

**Oct. 6, 1942.**

W. SCHEERER ET AL

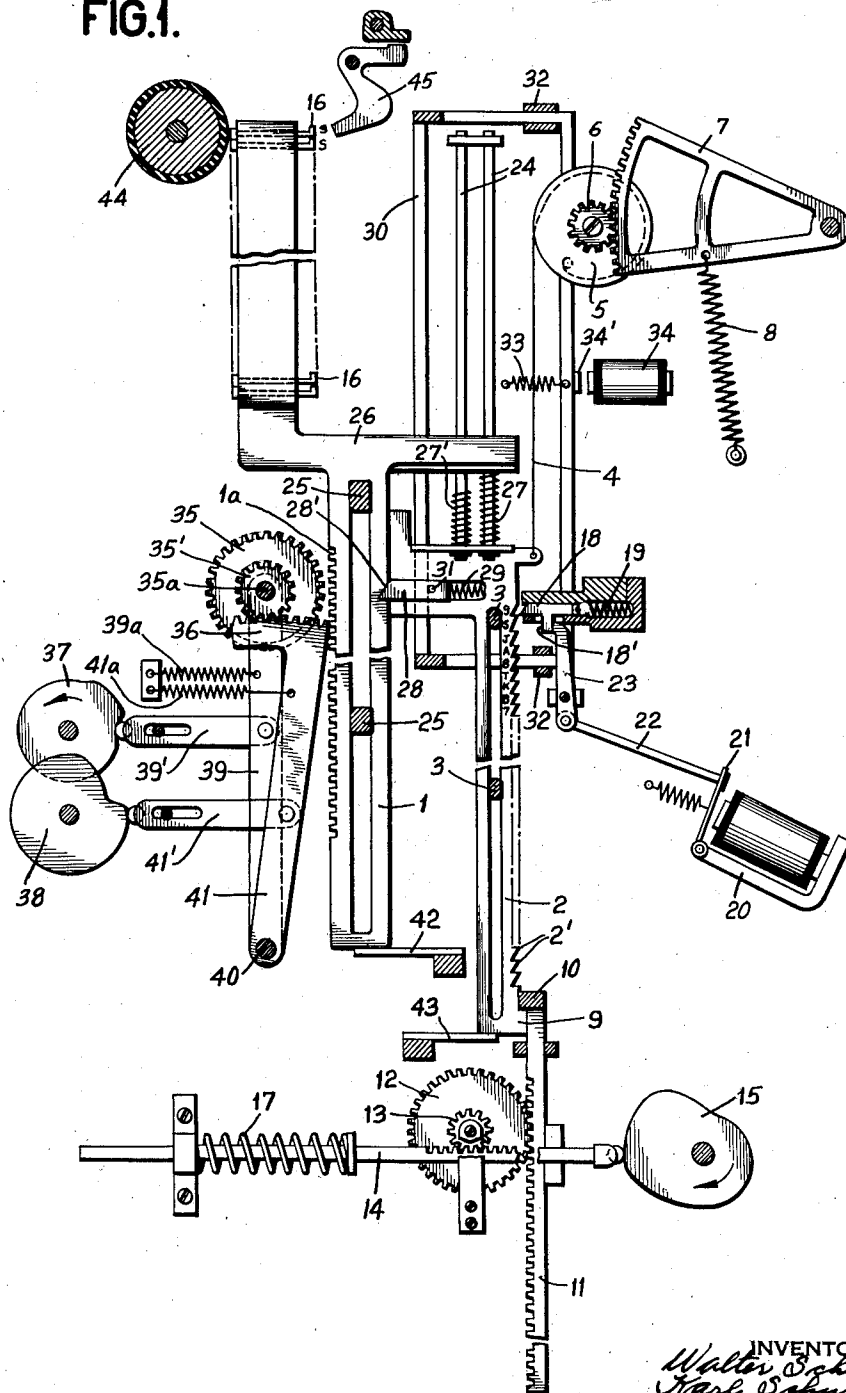
**2,297,803**

## PRINTING APPARATUS

Filed May 25, 1940

2 Sheets-Sheet 1

**FIG.1.**



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2 Sheets-Sheet 2

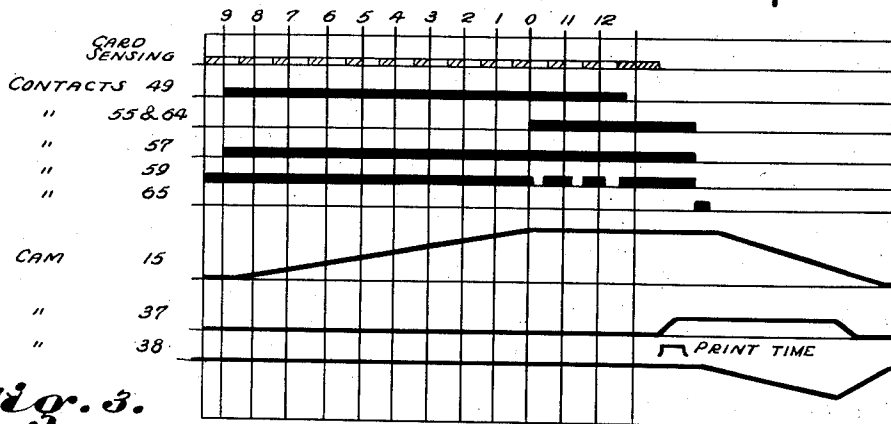
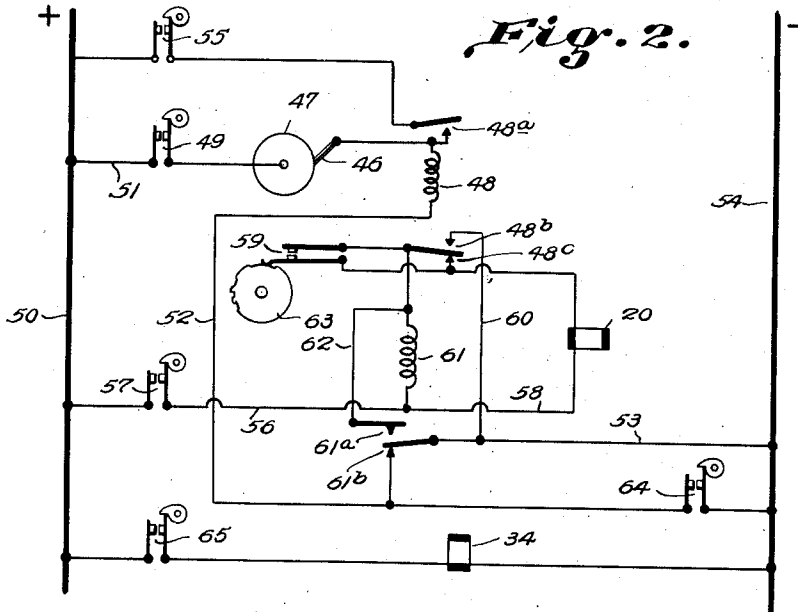


**Fig. 3.**

9876543210 ABCDEFGHIJKLMNOPQRSTUVWXYZ

|   |          |
|---|----------|
| R | 00000000 |
| X | 00000000 |
| 0 | 00000000 |
| 1 | 11111111 |
| 2 | 22222222 |
| 3 | 33333333 |
| 4 | 44444444 |
| 5 | 55555555 |
| 6 | 66666666 |
| 7 | 77777777 |
| 8 | 88888888 |
| 9 | 99999999 |

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38

**Fig. 4.**

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## UNITED STATES PATENT OFFICE

2,297,803

## PRINTING APPARATUS

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In Germany July 18, 1939

18 Claims. (Cl. 101—93)

This invention relates to printing apparatus of the kind having particular utility in automatic accounting machines to print characters under control of character designations on record cards.

The operating speed of an accounting machine is dependent, to a great extent, on the permissible stresses and strains which are produced in the parts of the machine. When the machine is provided with printing mechanism equipped with movable type carriers, the stresses and strains produced in the printing mechanism are factors governing the speed of the machine as a whole. This is particularly so where the type carriers are reciprocated either in a straight line or arcuate direction, involving a forward stroke during which they are differentially arrested under control of selecting means, such as designations on record cards, to bring the selected types to printing position and involving, after the printing operation has been completed, a return stroke to a start position. As far as printing mechanisms for printing only numbers are concerned, there are only ten types, one for each digit, on a type carrier and, consequently, the weight of the movable masses and the resultant inertia, acceleration, and momentum and the stresses and strains are small enough to enable the machine to operate at a high speed. Where the printing mechanism is required to print alphabetic, as well as numerical characters, the type carrier carries almost three times the amount of types as the purely numerical printing mechanism. Accordingly, the alphabetic type carrier is longer, has a correspondingly larger stroke and a correspondingly greater weight, thereby tending to increase the accelerating, inertia, and momentum effects and the resultant stresses and strains. Further, the