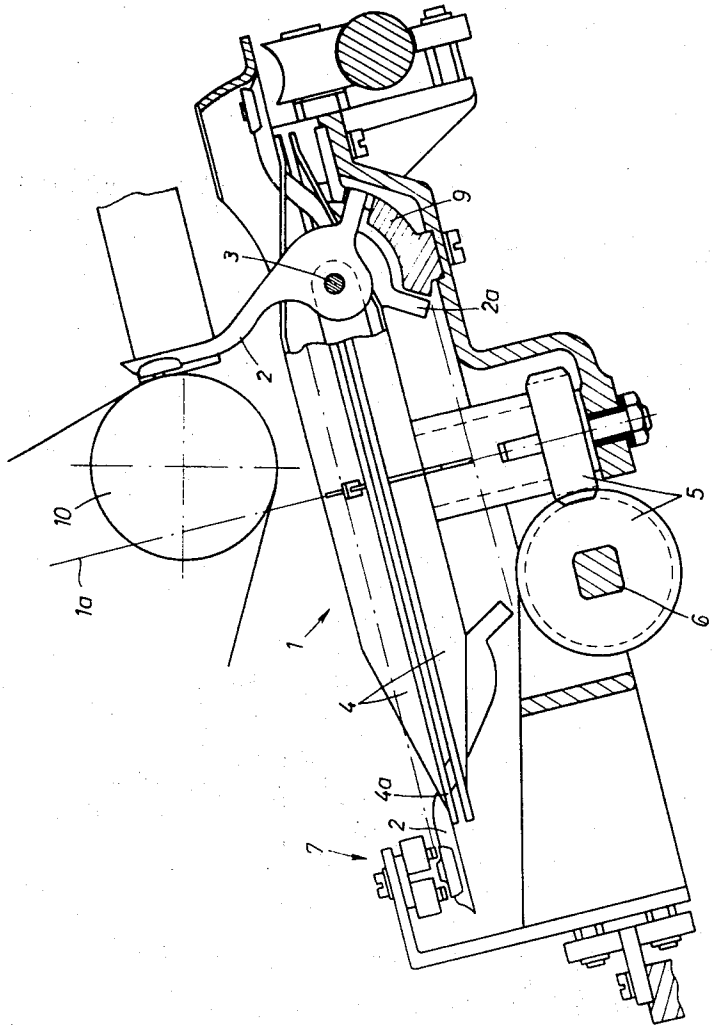


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SHEET 1 OF 3

Fig.1



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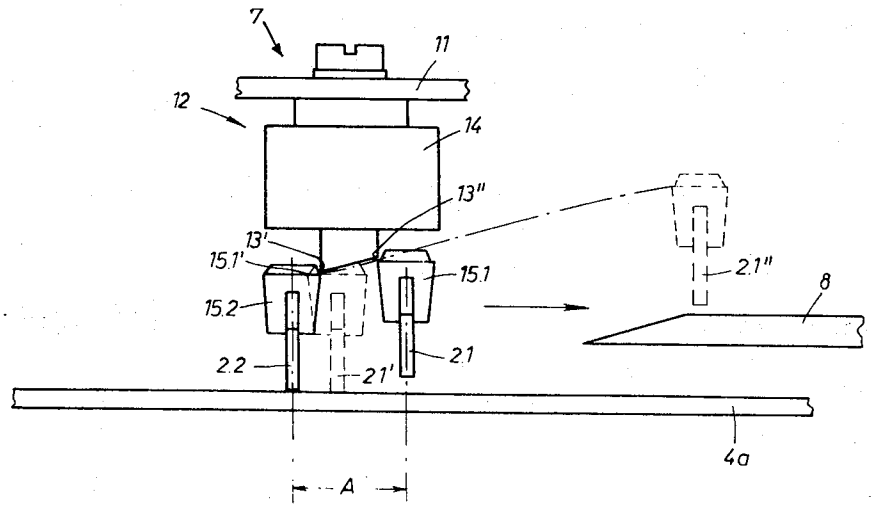


