Feb. 26, 1946. W. LEATHERS 2,395,557

SENSING MECHANISM

Filed July 7, 1943 5 Sheets-Sheet 1

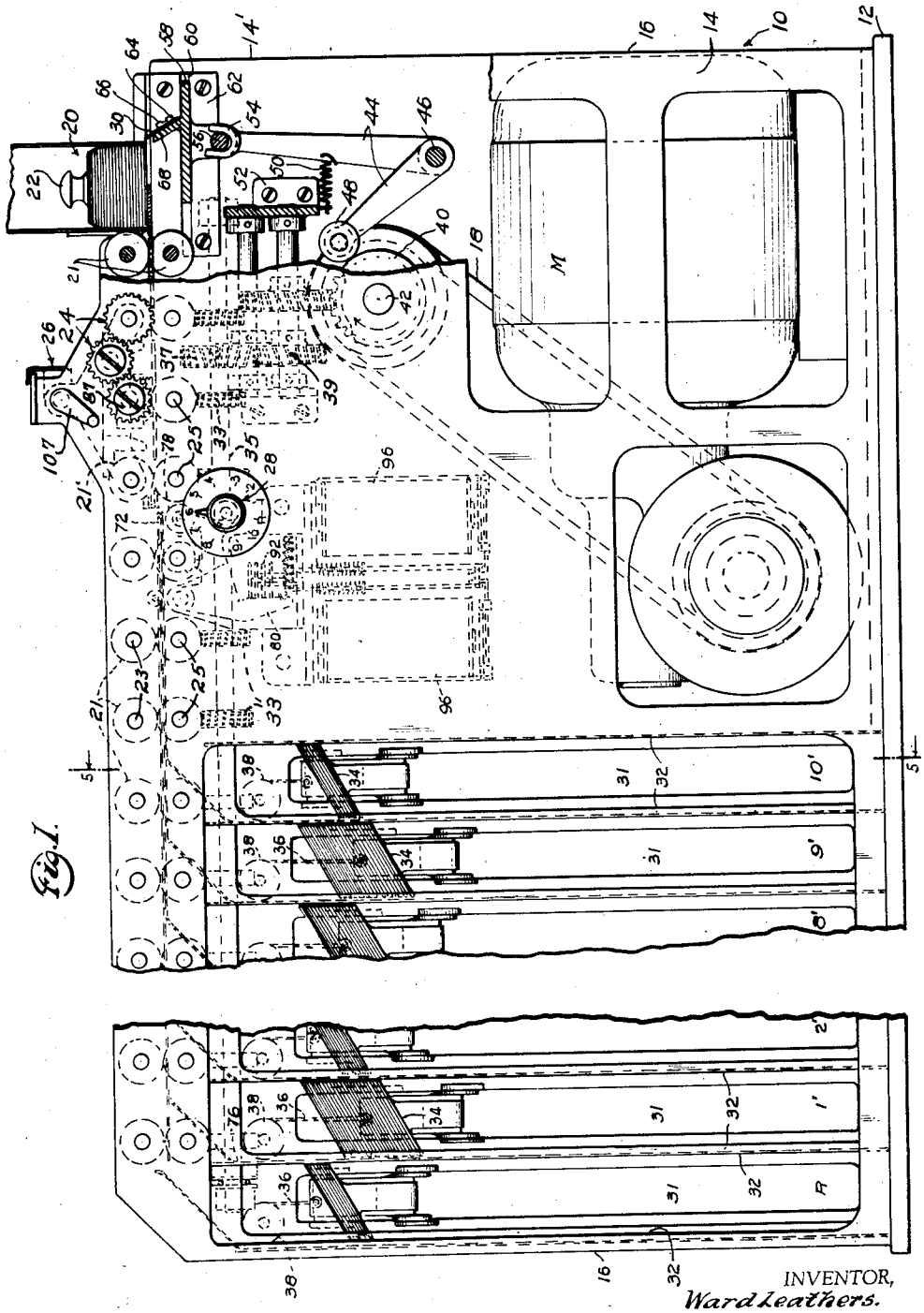

Fig. 1.

