Aug. 9, 1949. H. H. KEEN 2,478,277

DATA STORAGE DEVICE IN PRINTING MACHINES

Filed Feb. 6, 1947 2 Sheets-Sheet 1

Fig. 1.

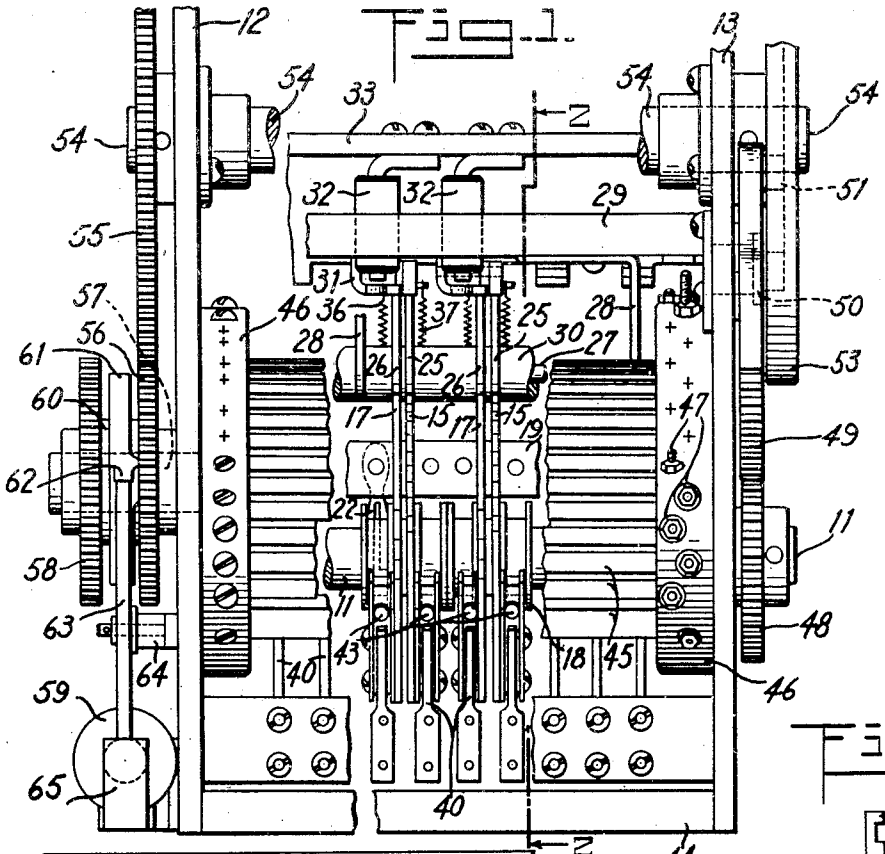


Fig. 8.

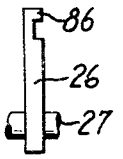
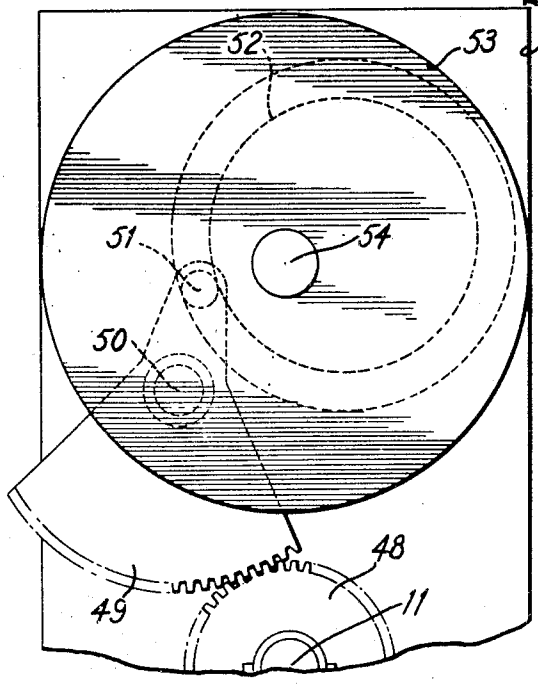


Fig. 3.