Fig.2

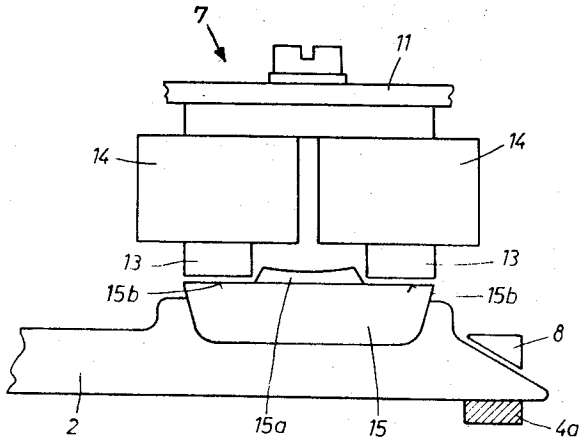


Fig.3

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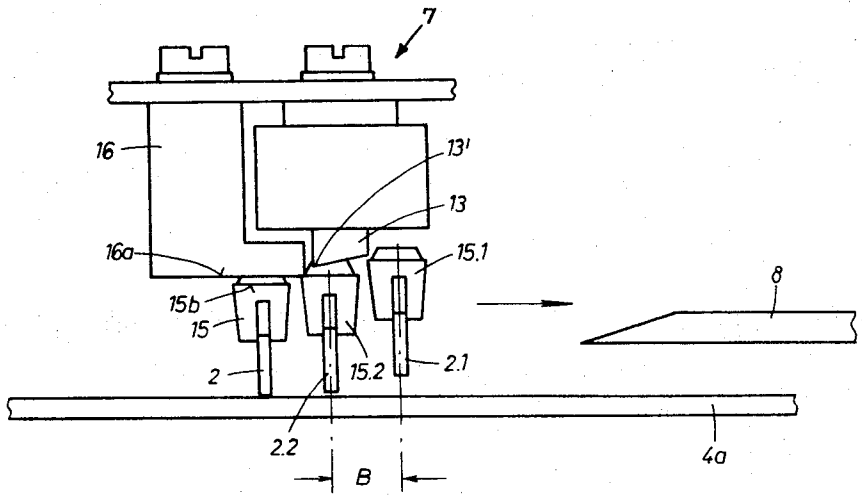


Fig.4

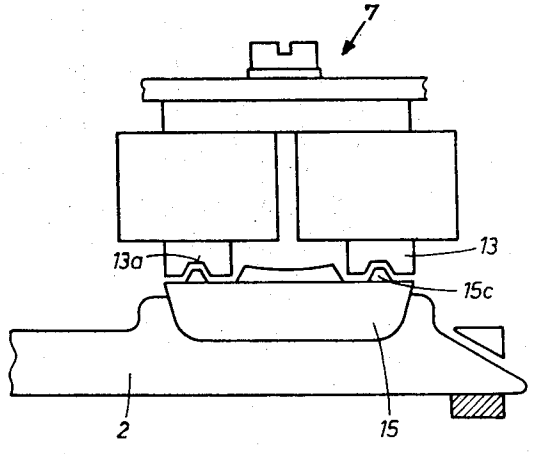


Fig.5

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PRINTING APPARATUS UTILIZING MAGNETIC SELECTION OF TYPE LEVERS FROM A CONTINUOUSLY ROTATING MAGAZINE

BACKGROUND OF THE INVENTION

The present invention relates to an arrangement for effecting the contactless magnetic selection of individual type levers from a plurality of same which, by being closely adjacent to one another, and in a continuously rotating rim-shaped magazine, are combined into one unit forming the printing unit of a serial printer, and in which the selected type levers are deflected out of the normal path of rotation into a path extending substantially parallel therewith, and leading to the striking of the platen (printing or characters).

Type lever selecting arrangements meeting the high demands placed on the printing mechanisms of the type mentioned hereinbefore, have already been proposed.

One of these arrangements, U. S. Pat. 3,420,349 issued Jan. 7, 1969, provides an optional magnetic marking of the free ends of transfer levers, which are in connection with the type levers, in the course of the rotation. Subsequently thereto, the thus marked ends enter a magnetic field within which they are distributed to the individual paths in accordance with their polarity.

According to another arrangement U. S. patent application of M. Fleischer, Ser. No. 801,688, filed Feb. 24, 1969, now abandoned, the selection is likewise effected magnetically. In this case a magnetic field moving along with the transfer lever to be deflected acts upon the free lever end so that it is deflected into the path leading to the printing.

Moreover, in my copending U.S. patent application, Ser. No. 812,636 filed Apr. 2, 1969, now U.S. Pat. No. 3,615,000 the selection is effected mechanically with the aid of a shooting magnet suddenly acting directly upon the free end of the respective type lever to be lifted, thus effecting its deflection into the path leading to the printing.