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SENSING MECHANISM

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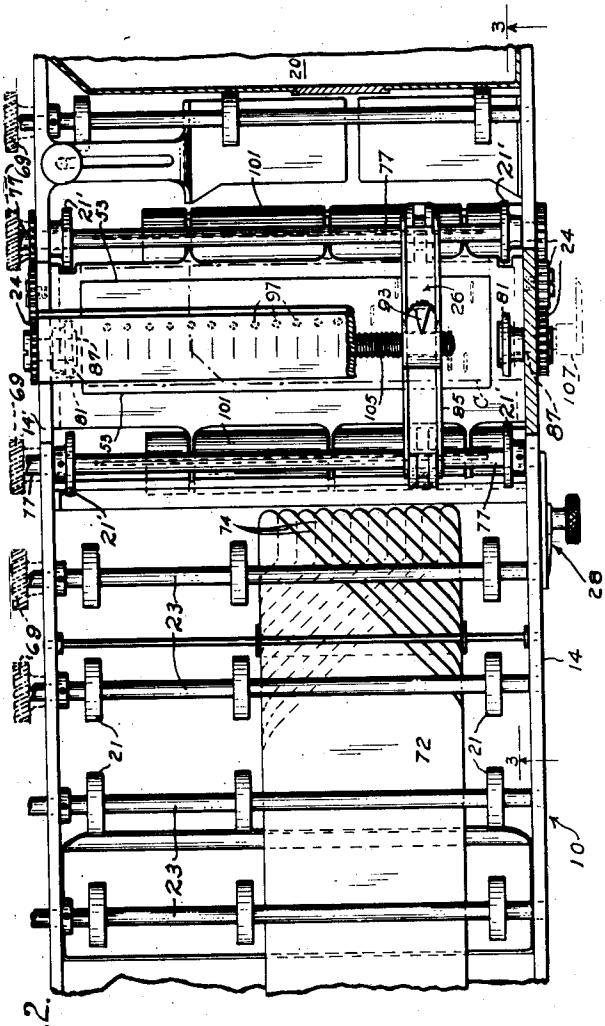

Fig. 2.

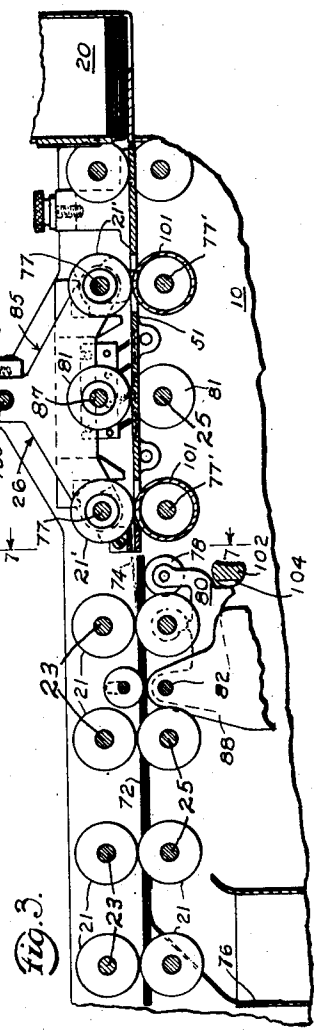

Fig. 3.

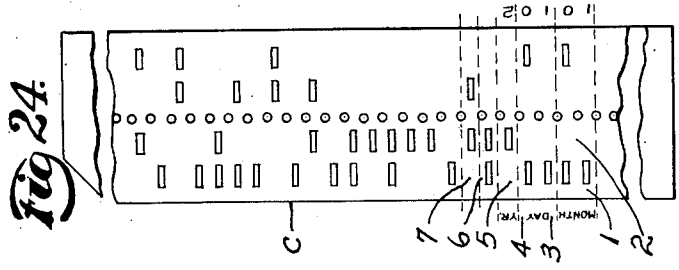

Fig 24.