heavier the type carriers, the heavier must be the supporting, guiding, and driving elements of the carriers, adding their share to the possible stresses and strains produced in the printing mechanism. In an accounting machine, the type carriers and their supporting means must be moved cyclically and in synchronism with other parts, including the type selecting means, of the machine. This involves the problem of operating the printing mechanisms in a manner to synchronize the movement of the type carriers with the other parts of the machine without producing too large stresses and strains.

One of the objects of the invention is to improve the printing apparatus such as described above in a manner which will enable their speed and that of the machine as a whole to be in-

creased while, at the same time, reducing the stresses and strains to a minimum.

More specifically, the latter object is to provide an improved printing mechanism the movable masses of which are subdivided into separately movable, though related, parts.

Further, the object is to provide yieldable means for coupling or associating one of the separately movable parts of the printing mechanism to another in order to absorb the stresses, and strains before transmitting the movement or arrest of one such part to the other.

The object is, still further, to provide means for establishing a fixed, ultimate relation in position between the separately movable, associated parts of the printing mechanism, although one such part reacts on the other through yieldable means, to the end that the parts may be set in required condition without material percussion effects.

The object is, moreover, to provide means to effect separate, though correlated, restoration of the separately movable parts of the printing mechanism and to couple the parts in predetermined relation at the start position.

Specifically, the invention provides for subdivision of the printing mechanism into two separately movable companion parts, one of which is the type carrier and its support means and the other of which is a setting device. The setting device is cyclically actuated and differentially arrested under control of the designations on cards and, through the yieldable means, transmits its differential movement to the type carrier, while after the arrest of the setting device, the type carrier is gradually brought to rest and locked to the device in a corresponding differential position. The return of the type carrier may be effected by a different means than the means for effecting return of the setting device, but both are coupled in fixed relation when they come to start position.