While the two first-mentioned arrangements require a relatively high technical expenditure, the type levers in the last mentioned and technically less expensive arrangement are subjected to a high mechanical stress which, from a production-technical point of view, requires unfavorable steps and measures and yet cannot prevent a certain wear.

SUMMARY OF THE INVENTION

In distinction thereto, the arrangement according to the present invention represents a solution which, in requiring minimum expenditure on technical means, provides a contactless, and consequently a wear-resistant, magnetic selection.

The invention is characterized in that the deflection of the rotating type levers is effected by an electromagnet which is stationarily arranged closely in front of the type bodies, with the time of energization of this electromagnet being each time restricted to the time of passage of the type lever to be deflected; that the type bodies are so designed that the magnetic circuit of the electromagnet is substantially completed via the type body forming part of the type lever to be deflected; and that the pole surfaces of the electromagnet are constructed in an inclined manner in the direction of rotation.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be explained in detail in conjunction with FIGS. 1 to 5 of the accompanying drawings, in which:

FIG. 1, in a partly sectional sideview, shows a printing mechanism in which the selecting arrangement according to the invention is suitable for being used;

FIG. 2, in a schematic representation, shows a selecting arrangement according to the invention in a front view;

FIG. 3 shows the arrangement according to FIG. 2 in a side view;

FIG. 4 shows a selecting arrangement according to that of FIG. 2. in a design suitable for closely following type levers; and

FIG. 5, is a sideview, shows a specific embodiment of the arrangement of FIGS. 2 and 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIG. 1 there is shown a printing mechanism of the type known per se, in which the selecting arrangement according to the invention is suitable for being used.

The printing unit 1 consists of a rim-shaped type lever magazine in which the type-levers 2 are supported on a common ring axle 3 arranged concentrically in relation to the center point through which the axis of rotation 1*a* passes, and are guided in the sideways direction in two plate-shaped slotted disks 4 which are arranged in a mirror-image manner with respet to one another. In the normal position the type levers 2 rest on the outer rim 4*a* of the upper slotted disk 4, thus assuming a substantially radial position in relation to the axis of rotation 1*a*. This position is secured during the rotation of the magazine by a slight bearing or contact pressure resulting from the centrifugal force acting upon the type levers.

The printing unit 1, designed in accordance with the foregoing, forms part of a carraige device capable of being displaced in the longitudinal line-of-print direction, parallel in relation to the platen 10. With the aid of a toothed wheel gearing 5, this printing unit 1 is continuously rotated via a stationary profiled shaft 6.

Staggered by approximately 180° with respect to the printing point, the selecting arrangement 7 according to the invention is arranged firmly connected to the carriage device.

By the selecting process still to be described in detail hereinafter, the respective type lever 2, as schematically illustrated in FIG. 2, is deflected out if its normal path of rotation and into a path lying thereabove, which is determined by a guide 8 (not shown in FIG. 1). In this deflected position, the selected type lever 2, with its projecting portion 2*a*, and in the course of the continued rotation of the magazine, enters the range of a printing cam 9 which is stationarily arranged on the carriage device, and which serves to accelerate the type lever 2 in such a way that it will hit the platen 10 at exactly the moment in which its printing movement extends perpendicularly in relation to the longitudinal axis of the platen 10. The type lever 2, rebouding after the striking operation, is engaged via its projecting portion 2*a* by a reset cam not shown and is returned to its normal path of rotation.

In FIGS. 2 and 3, the selecting arrangement according to the invention, as indicated in FIG. 1 by the reference numeral 7, is schematically shown. It consists substantially of an electromagnet 12 which is stationarily

mounted to a portion 11 of the printing unit frame above the rotating type levers 2. The magnet 12 consists of a U-shaped magnet yoke whose limbs 13 are each provided with an energization winding 4. The clear distance between the two limbs 13, according to FIG. 3, is at least equal to the maximum size of the type 15*a*, whereas the pole surfaces are constructed so as to be inclined in the direction of rotation and deflection.

The type bodies 15 mounted to the type levers 2 have a shape as shown in FIG. 3. In distinction to conventional embodiments, they are provided with planar extensions 15*b* above and below the actual type 15*a* which in shape and size are substantially consistent with the cross-section of the limbs 13.