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SENSING MECHANISM

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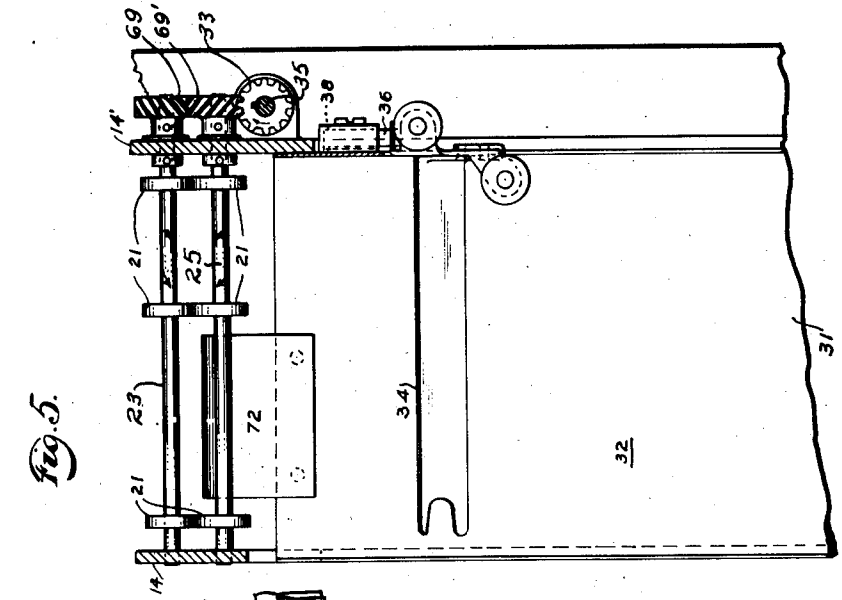

Fig. 5.

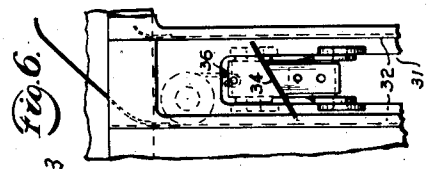

Fig. 6.

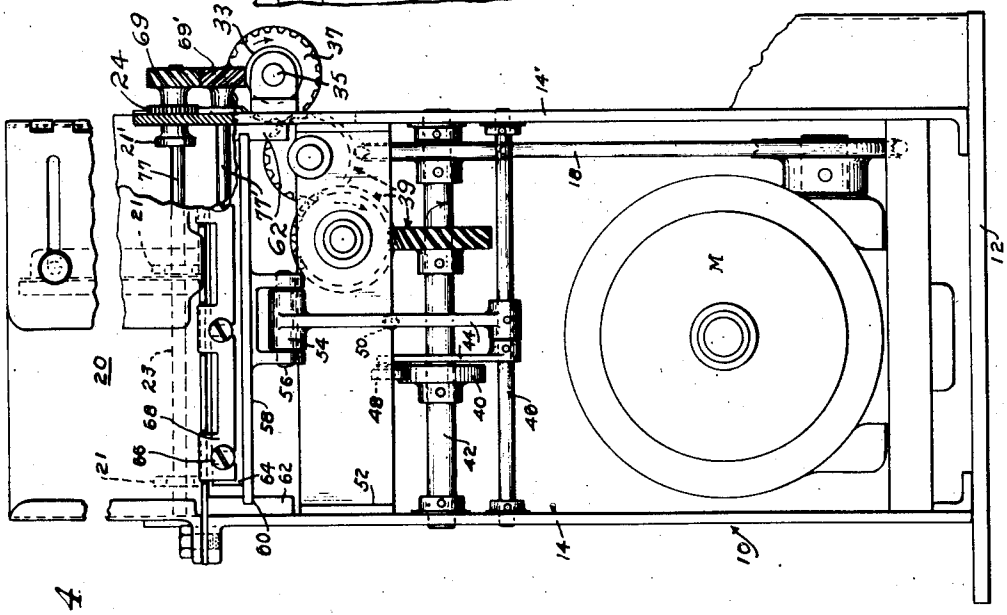

Fig. 4

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SENSING MECHANISM

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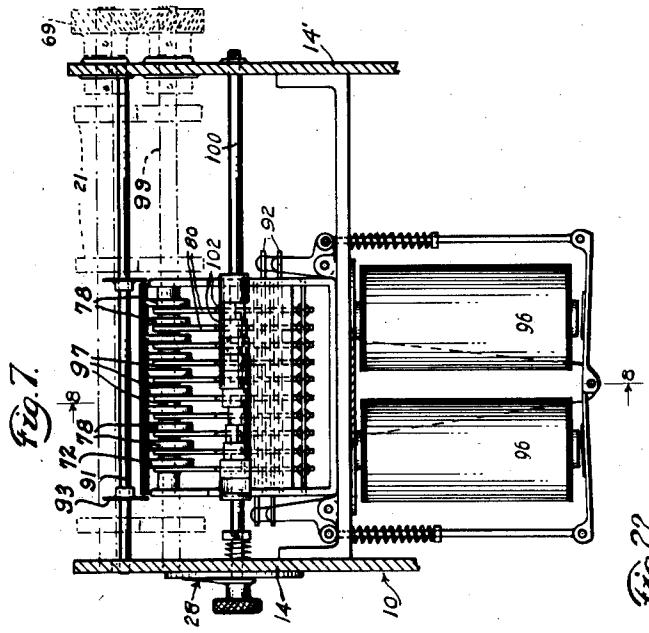

Fig. 7.

