

[54] **HIGH SPEED PRINT MECHANISM
WITH INTERPOSER ARM FOR PRINT
HAMMER**

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[58] Field of Search.....101/93 C; 173/123, 117

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ABSTRACT

Printing mechanisms comprising print hammers driven by striker arms selectively struck by projections on a rotating striker drum so that characters on print wheels are selectively printed on a sheet interposed between the wheels and the hammers. The striker arms are normally resiliently retained out of the path of the drum projections and selective energization of electromagnets causes the striker arms to be displaced into said path and thus impacted thereby causing a print to be made. Energization of the electromagnets may be controlled through a pulse counter which is fed in dependence on the rotation of the striker drum.

3 Claims, 4 Drawing Figures

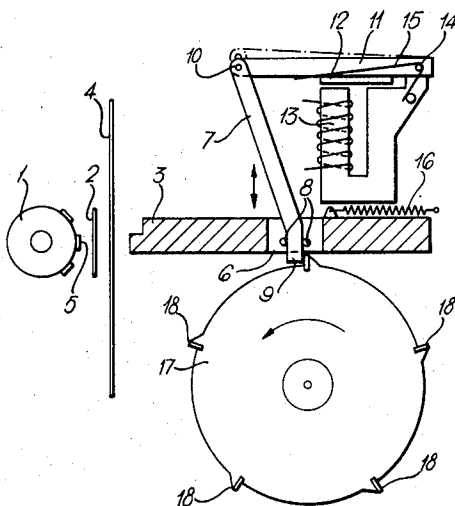
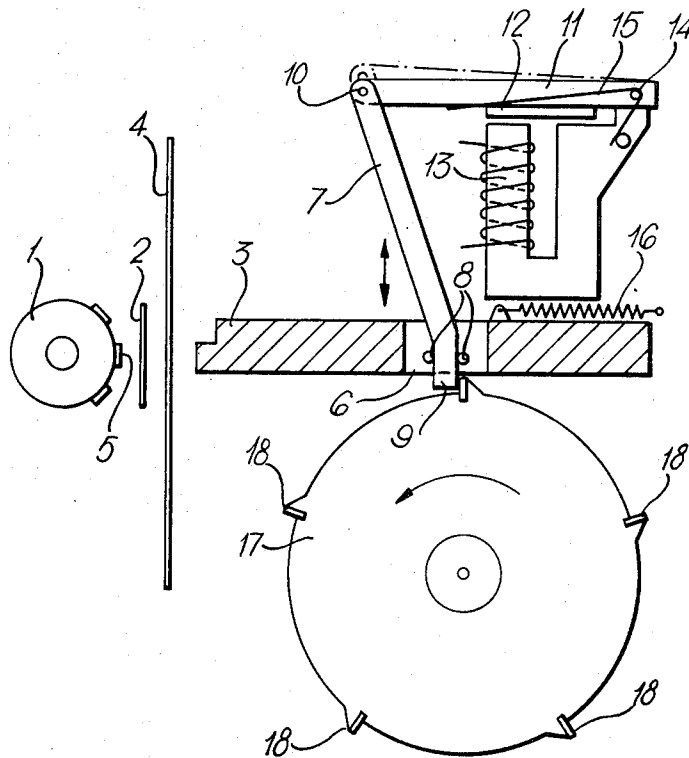


Fig. 1.