Another object of the invention related to numerical-alphabetic printing mechanisms controlled by combinational and single point designations on record cards, is to provide novel means for controlling the selection of the alphabetical and numerical types under control of such designations.

More specifically, the latter object provides a single pawl for arresting the printing unit—the companion type carrier and setting devices—differentially to select an alphabetic type and a novel manner of controlling operation of the printing unit by the joint action of this pawl and

the releasable actuating means which effects movement of the printing unit through its forward, type selecting stroke.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is an elevation of a printing unit and the actuating and control means therefor,

Fig. 2 is a simplified circuit diagram of the parts pertinent to the present invention, and

Fig. 3 shows a part of a record card punched with the code of the alphabetic and numerical characters.

Fig. 4 indicates the timing of cams and contacts.

Fig. 1 shows, as an exemplification of the invention, a printing unit subdivided into two main parts, the type carrier 1 and the setting device 2, movable relatively to one another. The device 2 is slotted vertically to ride on a pair of guide bars 3 which restrict the device to slidable, vertical movement. To the upper end of the device is secured one end of a cord 4 which extends upwardly, around a drum 5, and has its other end secured to the drum. A pinion 6, rigid with the drum, meshes with a gear segment 7 connected to a spring 8. When the spring is free to act, it moves segment 7 counterclockwise, causing clockwise movement of drum 6 to wind up cord 4 so as to raise the device 2. This constitutes yieldable, releasable elevating means for the setting device. The action of the elevating means is governed by the movement of a rack 11 which, at the upper end, has a nose 10 overlying a shoulder 9 of the lower end of the device 2. Rack 11 is meshed with a gear 12 rigid with which is a pinion 13 meshed with a horizontal rack 14, one end of which follows the periphery of a cam 15 under the influence of a spring 17. Cam 15 rotates clockwise and makes one revolution for each card cycle, i. e., for each cycle of operation of the machine on each of successively fed record cards (see Fig. 3). The ascent of rack 11 is effected under the influence of spring 17 as rack 14 follows a descending portion of cam 15. As rack 1 rises, it permits device 2 to follow under the pull exerted by the elevating means comprising elements 4 to 8. The upward stroke of device 2 covers a type selecting range which is equal to the span of the types 16 carried by the type carrier 1, and during the upward stroke of the device, one of the types is selected for printing under control of the designation sensed on a record card. The type selecting means includes ratchet teeth 2' formed along a vertical edge of the contrivance 2 and spaced similarly to the types 16, so that there is one tooth 2' corresponding to each type. Engageable with a tooth 2' is the nose of a slidable pawl 18 retracted from the teeth by a spring 19. A lug 18' of pawl 18 abuts the upper arm of a lever 23, the lower arm of which is pivotally connected to a link 22 which is acted on by the armature 21 of a print magnet 20. When magnet 20 is energized, its armature moves link 22 to the right, rocking lever 23 counterclockwise to bring the pawl 18 into engagement with a tooth 2'. This arrests the setting device 2 against the upward pull of the yieldable drive whose motive force is the spring 8, while the rack 11 continues freely to the end of its upward stroke.

Fixed to the device 2 is an upwardly extending frame comprising parallel, vertical rods 24 passing freely through the cross-piece 26 of the type carrier 1 and serving, incidentally, to supplement the main guide bars 25 in guiding the type carrier for vertically slidable movement. Between the cross-piece 26 and the top of the device 2, springs 27 and 27' surround rods 24. The spring 27 is longer and is under compression in all the possible positions of the type carrier relative to the setting device. The shorter spring 27' rests loosely on device 2 and does not engage the cross-piece 26 until after the type carrier and device have moved out of normal relation and the cross piece has approached closely to the top of the device. Thereafter, the resistance of spring 27' adds to the resistance of springs 27 in snubbing closer approach of the cross-piece 26 to the setting device and in urging the type carrier and device to return to normal relation. The type carrier and setting device are in normal relation to each other when the inclined nose of a pawl 28 carried by the device is seated in a notch 28' formed in the type carrier. Pawl 28 is slidably mounted in a recess in device 2 and is urged towards the side of the type carrier by a spring 29. The inclination of the nose of the pawl is such as to cause the pawl to be cammed out of the notch 28' either upon rise of the device relative to the carrier or descent of the latter with respect to the device.

When the device 2 starts moving upwardly under the influence of spring 8 and as governed by the contour of cam 15, pawl 28 cams out of notch 28', thereby releasing the type carrier. Accordingly, at the start of the upward stroke of setting device 2, it is released from the burden of the weight of the type carrier and it becomes unnecessary to overcome the inertia of the carrier to start it moving upwardly simultaneously with the setting device. This reduces the force of spring 8 required to effect the initial rise of the setting device and enables the device to attain a normal, regular movement without appreciable lag. Also, the starting stress exerted on device 2 is not directly transmitted to the type carrier, being absorbed by spring 27. As the setting device proceeds on its rise, it compresses spring 27 sufficiently to cause it to transmit upward motion to the type carrier, starting the latter gently on its upward stroke.