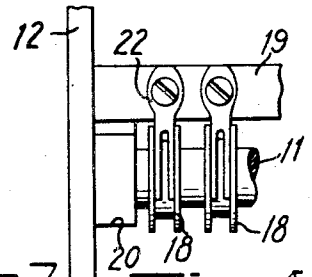
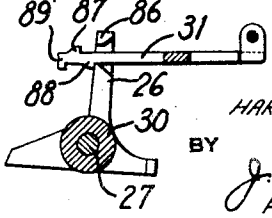


Fig. 4.

Fig. 7.



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Aug. 9, 1949. H. H. KEEN 2,478,277

DATA STORAGE DEVICE IN PRINTING MACHINES

Filed Feb. 6, 1947 2 Sheets-Sheet 2

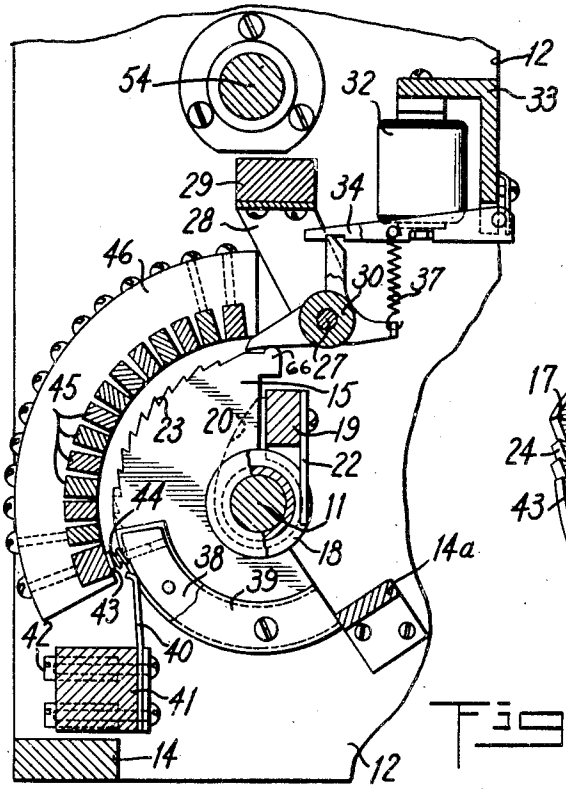


Fig. 2.

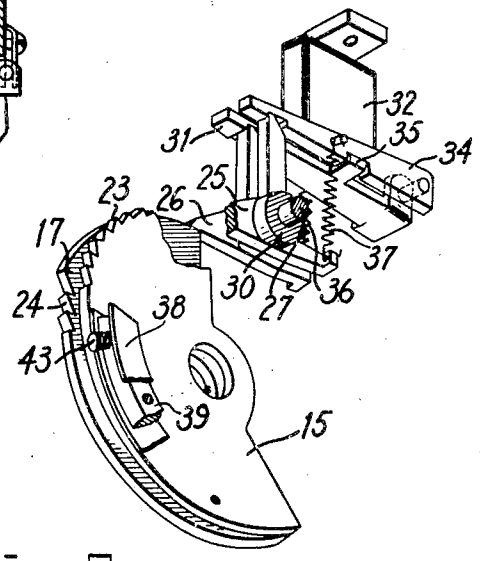


Fig. 5.