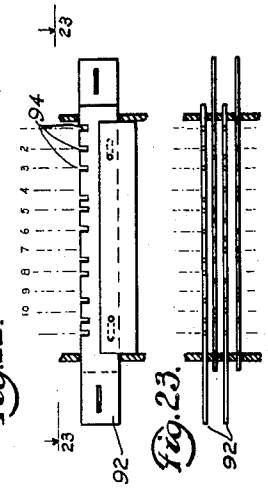

Fig. 22.

Fig. 23.

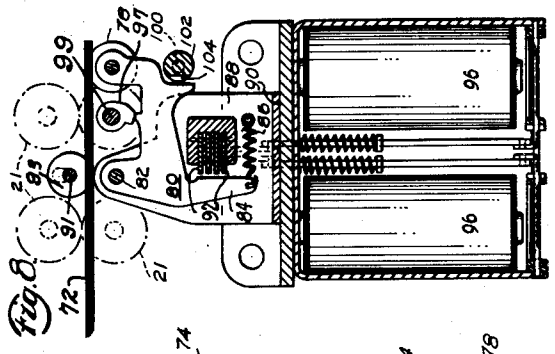

Fig. 8.

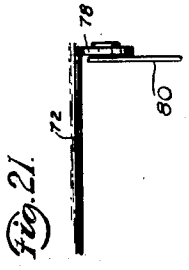

Fig. 21.

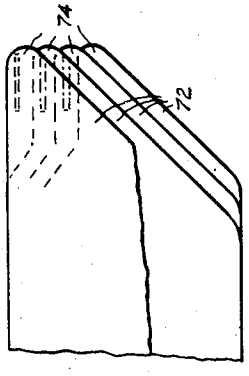

Fig. 19.

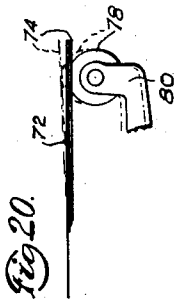

Fig. 20.