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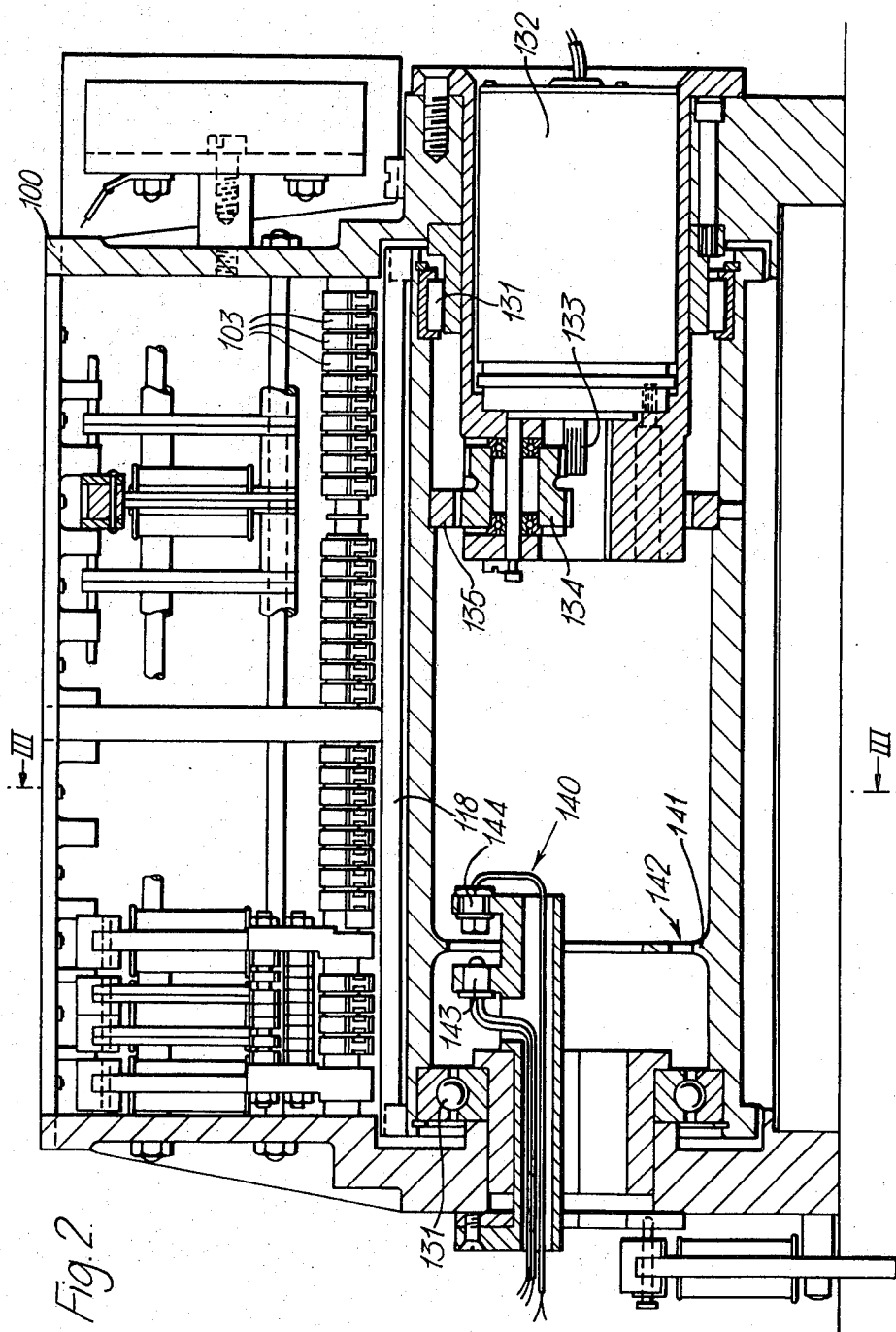
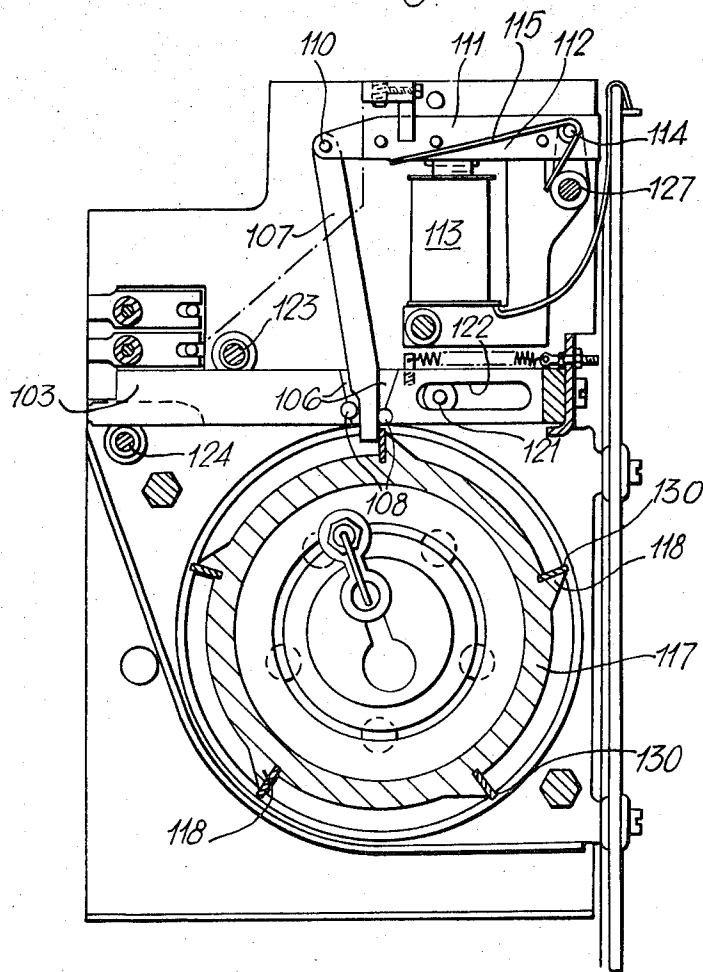