During the upward stroke of the device 2, a card is moving through the designation sensing or reading means and the cam 15 governs the rise of the device in a manner which causes the successive 9, 8, 7, . . . 2, 1 teeth of the device to pass the nose of pawl 18 in synchronism with the passage of the index positions 9, 8, 7, . . . 2, 1 of the card (see Fig. 3) past the sensing brush 46 (see Fig. 2). When a perforation is sensed in index position 9, 8, 7, . . . 2, or 1 of a card column, then magnet 20 is energized, in a manner which will be explained later, to bring pawl 18 into engagement with the tooth 2' corresponding to the index position. This arrests the rise of the device 2 while rack 11 continues to move upwardly to the end of its stroke. The stress of stopping the device 2 does not react rigidly upon the type carrier, the stress being absorbed by springs 27 and 27'. After the device 2 has stopped, spring 27 gradually forces the carrier 1 upwardly until notch 28' is directly opposite pawl 18, whereupon the pawl snaps into the notch, locking the device and carrier together in normal relation to each other,

The type 16 corresponding to the perforated index position 9 to 1 of the card column is then in printing position. If there is no additional perforation in the card column, the digit which corresponds to this position is printed. If an additional perforation is found in one of the positions 0, 11, or 12, an additional rise of the printing unit occurs, in a manner which will be explained later, setting an alphabetic type in printing position. The maximum rise of the printing device occurs when a "0" perforation is alone in a card column, and the "0" type 16 is then in printing position. At the end of the rising stroke of rack 11, it dwells for a short interval during which the printing operation is effected in a known manner by operating a hammer 45 to propel the type at printing position against a sheet on platen roll 44. The restoration of the printing unit is then effected during a brief remaining period of the card cycle. To provide for rapid and positive restoration of the parts of the printing unit without imposing shock on the parts, means are provided to restore the type carrier 1 and stop it in home position without imposing a stopping stress on the setting device 2. This restoring means for the type carrier acts separately from the restoring means for the setting device. The latter restoring means comprises the rack 11 and its connections to cam 15. Thus, each of the parts 1 and 2 is separately restored without reciprocal injurious reactions. To enable the parts 1 and 2 to be restored by separate means, the latch 28 is released from notch 28' directly after the printing operation and just before the restoration begins. For this purpose, a rectangular frame 30 has its left side in sliding contact with a stud 31 projecting transversely from the side of latch 28, so that in any vertical position of the printing unit, the stud and frame are in engagement. The horizontal legs of the frame 30 pass through guide brackets 32, thereby mounting the frame for horizontal, slidable movement. A spring 33 connected to the frame holds it in normal position in which it does not affect the latch 28. To the right side of the frame is fastened an armature 34' of a magnet 34. After the printing operation, magnet 34 is energized, shifting the frame 30 to the right, thereby withdrawing latch 28 from notch 28' and thus uncoupling the type carrier 1 from the device 2. Just before this happens, a gear 35 moves into mesh with rack teeth 1a formed along one side of the carrier 1. The means for moving the gear 35 into mesh with teeth 1a comprises a cam 37, making one revolution each card cycle, and acting on a follower, slide link 39' to rock the supporting lever 39 of the shaft 35a of the gear clockwise against resistance of a spring 39a. Lever 39 is mounted on a pivot 40 on which is also pivotally mounted an arm 41, the top of which is formed as a rack sector 36 meshed with a pinion 35' rigid with gear 35. Connected to arm 41 is a slide link 41' engaged with a cam 38, under the influence of a spring 41a. Cam 38 also makes one revolution each card cycle, and as the latch 28 is released from notch 28', this cam permits spring 41a to rock sector 36 counterclockwise, thereby rotating pinion 35' and gear 35 clockwise to effect descent of the type carrier. The cam 15 causes descent of the rack 11 to begin shortly after. During the printing operation and for a short interval thereafter, the pawl 18 remains engaged with a tooth 2' of the device 2. After cam 15 starts moving rack 11 down and immediately after the restoration of the type

carrier begins, the pawl 18 is released from teeth 2'. Since the nose 10 of the rack 11 may be spaced clear above the shoulder 9 of the differentially arrested device 2 at the beginning of the return stroke of the rack, there is a tendency, upon release of the device by pawl 18, for spring 8 to lift the device further. However, the type carrier 1 has already started its return and hence it acts through springs 27 and 27' to resist the free rise of the now-released device and to start the restoration of the device gently. The gear 35 and sector 36 restore the carrier to home position in which it is arrested without shock by a leaf spring stop 42. While the type carrier is being restored, rack 11 is also moving down and the nose 10 overtakes shoulder 9 and positively restores setting device to home position in which it is arrested by the leaf spring 43. The restoration of the device 2 is effected against resistance of the spring 8, so that when the rack 11 reaches its home position, the shoulder 9 of the device is held against nose 10 of the rack 11 in a definite home position. The type carrier 1 may have been restored beyond its predetermined home position, in which case, springs 27, and possibly spring 27', has been compressed and returns the carrier to normal relation with the setting device. If the carrier has rebounded from leaf spring 42 to a position above its normal home position, then the carrier descends, due to gravity, until latch 28 snaps into notch 28' and locks the two parts 1 and 2 together in normal relation.