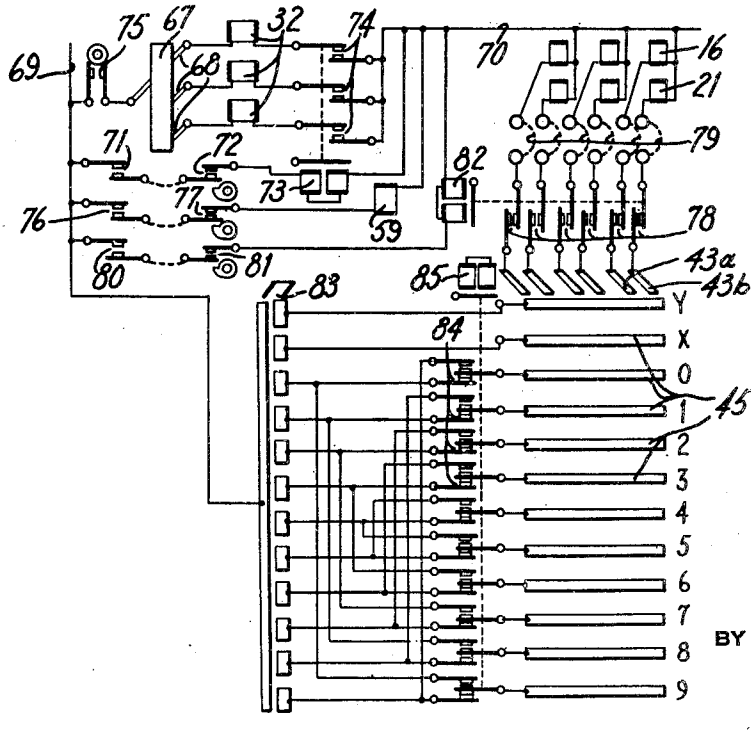


Fig. 6.

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2,478,277

DATA STORAGE DEVICE IN PRINTING MACHINES

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2 Claims. (Cl. 101—93)

1

This invention relates to improvements in record controlled machines relative to the storage of data.

More specifically this invention is associated with devices for storing data derived from a record card controlled machine wherein data is represented by one or two holes or similar designations in each column of the record card.

It is common practice in electrical accounting machines controlled by record cards to employ combinational codes to represent numerical and alphabetical characters. One such code, sometimes referred to as the two point code, includes ten index points for representing singly the nine digits and zero, and two other index points for representing so-called zone points, which may be designated "X" and "R," the zero point also being used to represent a zone point. A total of twelve index points in each column of a record card is required with this code, each such point being manifested by a perforation, a conductive mark, a discrete magnetized spot, or a photo sensed mark, depending upon the nature of the sensing mechanism. Numerical characters are represented by single index points while alphabetical characters are represented by combinations of index points, a digit point and a zone point making up each combination.

In the present invention two positionable members are provided, each capable of being set to an index point, together with means controlled by the record card controlled machine for setting the two members to a digit point and to a zone point, respectively. Further mechanism is provided, operable within any cycle of the record card controlled machine subsequent to the setting cycle, to read out the data represented by the two set members. The settings of the members may be retained intact during read out. Other means under control of the record controlled machine is provided for impositively moving each member through all its positions of index and to arrest its movement at the position where it is to be set. A contact carried by each member is adapted, when the member is moved, progressively to engage a series of contact bars common to all the members, each bar representing a digit point or a zone point.

A single electromagnet controls the positioning of each of the two members by the release of two detents adapted respectively to arrest each of the two members, a first actuation of the magnet releasing the detent of the digit member and a second actuation releasing the detent of the zone member. The detent of the zone member is

2

latched by the armature of the electromagnet. The detent of the digit member is latched by an arm adapted to unlatch the digit member when the armature is actuated but to remain in its unlatched position while the armature returns to the latched position of the zone member detent when the magnet is not actuated.

The movement of the members is obtained by a one revolution clutch, the first engagement of which moves the members in the direction for setting and the second engagement of which returns them to their normal positions.

The elements recited above, constitute the principal embodiment of the subject invention which provides a simple device capable of storing information in the form of the combinational codes previously described.

Accordingly, it is an object of this invention to provide an improved storage mechanism of simple construction and arrangement of parts in which data provided from sources in a record controlled machine may be stored.

It is another object of this invention to provide a storage mechanism of simple construction wherein the data may be read out without destroying the indicated data in the mechanism to permit a further read out operation if desired.

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 a front elevational view with certain portions broken away.

Fig. 2 is a sectional view along the line 2—2 of Fig. 1.

Fig. 3 is a partial side elevation view of Fig 1.

Fig. 4 is a detail view showing the friction drive of the positionable members.

Fig. 5 is a perspective view of parts of the positionable members and their controlling elements.

Fig. 6 is an electric circuit diagram.

Fig. 7 is a detailed sectional view representing a modification of the detent element shown in Fig. 5.