In alignment with the longitudinal extension of the type bodies 15, the electromagnet 12 according to FIGS. 2 and 3 is arranged in such a way that the rearward edges 13' of the limbs 13 will come to stand closely above the planar surfaces 15*b* of the type bodies 15 rotating with their type levers 2. The adherence to this airgap is safeguarded by the aforementioned defined support of the type levers 2 on the margin of the slotted disk 4a.

The mode of operation of the selecting arrangement described hereinbefore, will now be explained in detail with refernece to FIG. 2. The arrangement merely differs from the arrangement according to FIG. 4 in that a greater spacing A is provided between two successive type levers 2.1 and 2.2 which has no influence upon the mode of operation. Thus the following embodiments, in principle, also apply to the example of FIG. 4.

For the sake of clarity, only two of the type levers 2.1 and 2.2, as assembled in the type magazine, are shown in FIG. 2 rotating in the direction as indicated by the arrow. The distance or spacing A between the type levers is such that the type head 15.2 of the respective following type lever 2.2 will only enter the range below the yoke limbs 13 after the type body 15.1 of the preceding type lever 2.1 has already left this particular range.

In this manner, and when providing a suitable time control with respect to the energization of the magnet 12, it is safeguarded that the magnetic circuit is substantially completed via the type body 15 of the respective type lever 2 to be deflected. This process is still advantageously influenced in that the type bodies 15 have a relatively large cross-section and generally consist of soft iron.

If, for example, type lever 2.1 of FIG. 2 is selected, intending that it perform the striking or printing, then the energization of the electromagnet 12, in accordance with the selection principle of the above-mentioned prior art selection control, of which I am co-inventor, is effected at a time position in which the type lever 2.1 is in the dash-lined position indicated by the reference numeral 2.1'. The magnetic field which is thus being built up, reaches its full intensity when the rear longitudinal edge 15.1' of the type body 15.1 of type lever 2.1, further rotating in the direction as indicated by the arrow, comes to stand behind the rear longitudinal edge 13' of the yoke limbs 13. Via the type bodies 15.1 now acting as magnet armatures, the type lever 2.1 is lifted upward in the course of its lateral movement. The inclined slope of the magnet's pole surfaces from the rear longitudinal edge 13' towards the front longitudinal edge 13'', in accordance with the lifting acceleration of the type lever effected by the magnetic field, is so designed that the type body 15.1 at no time will come into contact with the magnet pole surfaces. During the resulting flying deflection, the type lever 2.1 is accelerated to such an extent that it, upon departing from the range of the magnet's poles, will continue to move in free flight in an inclined direction. Owing to the simultaneous rotational movement of the magazine in the direction indicated by the arrow, the lifted type lever 2.1 will finally assume the dash-lined position indicated by the reference numeral 2.1'', and has in such a position reached the intended path of rotation as determined by the guide 8, and as a result of which the type lever 2.1, in the way described hereinbefore, effects the printing, i.e. the striking of the platen.

The energization of the electromaget 12 is each time discontinued when the type body 15.1 of the deflected type lever 2.1 leaves the range of influence of the magnet's poles; in other words, when the rear edge 15.1' of the type body 15.1 escapes the front longitudinal edges 13' of the yoke limbs 13. At this particular time position the succedding type lever 2.2 is in the position as shown in FIG. 2, and from which there is no effective influence by the decaying magnetic field upon the type body 15.2. Thus the latter type lever continues to remain in the normal path of rotation. This process is cyclically repeated in the case of a continuous flow of intelligence.

As already mentioned, the principle of the embodient according to FIG. 4, differs only by the spacing B between type levers which is smaller than the spacing A. This is necesary, for example, in cases where a greater number of characters are required, requiring a consequence thereof a corresponding increase in the number of type levers assembled in the magzine.

In this particular case, and in accordance with FIG. 4, the sequential density may be so high that the type body 15.2 of the succeeding type lever 2.2 will be positioned almost completely below the magnet poles, when the type lever 2.1 to be deflected, has reached the position in which the energization of the magnet is switched off. If no corresponding steps were taken, this would lead to the possibility of not only the type lever 2.1, but also the type lever 2.2 being lifted.