It may be noted that if pawl 18 is allowed to remain engaged with device 2 throughout the restoring period, the spring 8 will be unable to elevate the device above its differentially arrested position. Then, during the return of rack 11, nose 10 will meet shoulder 9 and restore the device 2, the teeth 2' of which will ratchet past the pawl. With this mode of operation, it is not strictly essential to provide separate restoring means for the type carrier as the latter will be forced by gravity to follow the descent of the device 2. Even then, however, by providing the separate restoring means for the carrier, its return is made smoother and more positive. Another advantage in providing the separate restoring means for parts 1 and 2 is that the weight of the part 1 is substantially relieved from part 2 and the momentum of one will not affect the other directly, nor will the stress of stopping one part be communicated to the other part. Further, the two separate restoring means enable the parts to be restored rapidly and with less strain than if one restoring force were provided for both parts.

While the description thus far has specifically referred to one printing unit, it is to be understood that there is a plurality of such units, one for each of a plurality of card columns, and the advantages enumerated above have even greater force where the number of printing units to be actuated and controlled is increased.

The operation of the machine in controlling the differential setting of the printing units by designations on the record cards will be explained with reference to the circuit diagram, Fig. 2. Before proceeding with this explanation, the card and the character code will be briefly described. Fig. 3 shows a portion of a card punched in parallel columns with the codal indications of the different characters. The card has twelve positions 9, 8, 7, . . . 1, 0, X or 11, and R or 12 of which positions 9 to 1 may be called intrazone positions and positions 0, 11, and 12 zone posi-

tions. A digit 9 to 0 is indicated by a perforation in one of the corresponding index positions of a column unaccompanied by another perforation in the same column. A letter is designated by a combination of a perforation in an intrazone position with a perforation in one of the zone positions. The record cards are fed through the machine bottom first, so that positions 9, 8, 7, . . . 1, 0, 11, and 12 are sensed in order.

Referring now to Fig. 2, the sensing means comprises a sensing brush 46 for each card column and a common contact roll 47. During each card cycle, one card passes through the sensing means with positions 9 to 1 passing the brush 46 in synchronism with the upward travel of the 9 to 1 teeth 2' of the setting device 2 past the pawl 18. The contact roll 47 is connected to the + side 50 of the line through cam contacts 49 which are closed during the passage of index positions 9 to 1, 0, 11, and 12 through the sensing means. When the first perforation in a card column is sensed, the following circuit forms:

*Analyzing circuit #1.*—Side 50, wire 51, contacts 49, roll 47, brush 46 (engaging, through the perforation, with the roll), analyzing coil 48, wire 52, normally closed relay contacts 61b, wire 53, and to the — side 54 of the line.

Coil 48 closes relay contacts 48b to form the following circuit:

*Print magnet main circuit.*—Side 50, cam contacts 57, wires 56 and 58, print magnet 20, cam contacts 59, relay contacts 48b, wires 60 and 53, to side 54.

Simultaneously, a shunt circuit is formed through a coil 61 as follows:

*Coil 61 circuit.*—Side 50, contacts 57, wire 56, coil 61, contacts 48b, wires 60 and 53, to side 54.

The above print magnet circuit has energized magnet 20 which brings pawl 18 forward (see Fig. 1). If the first perforation in a column is in one of the 9 to 1 index positions, the pawl will engage the corresponding tooth 2' of device 2 and arrest the rise of the device, in turn causing the digit type 16 corresponding to the intrazone perforation 9, 8, . . . 2, or 1 to be set in printing position. If the first perforation is in the zero index position, the bar 2 will have moved to its upward limit and the pawl 18 will not have any arresting function. The zero type 16 will then be in printing position.

When a card column is punched in one of the intra-zone positions 9, 8, . . . 2, or 1 and an additional perforation is not found on one of the zone positions 0, 11, or 12, the digit 9, 8, . . . 2, or 1 is indicated and the printing unit remains set in the digit position in which it was arrested by pawl 18 as a result of the sensing of a perforation 9, 8, 7, . . . 2, or 1. Meanwhile, the card continues to feed through the sensing device 46—47 and after the 12 index position passes, hammer 45 is operated to effect printing by the selected digit type 16. Since coil 48 is de-energized as soon as the perforation 9, 8, . . . 2, or 1 leaves the brush 46, contacts 48b reopen and print magnet circuit #1 opens, but a holding circuit forms as a result of the reclosure of relay contacts 48c and the closure of relay contacts 61a by the now-energized coil 61. The holding circuit of magnet 20 is as follows:

*Print magnet hold circuit.*—Side 50, cam contacts 57, wires 56 and 58, magnet 20, contacts 48c, wire 62, contacts 61a, wire 53, side 54.

The closure of contacts 61a has also formed a holding circuit for coil 61 as follows:

*Coil 61 hold circuit.*—Side 50, cam contacts 57,

wire 56, coil 61, wire 62, contacts 61a, wire 53, side 54.

Cam contacts 57 remain closed during the passage of positions 9 to 12 and thereafter until the printing operation has been completed and restoration started, so that when a card column has a digit designation 9, 8, 7 . . . 1, the print magnet will remain energized through its holding circuit to cause the printing unit to remain set in arrested position until printing has been effected.