Fig. 2

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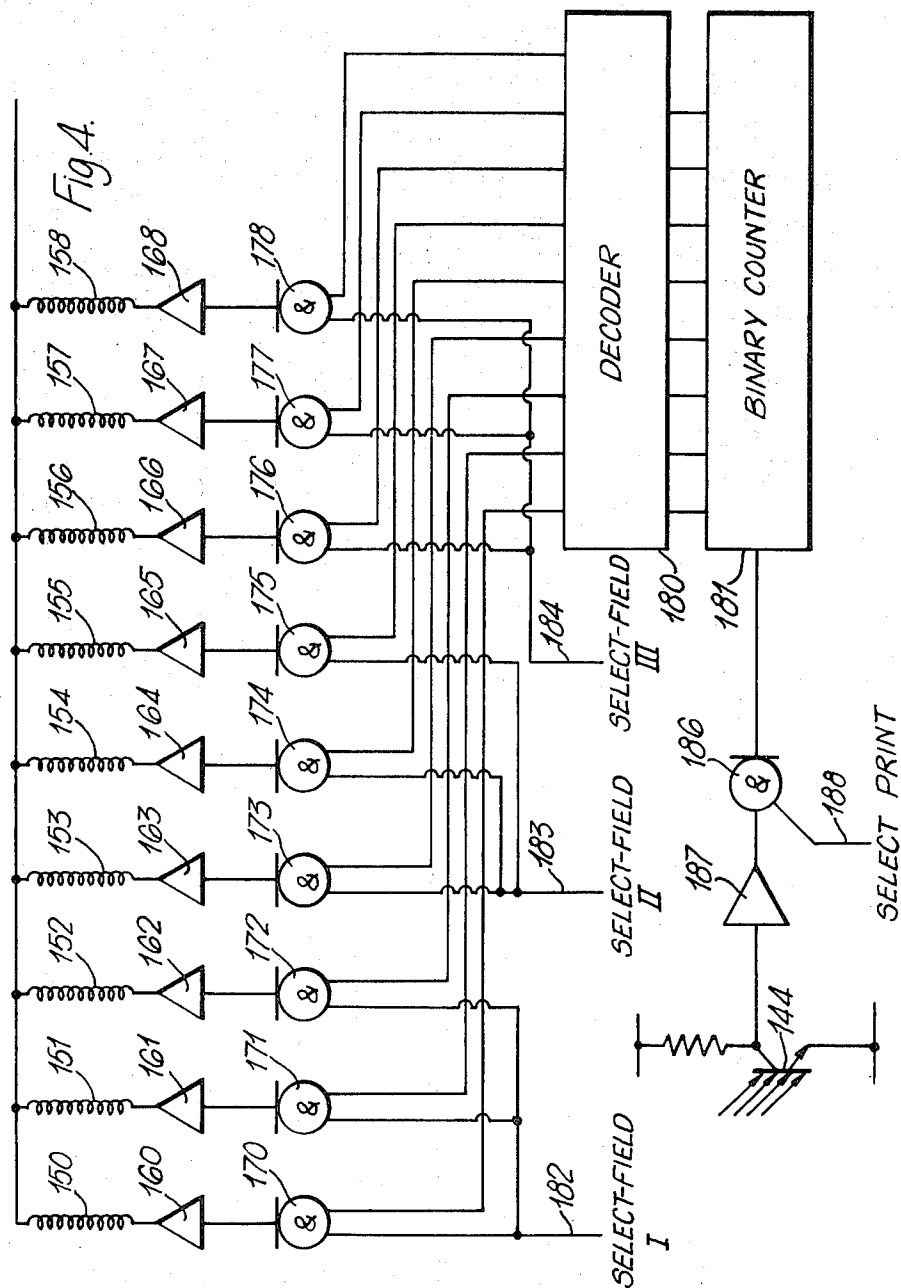
Fig. 3.



