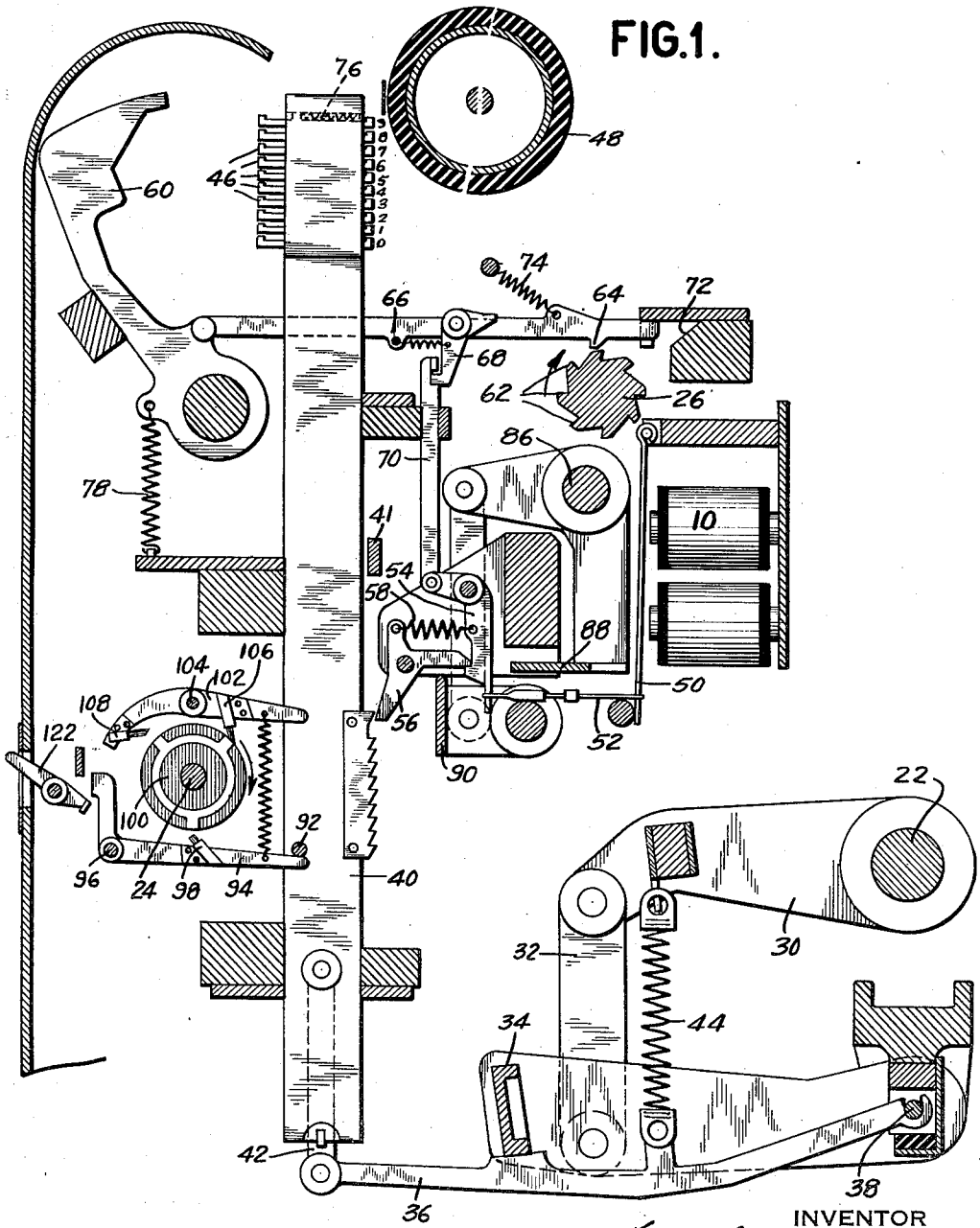
Nov. 5, 1935. F. J. FURMAN 2,019,901

PRINTING MECHANISM

Filed June 27, 1931 2 Sheets-Sheet 1

FIG.1.