To designate a letter of the alphabet, the card column has, in addition to an intrazone perforation, a perforation in one of the zone positions 0, 11, and 12. The types 16 are arranged with three alphabetic types between each pair of successive digit types (see Fig. 1). Thus, the sensing of the additional, zone perforation of the alphabetic character designation must cause one to three additional steps of rise of the printing unit to set the designated letter at printing position. This is effected in the following manner. Cam contacts 59 are controlled by a cam 63 in such a way as to remain continuously closed during the sensing of the 9 to 1 index positions. During the passage of each zone position 0, 11, and 12 through the sensing means, cam contacts 59 open momentarily. This provides three short successively spaced open intervals of contacts 59, one for each of positions 0, 11, and 12. Thereafter, the contacts 59 remain closed until after the printing operation. The intermittent opening of contacts 59 results in intermittent deenergization of the print magnet 20 provided a perforation has been sensed in a zone index position. For example, the letter A is designated by a "9" perforation plus a "0" perforation (see Fig. 3). The sensing of the "9" perforation temporarily formed the print magnet main circuit to cause energization of magnet 20 to engage pawl 18 with the "9" tooth of the setting device 2, and the magnet is held energized by the print magnet hold circuit. When the "0" perforation is subsequently sensed, the circuit of coil 48 is formed as follows:

*Zone analyzing circuit.*—Side 50, wire 51, contacts 49, roll 47, brush 46, coil 48, wire 52, cam contacts 64, side 54.

Coil 48 closes points 48a to provide a holding circuit as follows:

*Coil 48 hold circuit.*—Side 50, cam contacts 55, contacts 48a, coil 48, wire 52, contacts 64, side 54.

Cam contacts 55 and 64 are timed alike to close as the 0 zone position reaches the sensing brush 46 and then to remain closed continuously until after the printing operation. Accordingly, whenever a zone perforation is sensed, coil 48 remains energized, until after the printing operation, to hold contacts 48c open and, thereby, to maintain the print magnet hold circuit broken. The energization of the print magnet is thereafter controlled by the print magnet main circuit which includes the now-continuously closed contacts 48b, as well as the cam contacts 59 which open briefly during each of the 0, 11, and 12 position sensing intervals. Thus, if a "0" perforation has been sensed, the holding circuit of print magnet 20 will be broken, and the main circuit of the print magnet reestablished, except for a brief interval during the passage of the 0 position through the sensing means, another such brief interval during the passage of the 11 index position, and a third brief interval during the passage of the 12 position. Between these intervals, magnet 20 remains energized. Each open interval of contacts 59 is of such brief duration

as to cause momentary deenergization of magnet 20 long enough for pawl 18 to release one tooth 2' of device 2 and permit the next lower tooth to begin crossing the pawl. In the assumed example, the "9" tooth of device 2 has been engaged with pawl 18 as a result of the sensing of the "9" perforation. When the "0" perforation was subsequently sensed, it caused the holding circuit of magnet 20 to open and placed further energization of the magnet under control of its main circuit. During the passage of the "0" index position through the analyzing means, contacts 59 break momentarily, opening the main circuit of magnet 20, permitting pawl 18 to release tooth "9" of the device 2. Spring 8 thereupon raises the device until the "9" tooth has moved above the pawl 18, and as this happens, contacts 59 reclose and reestablish the main circuit of magnet 20 to cause pawl 18 to engage the next tooth "S". This operation is repeated as the "11" index position passes the sensing brush, causing another step of rise of the device 2, at the end of which the tooth "J" is engaged by the pawl 18. A third such operation occurs as the "12" index position passes the sensing brush, causing the third step of rise of the device at the end of which the tooth "A" corresponding to the alphabetic designation in the card column is engaged by pawl 18. As a result, the "A" type 16 is set in printing position.

If the zone position "11" of a column is perforated in addition to the "9" perforation, the letter "J" is indicated. The print magnet hold circuit of magnet 20 then remains in effect until the 11 position is sensed. The sensing of the perforation in the "11" position places the energization of magnet 20 under control of its main circuit, which is interrupted twice, once when contacts 59 open briefly during the "11" position sensing and, again, when contacts 59 open as the "12" position is passing the sensing means. Consequently, two steps of advance of the device 2 occur, at the end of which the tooth "J" is engaged by the pawl 18.

If the zone position "12" is perforated in addition to the "9" perforation, letter S is indicated. Magnet 20 then remains energized by its holding circuit until the "12" position is sensed. The sensing of the "12" perforation breaks the holding circuit of magnet 20, and as a result of the momentary opening of contacts 59 during the interval in which the "12" position is passing the sensing means, the main circuit of the print magnet is interrupted once. Hence, device 2 is released for a single additional step of advance from its "9" position, and, as a result, the pawl 18 is engaged with the tooth "S", causing the setting of the "S" type in printing position.

After the third open interval of contacts 59, they remain closed until after printing operation is effected. Cam contacts 55 and 64 are also timed to remain closed until after printing operation is completed; hence coil 43 stays energized by the coil 43 hold circuit. Accordingly, the print magnet main circuit remains in effect, causing the printing unit to stay in selected alphabetic position until the printing operation is completed. As soon as printing has been effected, cam contacts 65 momentarily close to form the circuit of magnet 34 which causes latch 23 to release type carrier 1 from the setting device 2. Meanwhile, gear 35 has been engaged with rack teeth 1a of the type carrier and as soon as the latter is uncoupled from device 2,

sector 36 starts rotating the gear 35 to restore the type carrier. Restoration of the printing unit is then effected in the manner described before.