Fig. 8 is a partial side elevation view of Fig. 7, representing a modification of the detent element shown in Fig. 5.

Referring to Figs. 1, 2, 3, and 5, a shaft 11 is mounted between the side plates 12 and 13 which are further supported by the bars 14. Supported loosely upon the shaft 11 are a plurality of pairs

of toothed sectors 15 and 17, each resting normally against the stop bar 14a. A flanged collar 18 is fixed to each sector. The collar 18 is also shown in Fig. 4 without the sector attached. A bar 19 is fixed to turn with shaft 11 by means of collars 20 pinned to shaft 11. The bar 19 carries a plurality of spring steel forks 22 one for each flanged collar 18, the prongs of each fork frictionally engaging the flanges. When shaft 11 is rotated all the sectors 15 and 17 are similarly rotated due to frictional contact of the forks 22 and the collar 18; however, any sector 15 or 17 may be arrested thereafter, the forks 22 sliding along the flanges in the collars 18.

The digit member, previously referred to, is represented by the sector 15 which has ten peripheral teeth 23 representing the digits "0" to "9" clockwise around the periphery. The zone member is represented by the sector 17 which has three teeth 24 representing the zones "R," "X," and "0" clockwise around its periphery. The detents 25 and 26 are adapted to engage the teeth of the sectors 15 and 17, respectively. The detents are mounted loosely on a rod 27 supported at intervals by brackets 28 on a bar 29, and are suitably spaced by washers 30 to engage their respective sectors.

The detent 26 is latched by the armature 31 of an electromagnet 32, there being one electromagnet 32 for each pair of detents 25 and 26 and sectors 15 and 17. The magnets are fixed to a bracket 33 mounted between the side plates 12 and 13. The detent 25 is latched by an arm 34 which is moved with the armature 31 by a lug 35 on the armature 31. A spring 36, connected between armature 31 and detent 26, urges the armature 31 away from the magnet 32 and tends to rotate the detent 26 counterclockwise. Another spring 37, connected between the arm 34 and the detent 25, urges the arm 34 away from the magnet 32 and tends to rotate the detent 25 counterclockwise.

When a magnet 32 is energized while sectors 15 and 17 rotate clockwise, the detent 25 is released by the action of armature 31 and lug 35 to engage a tooth in the sector 15 arresting that sector at a position corresponding to the time of energization of the magnet 32. At the same time, the detent 26 is released by the armature 31; however, since the toe of the detent 26 rides at this time on the smooth periphery of the zone sector 17, the detent 26 does not move into engagement with a tooth of the sector 17. Since the magnet 32 is energized only momentarily, the armature 31 again engages the detent 26 while the detent 25 continues to engage a tooth 23 in the digit sector 15. When the magnet 32 receives a second energization after the zone sector 17 has rotated clockwise to expose its teeth to the detent 26 for engagement, a tooth 24 of the zone sector 17 is engaged depending on the instant of energization of the magnet 32. Thus it is that by sending two momentary impulses to the magnet 32 while the sectors 15 and 17 are turning clockwise, the digit sector 15 is arrested at a digit tooth 23 and the zone sector 16 is arrested at a zone tooth 24.

Each sector carries an arcuate conductor 38 insulated from the sector by an insulator 39. Electrical contact is made with the conductor 38 by a brush 40 mounted on an insulated block 41 and having a terminal 42. A contact plunger 43 is fastened to the conductor 38 urged by a spring 44 to bear against the conductive bars 45 mounted in the insulated segments 46. A terminal 47 is

provided for each acting bar 45 of which there are a total of twelve with the addition of two others, one at each end of the segment 46, for supporting the contact plunger 43 at the extremes of its travel. The twelve active bars 45 correspond to the digits "0" to "9" inclusive and the zone indices "X" and "R," and are so arranged that when the sectors 15 and 17 are arrested in digit and zone positions respectively, their respective contact plungers 43 make electrical contact with corresponding bars 45.