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PRINTING MECHANISM

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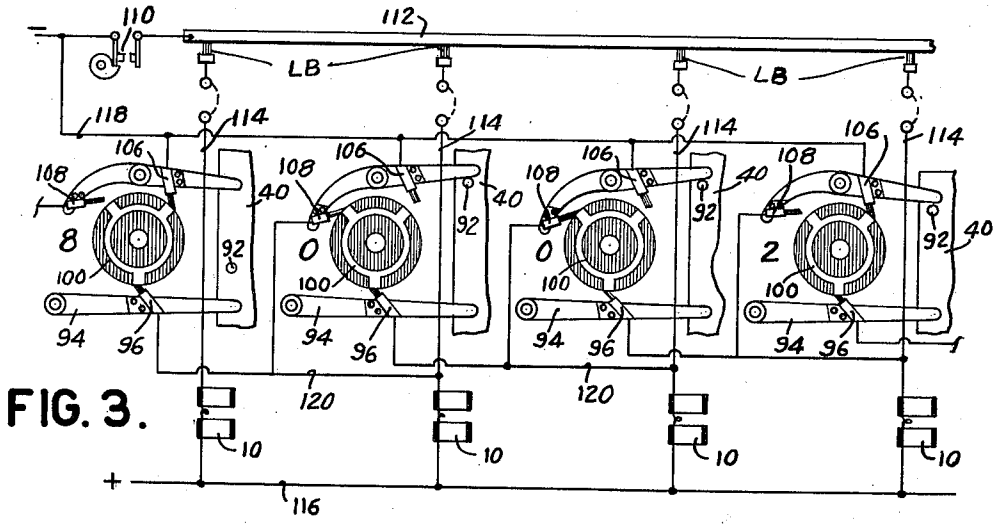
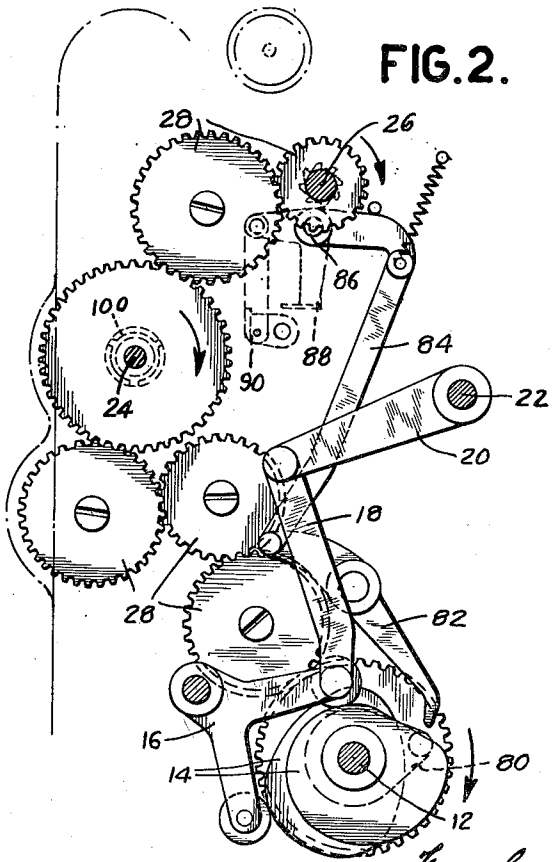


FIG. 3.

FIG. 2.



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UNITED STATES PATENT OFFICE

2,019,901

PRINTING MECHANISM

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4 Claims. (Cl. 101—93)

The invention relates to printing machines and is more particularly directed to the provision of a machine in which printing may be effected with great rapidity and also in which a plurality of printing operations may be effected in extremely rapid succession.

In the recorder art, when applied in connection with such machines as accounting machines, adding machines, tabulating machines and the like, printing is usually effected by differentially displacing one or more type carriers to one or more determined positions, then arresting the type carriers, thereafter taking an impression from all of them at once and afterwards restoring the type carriers to normal position. In the class of machines in which printing is thus effected simultaneously from a plurality of carriers the shock and impact necessary to obtain a clear impression subject the machine to excessive strain and either the printing becomes inaccurate or the machine is damaged.

The mechanism necessary to cause printing from all the carriers at one time requires a considerable portion of an operating cycle to function which constitutes a retarding factor to speedy operation.

The present embodiment in its preferred form contemplates a power actuated printing hammer individual to each type carrier. Coupling means is provided to couple the hammer to the driving means concurrently with the stopping of its associated carrier in differential printing position so that printing is effected immediately upon arrival of a selected type in printing position, obviating the loss of time and shock of impact heretofore present.