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HIGH SPEED PRINT MECHANISM WITH INTERPOSER ARM FOR PRINT HAMMER

BACKGROUND TO THE INVENTION

This invention relates to printing mechanisms and more particularly to printing mechanisms for printing from a plurality of previously set printing wheels.

SUMMARY OF THE INVENTION

According to one aspect of the invention there is provided a printing mechanism which comprises a plurality of print hammers which on actuation cause print to be made, a plurality of striker arms which are normally inoperative and each of which is engageable with a print hammer, constantly operating striker means for actuating the hammers by striking the striker arms, and electromagnetically operated means operable to cause the striker arms to be struck selectively by the continuously operating striker means.

Preferably the striker means comprises a rotating striker drum having a plurality of striker projections extending outwardly from its circumference and selectively engageable with the striker arms which pass through slots or recesses in the print hammers. The electromagnetically operated means may include an electromagnet operable to extend or withdraw the print striker arm in the slot of the print hammer respectively into or out of the path of the striker projections.

The striker arm may normally be retained out of the path of the striker projections by means of a spring and movable into the path of the striker projection by means of the electromagnet.

According to a second aspect of the invention there is provided a printing mechanism which comprises a plurality of striker hammers each engageable by one of a plurality of striker arms, a rotatable striker drum having a plurality of striker projections extending outwardly from its circumference for striking the striker arms and thereby actuating the print hammers which cause print to be made, a plurality of electromagnets associated with the striker arms and each of which when energized causes a striker arm to be struck by a striker projection, and controlling means associated with the rotation of the striker drum for energizing the electromagnets in a predetermined sequence.

Preferably, the controlling means includes a counter actuated by rotation of the striker drum, the output of the counter being such as to operate sequentially one or more of the electromagnets and thereby one or more of the printing hammers in dependence on the count registered by the counter. The counter may be fed from a source of pulses comprising a photosensitive transistor associated with a light source and an apertured plate rotatable with the striker drum positioned between the light source and the photosensitive transistor for controlling the output of the photosensitive transistor in dependence on the rotation of the striker drum. Means may be provided for selectively preventing the operation of one or more electromagnets and thus inhibiting the printing of certain data.

The print hammers may suitably be caused to strike the sheet to be printed and a ribbon against a type wheel so as to provide a print of the character on the type wheel. The type wheel may be provided with a plurality of characters, which are set by any suitable means before the printing operation. The print wheels may be suitably driven by counting apparatus.

DESCRIPTION OF THE DRAWINGS.

The foregoing and further features of the invention will now be described with reference to the accompanying drawings, in which:

FIG. 1 shows a schematic representation of one unit of a printing mechanism in accordance with the invention;

FIG. 2 shows a front elevation view of a printing mechanism using a plurality of the printing units shown in FIG. 1 but omitting the type wheels, ribbon and paper;

FIG. 3 shows a sectional view taken on the line III—III of FIG. 2; and

FIG. 4 shows a circuit diagram showing the electrical circuit used to control the printing mechanism shown in FIGS. 2 and 3.

DETAILED DESCRIPTION OF THE EMBODIMENT.

Referring firstly to FIG. 1, there is shown a type wheel 1 which cooperates with a ribbon 2 and a print hammer 3 to make a print of the character 5 on a project on of the type wheel 1, which is opposite to the print hammer 3 on a paper or other suitable material 4 in a well known manner. The print hammer 3 is provided with a slot or recess 6 intermediate its ends through which passes a striker arm 7 guided in the slot 6 by projections 8. This striker arm 7 is free at its end 9 and is pivoted at 10 to an arm 11 carrying the armature 12 of an electromagnet indicated at 13. The arm 11 is pivoted at 14 to a frame or casing (not shown).

The striker arm 7 is movable in and out of the slot in the directions indicated by the arrow and is urged to its retracted position (shown in broken lines in FIG. 1) by means of a spring 15 which acts on arm 11 and part of the frame. For actuating the print hammer, a striker drum 17 is provided which has a plurality of striker projections 18 positioned on the periphery of the drum. The striker drum 17 is constantly rotated in the direction shown by the arrow.