The shaft 11 has affixed to it a gear 48 which is driven by a sector gear 49 pivoted on a stud 50. The sector gear 49 carries a roller 51 which engages a groove 52 in the internal cam 53 mounted on shaft 54. The shaft 54 is journalled to protrude through plates 12 and 13, and on its end opposite the cam 53 is a gear 55 which engages a constantly driven gear 56 mounted to turn freely on a stud 57. The gear 56 carries a one revolution clutch, similar to that shown in U. S. Patent No. 2,378,371, by which it can be turned through one revolution by the constantly driven gear 58 when a clutch magnet 59 is energized. The gear 58, which turns freely also on the stud 57, carries a sleeve 60 having a notch (not shown). Pivoted to the gear 56 is a semi-circular arm 61 provided with a lug urged by a spring to engage the notch, previously mentioned. Normally, one end of the arm 61 is latched at a point 62 on one end of a lever 63 which is pivotally mounted to the side plate 12 by a stud 64, the other end of the lever 63 carrying the armature 65 spring urged from the magnet 59. When magnet 59 is energized, the arm 61 is unlatched by the lever 63 and the lug on arm 61 engages the notch in the sleeve 60 so that the gears 58 and 56 are clutched together. When the magnet 59 is deenergized releasing the lever 63, the next completion of a revolution of the gear 56 causes the arm 61 to strike against the end of the lever 63, thereby latching, and the lug on arm 61 is withdrawn from the notch in sleeve 60 so that the gears 56 and 58 are declutched. Thus, when an impulse energization is furnished to the magnet 59, the gears 56 and 58 are clutched together only for one revolution while the gear 55 (in 1:2 ratio with gear 56) makes one half revolution as does the cam 53. The sector gear 49 is thereby actuated to cause the gear 48, the shaft 11, the bar 19, and the sectors 15 and 17 to be rotated in one direction (clockwise). When the next impulse energization is furnished to the magnet 59, a similar operation of the above rotating and reciprocating elements occurs; however (due to the action of the cam 53 and the sector gear 49), the gear 48, the shaft 11, the bar 19, and the sectors 15 and 17 will be reversely rotated (counterclockwise) thereby resetting these elements to their normal positions. In resetting, a projection 66 (see Fig. 2) on the sector 15 lifts the detent 25 to engage the arm 34, the detent 26 is latched with the armature 31 in a similar manner when the detent 26 encounters the smooth periphery of the sector 17.

Now, referring to Fig. 6, the functioning of the device will be described in connection with other record card controlled equipment, circuits of which are shown only to the extent relevant to the subject invention.

The sensing station 67 is shown in Fig. 6 having three sensing brushes 68, one brush per columnar position of a record card of three columns. The lines 69 and 70 represent the line conductors supplying electrical energy to the device. When it is desired to store data in the device, the con-

tacts 71 are closed by the record controlled machine circuits so that a circuit is completed from line 69, through contacts 71, cam contacts 72, acceptance magnet 73, to line 70 thereby closing contacts 74. A circuit is consequently completed thereby from line 69 through the circuit breaker 75, a brush 68, a magnet 32, a set of contacts 74 to the line 70. Another circuit is completed (by the closing of contacts 76 under control of the record controlled machine) from line 69, through contacts 76, cam contacts 77, clutch magnet 59, to the line 70. The cam contacts 72 and 77 are set to be closed during the card sensing cycle and to be open otherwise. Since the clutch magnet 59 controls the rotation of the sectors 15 and 17 and the magnets 32 control the arresting of the sectors 15 and 17, data is stored thereby in the device by the plungers 43 being set to contact the bars 45.

The plunger 43*a* in Fig. 6 represents a plunger on a sector 17 capable of being arrested to contact any one of the zone bars 45 while the plunger 43*b* represents a plunger on a sector 15 capable of being arrested to contact any one of the digit bars 45. Each plunger 43 by way of its conductors 38, brush 40, and terminal 42 is connected to a suitable zone selecting magnet 16 or print magnet 21 though a contact 78 by means of jumpers 79. The magnets 16 and 21 may control printing elements similar to those described in U. S. Patent No. 2,016,682 which shows similarly numbered magnets controlling such elements.