A further object of the invention resides in the provision of a zero printing mechanism. It is the custom in punching record cards for card controlled machines to place a perforation in each card column to minimize the risk of inadvertently omitting a significant figure and any column in which no significant figure or digit occurs is punched in the zero position. These zero perforations occur to the left of the first significant figure of a number as well as to the right of it but in printing numbers consisting of figures of several different denominational orders it is desirable to suppress the printing of all zeros to the left of the first significant figure while permitting the printing of all zeros to the right of this figure regardless of their position with respect to any other figure of the number.

The invention is illustrated by way of example in the accompanying drawings in which:

Fig. 1 shows the mechanical structure of the printing mechanism;

Fig. 2 shows the operating devices for the printing mechanism; and

Fig. 3 is a detail showing the zero printing control circuits.

The device may be applied to a printing tabulator of the type disclosed in the patent to Daly and Page 1,762,145, issued June 10, 1930. Cards are fed successively past upper analyzing brushes and lower analyzing brushes LB (Fig. 3) and as they pass the latter the items represented by their perforations may be entered into accumulators and also printed by printer magnets 10.

On a change in the group classification perforations the group control system interrupts accumulating and a total taking operation may be initiated during which the printing of totals is also controlled by the printing magnets 10. These operations are well understood and fully explained in the patent referred to above.

Each card column contains ten index point positions differentially located to represent the ten digits and a different digit is represented by a perforation in each position. As the card passes the lower brushes LB the position of its index points determines the time of closure of circuits through the analyzing brushes and the resulting current impulses may energize selected printer magnets 10 when the latter are properly plugged to the lower analyzing brushes LB.

Referring now to Fig. 2 the listing shaft of the machine is shown at 12 and rotates constantly while the machine is listing and total printing at the rate of one revolution for each card cycle. A pair of complementary cams 14 coact with a double-arm follower lever 16 connected by link 18 and arm 20 to rock shaft 22. Zero printing shaft 24 and hammer actuating shaft 26 are also driven from shaft 12 through train of gearing generally designated 28. Fixed to the rock shaft 22 (Fig. 1) is a rock lever 30 one of whose arms is connected by a link 32 to a bail 34 which rises and lowers in response to the rocking of lever 30. The bail 34 engages the upper edge of an arm 36 pivoted at 38 and connected at its free end to type bar 40 through link 42. As the rock shaft 22 rocks during a printing cycle the bail 34 rises and all the arms 36 will be rocked in a clockwise direction through the action of springs 44 connected thereto, thus elevating type carriers 40 to successively bring each type 46 into active printing position with respect to platen roll 48.

Any of the type 46 may be selected for print-

ing by arresting the type bar with the desired type 46 opposite the platen 48. This is accomplished by energization of the printing control magnet 10 which attracts its armature 50 and pulls a call wire 52 to the right releasing latch 54 and permitting a pawl 56 to be moved by its biasing spring 58 to engage with ratchet teeth integral with the type bar.

When the bar is thus engaged it will no longer follow the bail 34 in its upward movement but will remain stationary in the selected printing position until it is restored during the latter part of the cycle by the downward movement of the bail 34.

A printing hammer 60 is impelled against the selected type element 46 concurrently with the release of pawl 56 so that printing is effected immediately upon arrival of the selected character in printing position. This is effected in the following manner: Shaft 26 which is constantly driven from shaft 12 as explained is provided with a plurality of flutes or teeth 62 which are adapted to engage a tooth 64 in link 66 when the latter is depressed. Carried by link 66 is a spring pressed latch 68 cooperating with a vertical link 70 whose lower end is loosely connected to an arm of releasing latch 54. Upon counterclockwise rocking of latch 54 link 70 is drawn downwardly and through latch 68 will tilt link 66 in a clockwise direction about its pivot point on hammer 60 thus moving tooth 64 into engagement with one of the teeth 62 on shaft 26. Continued rotation of shaft 26 will draw link 66 to the right thereby positively impelling hammer 60 against type 46 to urge the latter against platen 48. As link 66 is moved to the right latch 68 is moved out of cooperation with link 70 and the free end of link 66 engages a camming surface 72 which forces the link upwardly out of engagement with shaft 26 in which position it is retained by its spring 74. Release of link 66 from shaft 26 may take place just prior to the actual printing contact of type 46 with platen 48, the parts continuing to advance to complete the impression under their accumulated momentum. After printing, type 46 and hammer 60 will rebound to restored position aided by their individual springs 76 and 78 respectively.