While there has been shown and described and pointed out the fundamental novel features of the invention as applied to a single modification, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention therefore to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. Printing apparatus to print data, comprising a movable printing unit including a type carrier and companion setting device having a normal relation in position to each other, means for actuating the setting device, a yieldable transmission between the type carrier and setting device for yieldably transmitting movement of the device to the carrier, and means for arresting the printing unit with a type of the carrier at a printing position including means for engaging the setting device to stop its movement while the type carrier may continue to be moved further by the yieldable transmission until brought into normal relation to the setting device.

2. Printing apparatus to print data, comprising a movable printing unit including a type carrier and companion setting device having a normal relation in position to each other, means to actuate the setting device, a yieldable transmission from the setting device to the type carrier enabling the device to start moving before transmitting its motion to the type carrier, and means for arresting the printing unit after differential movement including means to engage the setting device to stop it after differential movement and, thereby, to cause the type carrier under the influence of the yieldable transmission and after arrest of the setting device to move further into its normal relation with the setting device, to be set with a selected type in a printing position.

3. Printing apparatus to print data, comprising a movable printing unit including a type carrier and companion setting device having a normal relation in position to each other, means to actuate the setting device, a yieldable transmission from the setting device to the carrier enabling the device to start moving before movement thereof is imparted to the carrier, means for arresting the printing unit including means engageable with the setting device to interrupt travel of the device and, thereby, to stop transmission of motion to the type carrier, and a releasable coupling between the carrier and device acting in conjunction with the yieldable transmission to establish the normal relation in position between the carrier and device, whereby the interruption of the travel of the device causes the type carrier to be arrested after corresponding travel with a type thereof at a printing position.

4. Printing apparatus comprising a printing unit including a type carrier with a plurality of successive types, a companion setting device, means for actuating the setting device through a type-selecting range of travel, a yieldable transmission for yieldably actuating the carrier from the device, type-selecting means, means con-

trolled thereby for interrupting actuation of the device after a differential movement along said range of travel, and means for establishing a definite relation in position between the device and carrier whereby the differential movement of the device causes a corresponding differential extent of movement of the carrier so as to place a selected one of the types at a printing position.

5. Printing apparatus comprising a printing unit including a type carrier with a plurality of successive types, a companion setting device having spaced teeth corresponding to spaced types of the carrier, means acting on the setting device to move the latter through a type-selecting range of travel, yieldable means for transmitting the movement of the device yieldably to the carrier, type-selecting means, a pawl controlled thereby for engaging a tooth of the device to arrest the latter after differential movement along said range of travel, and means for establishing a definite relation in position between the device and carrier whereby the arrest of the device after differential movement causes arrest of the carrier after a corresponding extent of differential travel so as to place the type corresponding to the engaged tooth of the device at a printing position.

6. Printing apparatus comprising a printing unit including a type carrier with successive types, a companion setting device with spaced teeth corresponding to spaced types of the carrier, means for mounting the carrier and device for relative movement, means for actuating the device through a type-selecting range, spring means under compression between the device and carrier for yieldably transmitting movement of the device to the carrier, type-selecting means, a pawl controlled thereby for engaging a tooth of the device to arrest the device after differential movement along said range, and means for establishing a definite relation in position between the carrier and device including a releasable latching means between the carrier and device acting in conjunction with said spring means to latch the carrier to the device in said relation, whereby the arrest of the device results in the arrest of the carrier with the type corresponding to the engaged tooth at a printing position.

7. In a machine acting in succession on record bodies bearing character designations; printing apparatus comprising a printing unit including a type carrier with successive character types, a companion setting device, means for actuating the device through a type-selecting range, yieldable means between the device and carrier for yieldably transmitting actuation of the device to the carrier, means for sensing a record body for a character designation, means controlled thereby for arresting the device after differential movement along said range, and means for establishing a normal relation between the carrier and device whereby the arrest of the latter places the character type corresponding to the sensed designation on the record body at a printing position.

8. In a machine acting during successive cycles on successive records having index positions marked with a character designation; a printing unit including a type carrier with successive character types and a companion setting device with successive stop teeth, means acting each cycle to sense the index positions of a record card in succession for character markings, means for actuating the device through a type-selecting range in one direction in synchronism with the successive sensing of index positions, yieldable means

for yieldably transmitting the movement of the device in the aforesaid direction to the companion type carrier, means controlled by the sensing means according to the sensed character designation for engaging a stop tooth of the device to interrupt said movement of the device at a differential point of said range, means for establishing a definite relation in position between the device and carrier to cause the carrier to be arrested differentially according to the differential point of arrest of the device with a type corresponding to the sensed designation at a printing position, and means for restoring the device and carrier in the opposite direction to the aforementioned direction after printing has been effected from the type at printing position.

9. Printing apparatus for printing data, comprising a printing unit subdivided into separately actuable parts, one of the parts being a type carrier and another of the parts being a setting device, means for moving the parts in one direction from a start position to select a type for printing and including means to establish a definite relation in position between the parts prior to the printing operation, individual, independently actuated restoring means for each part to restore the parts separately to the start position, and shock-absorbing means between the parts to prevent the shock of stopping one of the parts from reacting directly on another of the parts.