In order to read out data stored in the device, the contacts 80 are closed by the record card controlled machine whereupon a circuit is completed from line 69, through contacts 80, cam contacts 81, read out magnet 82, to line 70 thereby closing contacts 78. Cam contacts 81 are set to be open during the card sensing cycle and to be closed otherwise. An emitter 83 under control of the record controlled machine causes circuits to be completed from line 69, through the emitter 83, normally closed contacts 84, the bars 45, the plungers 43, contacts 78, jumpers 79, zone selecting magnet 16 or print magnets 21, to line 70. The magnet 85 is for the purpose of transferring contacts 84 so that the emitter pulses effect nines complements to be furnished to the read out circuits when required.

Data stored in the device may be read out repeatedly until a resetting of the sectors 15 and 17 is made by energizing the clutch magnet 59 whereupon the sectors 15 and 17 will be returned to their normal positions and the plungers 43 will no longer be in contact with the active bars 45.

It may be pointed out that the device above described may be adapted to other than printing functions; for example, the magnets 16 and 21 might be utilized to actuate card punches and the like. Furthermore, the input data need not necessarily be derived directly from a record card since the magnets 32 might be energized by emitter impulses from an accumulating mechanism of a record card controlled machine.

A modification of the detent 26, as shown in Figs. 7 and 8, will permit codes, in which the two index positions can occupy any positions in the length of column containing index positions, in lieu of the somewhat limited code herein described. The latching arm of the detent 26 is extended to provide a second latching point 86 which engages a latching point 87 on the armature 31 after the detent 26 has been released from its first latching point 88. When the armature 31 drops (after the impulse delivered to the magnet 32 dies out) the detent escapes from the latching point 87 but is caught and relatched by the latching point 89. The detent 26, therefore, will not be released until the magnet 32 receives a second impulse, and the smooth peripheral portion of the sector 17 will not be required to support the detent 26 when the magnet 32 receives its first impulse, causing the detent 25 to be released from the arm 34 as the armature 31 is attracted. Consequently, the sector 17 could thereby be provided with teeth 24 over its entire periphery corresponding to all the index points contained in a single column of a record card.

While there have been shown and described and pointed out the fundamental novel features of the invention, as applied to a preferred embodiment, 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. A storage device for combinational data representations in a two point code derived from a record card or the like comprising a pair of rotatable toothed sectors, a shaft carrying loosely the said sectors, means on the said shaft to frictionally grip all the said sectors to rotate with the said shaft, means for rotating the said shaft a predetermined amount in one direction and then reversely rotating the said shaft to its original position, a pair of detents each operative to engage a tooth in the said sectors respectively, means on one of the said sectors to prevent engagement with its detent until a predetermined amount of rotation occurs, a pair of pivoted arms each normally engaging and latching with one of the said detents, one of said arms carrying a lug and the other of the said arms having a notch coacting with the said lug, an electromagnet capable of attracting the first said arm to operate to disengage its detent, the said lug engaging the notch on the second said arm to operate to disengage its detent, and means for energizing sequentially the said electromagnet in response to the said data derivations whereby one of the said sectors is arrested at a position corresponding to one data derivation and the other sector is arrested at a position corresponding to a second data derivation.

2. A storage device for combinational data representations in a two point code derived from a record card or the like comprising a pair of rotatable toothed sectors, a shaft carrying loosely the said sectors, means on the said shaft to frictionally grip all the said sectors to rotate with the said shaft, means for rotating the said shaft a predetermined amount in one direction and then reversely rotating the said shaft to its original position, a pair of detents each operable to engage a tooth in the said sectors respectively, a pair of pivoted arms, one of the said arms being adapted to be attracted to move by an electromagnet and arranged to carry a lug, the other of the said arms being arranged to be engaged to move with the first said arm by the said lug, a latching member on the first said arm normally engaging one of the said detents operable to release the detent after two movements of the arm, a latching member on the other of the said arms normally engaging the other said detent operable to release the detent after one movement of the arm, an electromagnet, and means for energizing sequentially the said electromagnet in response to the said data deriva-

tions whereby one of the said sectors is arrested at a position corresponding to one data derivation and the other sector is arrested at a position corresponding to a second data derivation.

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