In order to avoid this problem in type lever selection, there is provided in the direction of rotation and in front of the magnet 12, a limit stop 16 consisting of a non-magnetic material of high abrasive resistance, which extends in the direction of rotation to a position immediately in front of the yoke limbs 13. Its bottom edge 16*a* extends parallel in relation to the rotation of the type levers 2 and is positioned substantially in the center of the space which is limited by the rear longitudinal edges 13' of the yoke limbs 13 and the planar surfaces 15*b* of the type bodies 15 whose type levers 2 are resting on the rim portion of the slotted disk 4*a* which is indicative of the normal path of rotation.

Upon lifting the selected type lever 2.1, the type body 15.2 of the following type lever 2.2. will in this situation come into the range of action of the magnetic field; but, by the fact that its planar surfaces 15 meet against the bottom edge 16*a* of the limit stop, it is prevented from performing any further upward movement. The limit stop 16 extends so closely up to the yoke limbs 13 that the foregoing still exists according to FIG. 4, when the energization of the magnet 12 is switched off again. While the type lever 2.1, accelerated under the influ-

ence of the magnetic field, is still moving upwards and reaches the path leading to the printing or striking of the platen, the corresponding movement of the subsequently following type lever **2.2** has been retarded by the limit stop **16** so that it, as the magnetic field decays, will return or drop back into the normal path of rotation.

In the embodiments described thus far, there are used type bodies **15** which, owing to the omission of directional markings, have plane-shaped extensions **15***b*. According to FIG. **5**, the selecting arrangement according to the invention can also be designed for type bodies **15** employing these directional markings **15***c*. In this case the yoke limbs **13** are merely provided with recesses **13***a* correspoiding to said directional markings **15***c*.

I claim:

1. An arrangement for providing contactless magnetic selection of individual ones of a plurality of closely adjacent type levers which are assembled in a continuously rotating rim-shaped magazine unit of a printing apparatus, and in which selected type levers are deflected out of the normal path of rotation into a second path leading to a striking of a platen, comprising:

a. electromagnet means (**12**) for effecting the deflection of a slected rotating type lever (**2**), said electromagnet means being stationarily arranged above and in close proximity to the type bodies (**15**) of the rotating type levers (**2**) and having a energization time, in the selection of an individual type lever (**2**), limited to the time of passage thereof proximate to said electromagnet means (**12**);

b. type bodies (**15**) position3d on the type levers, said type bodies being magnetically conductive and constructed to correspond in shape to the pole surfaces of said electromagnet means (**12**), permitting thereby a completion of the magnetic circuit of said electromagnet (**12**) by the type body (**15**) of the type lever (**2.1**) to be deflected upon a passing thereof proximate said electromagnet; and

c. said electromagnet (**12**) having pole surfaces of inclined construction in the direction of rotation of the type levers (**2**) in order to provide a deflection of a rotating type lever without contact with said electromagnet (**12**).

2. The arrangement according to claim **1** wherein said electromagnet (**12**) comprises a U-shaped magnet yoke, in alignement with the longitudinal extension of the type bodies (**15**), the inside spacing between the limbs thereof being at least equal to the maximum size of the types (**15**a), and wherein said type bodies (**15**) above and below the actual type (**15**a) are provided with a plane surface extension (**15**b) arranged parallel to the cross-section of the yoke limbs (**13**).

3. The arrangement according to claim **2** further including means for discontinuing the energization of said electromagnet (**12**) in a selection of a particular type lever when the rear longitudinal edge (**15.1'**) of said boey (**15.1**) is in alignment with the front longitudinal edge (**13''**) of the yoke limbs (**13**).

4. The arrangement according to claim **2** further comprising a limit stop (**16**) positioned, in the direction of rotation of said magazine, in front of said electromagnet (**12**) and extending approximate to said yoke limbs (**13**), with the bottom edge (**16**a) of said limit stop (**16**) extending parallel in relation to the normal path of rotation and positioned substantially at the center of the separation between the rear longitudial edges (**13'**) of said yoke limbs (**13**) and the planar surfaces (**15**b) of the type bodies (**15**) following the normal path of rotation.

5. The arrangement according to claim **4** wherein said limit stop (**16**) consists of a non-magnetic abrasive resistant material.

6. The arrangement according to claim **2** further including directional markings on the type bodies in the form of protuberances situated on said planar surfaces and extending longitudinally in the direction of rotation of the type levers, the yoke limbs having recesses extending longitudinally in the direction of rotation and corresponding to said protuberances such that the latter fit into said recesses upon the passing of each type lever relative to said electromagnet.

* * * * *