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SENSING MECHANISM

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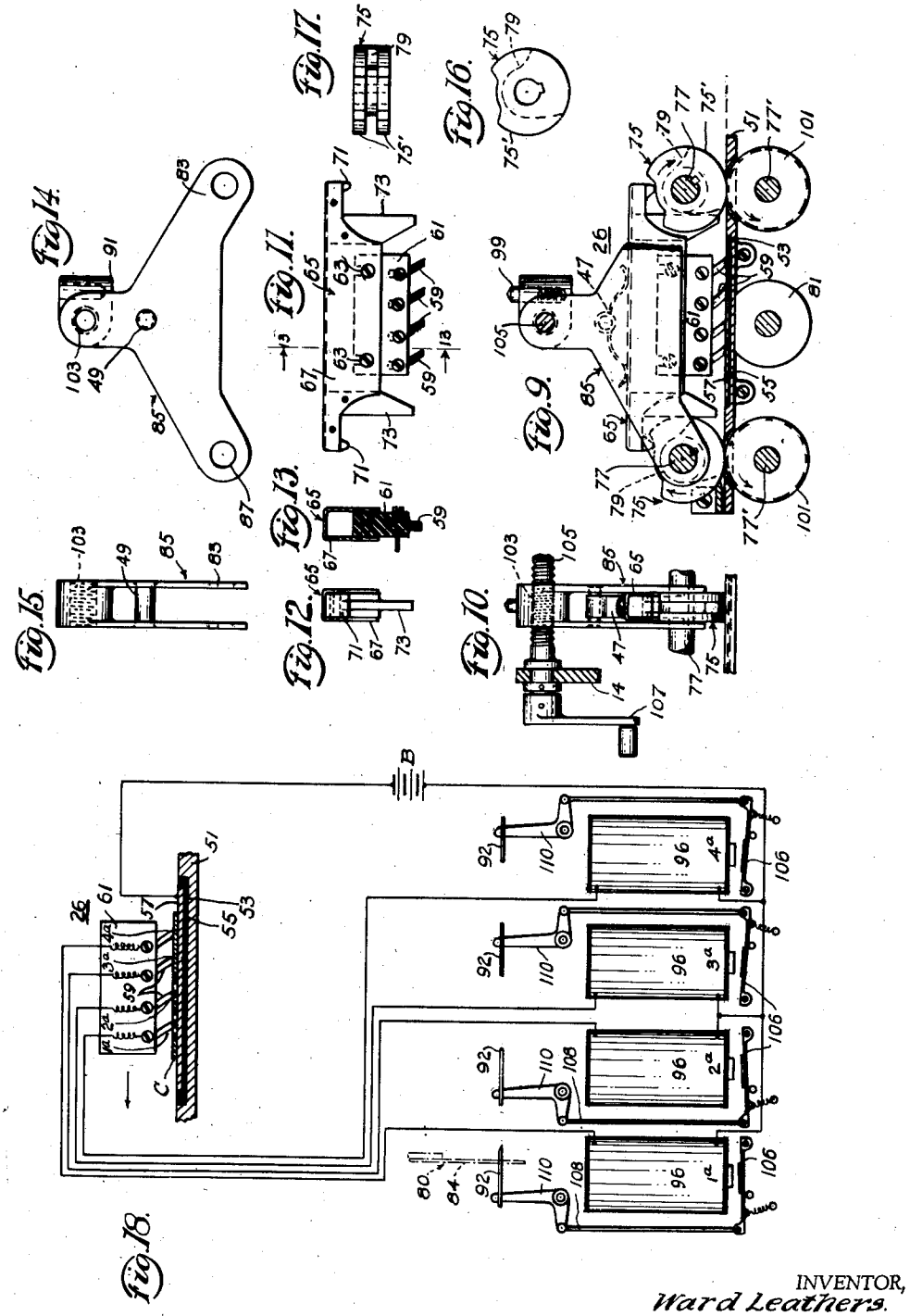

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Patented Feb. 26, 1946 2,395,557

UNITED STATES PATENT OFFICE

2,395,557

SENSING MECHANISM

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Application July 7, 1943, Serial No. 493,766

3 Claims. (Cl. 235—61.11)

The present invention relates to sensing mechanism for sorting machines adapted to sort perforated records of the type in which code perforations are provided in adjacent columns. Such records ordinarily represent in code form, by means of the arrangement of perforations, a plurality of different characters and it is the purpose of a sorting machine to sort such records so as to selectively segregate the records in accordance with the character representations.

The present invention has been illustrated herein in connection with machines for sorting small record cards or tokens, as they are sometimes called, which have been severed from a continuous strip of record media, such as telegraphic tape. Additionally, the present disclosure is concerned with the sorting of such a record media bearing only numerical character representations, with the representations being produced according to a simple four-line code. Such limitations of disclosure have been resorted to purely for convenience of illustration and simplicity, and it is to be distinctly understood that the invention may by suitable modification be designed for use in the sorting of larger standard size record cards which may be perforated according to an alphabetical as well as a numerical code.

As will be apparent presently, apparatus which is constructed according to the present invention differs materially both as regards its structural features and its principle of operation from conventional sorting machines now on the market, and principal among these differences is the use of a novel form of sensing mechanism wherein the sensing brushes or pins, as the case may be, are caused to reciprocate and by their reciprocation travel for a short period of time in the direction of movement of the cards and at the same rate of speed, with the individual sensing brushes or pins in actual sensing position and forming contact with the common sensing bar through the perforations in the selected character position in the case of a single character sensing device or in the selected field in the case of a multiple sensing device. By such an arrangement the duration of contact between the individual sensing devices and the common contact plate may materially be increased for any given rate of movement of the cards and, as a consequence, the rate of operation of the machine in its entirety may be stepped up to speeds of operation hitherto unattained with conventional present day sorting machines having stationary brushes.

The provision of an apparatus possessing the features outlined above being the principal object of the invention, other objects and advantages thereof will become apparent hereinafter.

In the accompanying five sheets of drawings forming a part of this specification, one embodiment of the invention has been illustrated. In these drawings:

Fig. 1 is a fragmentary side elevational view of a sorting machine constructed in accordance with the principles of the present invention. In this view certain portions of the machine framework have been broken away to more clearly reveal the nature of the invention.