The operation of the above described unit will now be described:

With the striker arm 7 in the retracted position, the electromagnet 13 is not energized and the projections 18 of the striker drum 17 pass beneath the end 9 of the striker arm 7. In this way no printing is performed. To cause the unit to print, the magnet 13 is energized attracting the armature 12 and moving the striker arm 7 in a downward direction until the end 9 of the striker arm 7 extends into the path of the striker projections 18. On rotation of the striker drum 17, a striker projection 18 strikes the end 9 of the striker arm 7 and moves the print hammer forwards (i.e. to the left in the FIG.) and cause it to press the paper 4 and the ribbon 2 against the character 5 on the type wheel 1 and thus print onto the paper 4 of the character 5.

The movement of the print hammer takes place in three phases. In the first phase, it is positively driven through the striker arm by the striker projection 18 for approximately 60 percent of the stroke of the hammer. In the second phase the hammer moves forwards under its own momentum until it engages the paper 4, whereupon it enters the third phase and pushes the paper forward together with the ribbon 2 against the character 5 on the type wheel 1. At the end of the positively driven part of the stroke of the print hammer 3, the electromagnet 13 is deenergized and permits retraction of the striker arm 7 under the action of the spring 15. After completion of the printing stroke the hammer 3 is returned to its original position by the spring 16.

FIGS. 2 and 3 show a practical example of the use of the unit shown in FIG. 1 in a mechanism for printing a plurality of type wheels, the ribbon, paper and type wheels being omitted in these Figures. Also shown in FIG. 2 is a synchronizing device for ensuring that a striker arm 7 can only be actuated during the intervals between the times during which a striker 18 is passing below a striker arm and also ensures that the magnets 13 of a plurality of striker arms 7 are actuated sequentially so as to avoid excessive peak values of electromagnet energizing current and to reduce speed fluctuations due to absorption by the strikers 7 of the kinetic energy of the striker drum 17.

Referring now to FIGS. 2 and 3, there is shown a printing mechanism comprising a frame 100 carrying a plurality of print hammers 103, which are guided by a pin 121 attached to the frame 100, which pin 121 slides in slots 122 in the print hammers 103. A second guiding means comprising pins 123 and 124 is provided to ensure parallel motion of the print

hammer 103. Each print hammer 103 has a recess or slot 106 on one side thereof which receives a striker arm 107 guided therein by pins 108. The striker arm 107 is pivoted at 110 to an arm 111 carrying an armature 112 which cooperates with an electromagnet indicated generally at 113. Each magnet 113 controls the operation of four print hammers 103 and for this reason each armature carrier 111 is connected to four striker arms 107, the slots 106 being provided in opposite faces of the appropriate print hammers 103. The armature carrier 111 is pivoted to the frame 100 at 114. Each armature carrier 107 is provided with a return spring 115 pivoting at 114 and acting at 127 on a portion of the frame 100.

Mounted beneath the print hammers 103 is a rotary striker drum 117 having a plurality of striker projections 118 around its circumference, the striker projections 118 being seated in recesses 130 in the drum and being constructed of any suitable material. The drum 117 is mounted on one ball bearing and one needle roller bearing at each end 131 and is driven by means of an internally positioned electric motor 132, the shaft 133 of the motor being coupled to the striker drum 117 by way of a multiple gear 134 and an internal gear ring 135 attached to the striker drum 117.

Also provided on the striker drum 117 is a synchronizing device indicated generally at 140 and comprising a plate 141 having a plurality of apertures 142 therein corresponding to the number of striker projections 118 in the periphery of the striker drum 117. Positioned on opposite sides of the slotted plate 141 are an indicator lamp 144 and a photosensitive transistor 143. The output of this photosensitive transistor 143 is connected to a counting device as will be described in connection with FIG. 4, by means of which the synchronization previously referred to is carried out.

FIG. 4 shows the circuit diagram of the circuit enabling control of the operation of the printing mechanism to be achieved. Nine of the electromagnets 113 are shown labelled 150 to 158. These electromagnets are indicated as being in three groups or fields having three electromagnets in each, viz: 150 to 152, 153 to 155 and 156 to 158. Each electromagnet is fed by driver circuit stage 160 to 168 in turn controlled by "AND" gates 170 to 178 one input to each of the gates 170 to 178 being provided by a decoder 180 which is in turn fed from a binary counter 181. The other inputs to the "AND" gates 170 to 178 are provided by "select field" inputs for selecting field I (182) selecting field II (183) and field III (184).

Input to the binary counter 181 is achieved through an "AND" gate 186 having one input fed from an amplifier 187 connected to the circuit of the photosensitive transistor 144. The other input to the "AND" gate 186 is provided by a print signal 188 which controls the whole of the printing operation.