10. Printing apparatus for printing data, comprising a printing unit subdivided into separately actuable parts, one of which is a type carrier and another of which is a setting device, means for moving the parts in one direction to select a type for printing, means for releasably latching the parts together to establish a definite relation in position between the parts prior to and during the printing operation, means operable after the printing operation for unlatching the parts from each other, and means for thereafter separately restoring the parts in the opposite direction to the aforementioned direction.

11. In a machine controlled by record bodies having characters represented by a plurality of markings; printing apparatus comprising a printing unit provided with character types, means to advance the printing unit impositively through a type-selecting range, means to sense a record body for character-representing markings, a stop member engageable with the printing unit to arrest its advance, operating means for the stop member, means controlled by the sensing means according to the sensing of one of the markings representing a character for causing the operating means to operate the stop member for arresting advance of the printing unit temporarily, means controlled by the sensing means according to the sensing of another of the markings representing the character for rendering the operating means ineffective so as to cause the stop member to release the printing unit for additional advance, and means for governing the extent of the additional advance so as to locate the type for the sensed character at printing position.

12. In a machine controlled by record bodies bearing character designations represented by a plurality of markings; printing apparatus comprising a printing unit provided with successive groups of character types, means for impositively actuating the printing unit through a type-selecting range, sensing means located at a single station for sensing the plurality of markings of a character designation on a record body, a stop member operated under control of the sensing

means according to the sensing of one of the designation markings for engaging and arresting the printing unit to select one of the groups of character types, and means controlled by the sensing means according to the sensing of another marking of the designation for releasing the stop member from the printing unit to allow additional movement of the printing unit and then returning the stop member to arresting co-action with the printing unit to select the type, corresponding to the designation and lying within the selected group, for printing.

13. In a machine controlled by record bodies having zone and intrazone markings to represent characters; printing apparatus comprising a printing unit provided with groups of character types, means to advance the printing unit impositively, means to sense a record body for character representing markings, means to arrest the advance of the printing unit, means acting in conjunction with the sensing means according to the sensing of the intrazone marking of a character for operating the arresting means to arrest the printing unit to select a group of types, and means acting in conjunction with the sensing means according to the sensing of the zone marking of the character for releasing the arresting means to allow additional advance of the printing unit to select one of the types of the selected group for printing the character of which the zone and intrazone markings have been sensed.

14. In a machine controlled by record bodies having successive index positions marked in pairs to represent characters; printing apparatus comprising a printing unit provided with successive character types, means to advance the printing unit impositively, means to sense the index positions of a record body for character markings, means controlled by the sensing means according to the sensing of the first marking of a pair representing a character for arresting advance of the printing unit, means controlled by the sensing means according to the sensing of the second marking of the latter pair for releasing the printing unit for steps of additional advance, and means for governing the number of steps of additional advance according to the location of the index position bearing the second marking of the pair, with the final step of advance of the printing unit placing a type in position to print the character represented by the pair of sensed markings.

15. In a cyclically operating machine acting during each card cycle on a record card bearing a plurality of markings to represent a character; printing mechanism including a type carrier having successive character types, means to advance the type carrier impositively, means to sense the record card during a card cycle for character-representing markings, means controlled by the sensing of one of the markings of a character for temporarily arresting advance of the carrier, and means timed in relation to the card cycle and rendered effective by the sensing of another of the markings of the latter character for effecting repeated release and arrest of the carrier to cause a number of additional steps of advance thereof to select the type for printing the latter character.

16. A cyclically operating machine controllable by character indications made up of a plurality of characteristics, comprising a recording unit including a carrier for successive character recording elements, impositive means for advancing the carrier each cycle through a selecting range, means for sensing the characteristics of a character indication in succession, means controlled by the sensing means upon first sensing one characteristic of a character indication for causing the advance of the carrier to be stopped at a differential point of the selecting range, means controlled by the sensing means upon the subsequent sensing of another characteristic of the latter character indication for causing the carrier to be released for a further advance of said impositive means, and cyclically timed means for governing the extent of said further advance so as to cause the carrier to be positioned at the end of the further advance at a point of the selecting range at which the recording element corresponding to the character whose characteristics have been sensed is selected for recording operation.

17. In a cyclically operating machine acting on record cards having successive index positions marked in combination to represent characters; printing mechanism including a type carrier having successive character types, means to sense the index positions of a card in succession for character markings, a magnet, means operated by the magnet upon energization thereof by the sensing of the first marking representing a character for effecting a preliminary type selection, intermittently closed contact means timed with relation to the sensing of the index positions, and means controlled by the sensing of the second marking representing the character for rendering the contact means effective to cause repeat energizations of the magnet, the number of which is dependent on the index position in which the second marking is found, for causing a final type selection of the type corresponding to the character represented by the sensed markings.

18. In a machine controlled by a record which bears characters represented by a plurality of markings; printing apparatus comprising a printing unit provided with character types, means to advance the printing unit releasably through a type-selecting range, means to sense character representing markings on the record successively, an electromagnet energized under control of the sensing means upon sensing of the first marking, a stop device operated by the electromagnet while energized for engaging the printing unit to arrest its advance, means for maintaining the electromagnet energized after energization thereof resulting from sensing of the first marking and until the next marking is sensed, means controlled by the sensing means upon sensing this next marking for causing deenergization of the electromagnet thereby to cause the stop device to release the printing unit and permit its further advance, and means for determining the extent of this further advance.

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