After printing has taken place in the last type position pawls 56 and latches 54 are positively restored in the following manner: Referring to Fig. 2 shaft 12 carries a roller arm 80 which is adapted to strike arm 82 and through link 84 rock shaft 86 in a clockwise direction. Shaft 86 carries bail 88 and has link connection to a bail 90 the parts being so proportioned that pawls 56 are restored in advance of the restoration of latches 54.

Type bar 40 is provided with nine ratchet teeth for selecting each of the nine digits. A fixed bar 41 serves as a zero positioning stop when engaged by the upper end of the toothed portion of the type bar. It is thus apparent that all type bars that are not intercepted to print a significant figure will advance to present their zero type to the printing line and such zeros may be printed in a manner now to be explained.

Each type bar 40 carries a pin 92 which when the bar is in lowered or restored position engages an arm 94 pivoted at 96 and holds a brush 98 thereon out of engagement with commutator 100 carried by continually running shaft 24. As the bar rises through the several digit positions pin 92 moves upwardly toward an arm 102 pivoted at 104, permitting brush 98 to engage commutator 100. As the bar passes from the 1 to zero position pin 92 tilts arm 102, raising brush 106 from commutator 100 and lowering brush 108 thereon. At the same time commutator 100 will be in the position shown in Fig. 1 with the projections of its conducting ring adjacent to the several brushes.

The operation of this device will be clearer when explained in connection with a specific example. If the number 8002 is to be printed the type bars 40 of the significant figures 8 and 2 will be arrested in the printing positions for these figures (see Fig. 3) and all the other type bars will have moved to zero printing position. In this particular number it is necessary to print zeros from the two type bars to the right of the 8 and when such bars are at zero printing position the parts will occupy the relative positions indicated in Fig. 3. Printing magnets 10 of the 8 and 2 have previously been energized by circuits extending from negative side of line through contacts 110, common contact bar 112, holes in the card, brushes LB, wires 114, magnets 10 to positive side of line 116. At zero position of type bars 40 and commutators 100 current will flow from negative side of line through wire 118, brush 106 of the leftmost position, conducting ring of commutator 100, brush 96, wire 120, magnet 10 of the next order to line 116. From line 120 the current will branch to brush 108 of the second position, commutator 100, brush 96, wire 120 to the third magnet 10. The two central type bars will thereupon have their hammers tripped in a familiar manner and zero printing will be effected. In a similar manner magnet 10 of the order furthest to the right will also be energized but since its type has already been interrupted at 2 this has no effect since link 70 and latch 68 have not been restored to normal latching position.

It is sometimes desirable to split a printing bank into several portions on each of which independent numbers may be printed and in this case the zero printing control circuit must be interrupted at the splitting point of the bank. This may be done by rocking an arm 122 (Fig. 1) in a counterclockwise direction thus causing its inner end to cam arm 94 to its clockwise position and hold it there. Where such splitting is effected it will be apparent from an inspection of Fig. 3 that the zero printing circuit will be interrupted at such point preventing either the initiation or extending of a zero printing operation through the locked unit.

The invention has now been described in connection with a single embodiment but it is to be understood that this is for convenience of disclosure and is not intended to limit the scope of the invention. I intend to be limited only as indicated by the scope of the following claims:

1. In a printing mechanism, a constantly rotating actuator, a differentially positionable type bar having a plurality of type elements thereon, a printing hammer therefor, record card sensing means and means controlled thereby for coupling said hammer to said actuator to cause printing from one of said type elements.

2. In a printing mechanism, a constantly rotating actuator, a differentially positionable type bar having a plurality of type elements thereon, a printing hammer therefor, record card sensing means, means controlled thereby for coupling said hammer to said actuator to cause printing from one of said type elements, and means for

automatically uncoupling the hammer from said actuator after a single printing operation.

3. A printing apparatus comprising in combination a constantly rotating actuator, a plurality of differentially positionable type carriers, a plurality of printing hammers cooperating therewith each selectively engageable with said actuator, means for moving said carriers past printing position, means for selectively stopping said carriers in any position and means for coupling a printing hammer to said actuator upon stopping of its associated carrier in printing position.

4. In a printing apparatus in combination with a plurality of printing hammers, a plurality of members one for each hammer, a constantly driven actuator, means for coupling one or more of said members to said actuator for operation of its or their associated hammer and means for preventing a repeat operation of said members.

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