The operation of the printing device will now be described with reference to FIGS. 2, 3 and 4:

The print wheels not shown in FIGS. 2 to 4 but indicated in FIG. 1 are set by any suitable means which may be manual or in the majority of cases from a counting device or similar automatic setting device whose information is to be printed. The whole or part of the numbers or information to be printed are selected by energizing one or more of the "select field" inputs 182 to 184 so that when the printing operation is started the fields selected will print as a result of energization of the appropriate "AND" gates 170 to 178 by signals from the decoder 180. Having set up the desired field of print, a signal is applied to the select print input 188 of "AND" gate 186 and pulses are transmitted from the photosensitive transistor 144, which pulses correspond to the passage of the apertures 142 in the plate 141 which in turn correspond to the striker projections 118 on the striker drum 117. On the first pulse arriving at the binary counter 181 the counter energizes the magnet 150 through the amplifier 160 and the "AND" gate 170 and causes the striker arm 107 to move into the path of the striker projections 118 and cause the print hammers 103 associated with the magnet 150 to print as previously described with reference to FIG. 1. It should be noted that the relative positions of the apertures 142 and the striker projections 118 is

such that a striker arm 107 will not be moved at a time when a striker projection is passing. On receipt of the second pulse, the binary counter will energize through the decoder 180, the "AND" gate 171 and the amplifier 161, the electromagnet 151 causing its print hammers 103 to print. Thereafter on each successive pulse the following electromagnets 152 to 158 will be energized sequentially and will consequently print from appropriate type wheels in sequence. Because of this sequential operation of the electromagnets 150 to 158, it is achieved that excessive peak values of electromagnet energizing current are avoided and speed fluctuations are reduced.

When the printing of the required information has been completed, the print and the select field signals may be automatically restored to their inoperative states, for example, through circuits (not shown) coupled with the binary counter. Provision could be made for automatic repetition of the printing if desired.

It will be appreciated that various modifications may be made to the above described embodiment without departing from the scope of the invention. For example the electromagnet 113 of the FIGS. 2 and 3 could be employed to operate one or two print hammers, it being preferred that one, two or four print hammers be used. Instead of the use of optical synchronizing means as described, electrical or electromagnetic sensing could be employed. With appropriately redesigned circuits, the "AND" gates may be replaced by "NAND" gates.

We claim:

1. A printing mechanism comprising in combination:
 - a. a type wheel,
 - b. a striker arm pivotably mounted for rotation about an axis parallel to the axis of said type wheel;
 - c. an elongated print hammer extending in a direction transverse of the striker arm and engageable by that arm for longitudinal printing motion of the print hammer toward the type of wheel,
 - d. a continuously rotatable striker drum, having a plurality of striker projections extending outwardly therefrom,
 - e. means comprising an electromagnet which when energized is adapted to move the striker arm from a position spaced from said drum into an operative position wherein the end of said striker arm is accessible for engagement with a striker projection, for selective movement of the striker arm toward the type wheel;
 - f. means defining a recess in said print hammer, and also defining a pair of abutments, rigid with said print hammer, disposed in the recess and slightly projecting from the walls of the recess, said abutments being spaced apart in a direction parallel to the length of the print hammer by a distance substantially corresponding to the width of the striker arm in said direction, and
 - g. means for mounting the striker arm for operation by the electromagnet so as to be in sliding contact with both of said abutments of the print hammer, while the end of the striker arm variably extends beyond the print hammer for engagement by a striker projection.
2. A printing mechanism as defined in claim 1, further comprising controlling means associated with said striker drum, whereby upon rotation of said striker drum said controlling means energizes said electromagnet in a predetermined sequence, said controlling means comprising:
 - a counter operable by rotation of said striker drum, output connection means of said counter being connected to said electromagnet effective to cause said energization thereof,
 - an element rotatable with said striker drum, and having apertures,
 - a light source located to one said of said element,
 - a photosensitive transistor located to the opposite side of said element, whereby light from said light source reaches said photosensitive transistor only when one of said apertures lies between said light source and said photosensitive transistor, and

output connection means of said photosensitive transistor connected to input connection means of said counter.

3. A printing mechanism as defined in claim 1, wherein said print hammer is are horizontally reciprocably mounted below said electromagnet, whereby said striker arm moves 5 downwardly into said recess in the print hammer upon energization of the electromagnet, said striker drum being situated below said striker arm.

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