Fig. 2 is an enlarged detailed fragmentary plan view showing the sensing mechanism and card deflecting plates.

Fig. 3 is a sectional view taken substantially along the line 3—3 of Fig. 2.

Fig. 4 is an end elevational view of the structure shown in Fig. 1.

Fig. 5 is a sectional view taken substantially along the line 5—5 of Fig. 1.

Fig. 6 is a fragmentary side elevational view of one of the card compartments together with its spring actuated card shelf.

Fig. 7 is a sectional view taken substantially along the line 7—7 of Fig. 3.

Fig. 8 is a sectional view taken substantially along the line 8—8 of Fig. 7.

Fig. 9 is an enlarged detail front elevational view of the sensing mechanism, certain parts being broken away to more clearly reveal the details thereof.

Fig. 10 is a side elevational view of the structure shown in Fig. 9.

Figs. 11 to 17 inclusive are detailed views of certain individual elements which cooperate when assembled to make up the sensing mechanism.

Fig. 18 is a diagrammatic view showing the electrical connections employed in connection with the sensing mechanism.

Fig. 19 is a fragmentary plan view of a group of deflector plates employed in connection with the present invention.

Fig. 20 is a side elevational view of the structure shown in Fig. 19.

Fig. 21 is an end elevational view of the struture shown in Fig. 19.

Fig. 22 is a top plan view, diagrammatic in its representation, of a series of permutation bars employed in connection with the present invention.

Fig. 23 is a side elevational view of the structure shown in Fig. 22.

Fig. 24 is a fragmentary plan view of a typical

record card or token employed in connection with the present invention.

In all of the above described views like characters of reference are employed to designate like parts throughout.

In order to facilitate an understanding of the operation of the machine, Fig. 24 shows a typical record card C or token arranged to compile a sales or other record. This card is perforated according to a selected code which is concerned only with the figures of the Arabic numeral system. The perforations appearing in the card are formed therein according to a simple four-line code.

Referring now to Fig. 1, wherein a side elevational view of a sorting machine embodying the present sensing mechanism is shown, the frame 10 is suitably mounted upon a base 12 and includes more or less open frame-like side portions 14 and similar frame-like end portions 16. Disposed within the framework and suitably supported on the base 12 is a motor M which drives the machine by means of a belt and pulley arrangement 18.

In handling the tabulating record cards or tokens, they are carefully stacked by the operator and then placed in the feed magazine which is designated at 20 with a weighting plate 22 resting thereupon so that when there are only a few cards remaining in the stack there will be enough weight on them to prevent them from becoming displaced from their true positions by the rapid action of the picker mechanism. The operator, by means of a crank handle 107, Figs. 1 and 10, moves the sensing assembly 26 so that it will register with the desired index column on the cards as they pass under it and he also, by means of a knob and pointer assembly 28 arranges the machine to give the kind of sort he desires. He then sets the motor into operation by means of any suitable electrical control not shown. The picker 30 commences to reciprocate and feeds the cards one by one from the bottom of the stack to the sensing device or analyzer from whence passage of each card is directed to one of eleven receiving stations, labeled consecutively R, 1', 2', 3', 4', 5', 6', 7', 8', 9', 10'. Passage of the cards from the feed magazine 20 through the analyzer and across the machine to its respective bins is accomplished by means of succeeding pairs of conveyor rolls 21, as will be set forth presently.

Each receiving station consists of a compartment or bin 31 formed by vertical walls 32 in which there is disposed an inclined tray 34 carried at its side edges by means of weighted straps 36 that pass over rollers 38, the weighting of the straps 36 being such that the cards will gradually sink into the bin as the load of cards increases, thus always maintaining the top of the stack at or near the top of the bin so that newly arrived cards will have but a slight distance to fall and consequently will have no opportunity to turn over or otherwise become disarranged.

The feed mechanism for removing the cards one at a time from the bottom of the stack provided in the feed compartment 20 is best illustrated in Figs. 1 and 4, and comprises a rotary picker cam 40 carried on a horizontal shaft 42 that extends transversely of the machine and which is driven by the pulley arrangement 18. A bell crank lever 44 supported on a rock shaft 46, also extending transversely of the machine, is provided with a follower 48 which is normally maintained in engagement with the surface of the cam 40 by means of a coil spring 50 anchored at one end to the lever 44 and at the other end to a stationary bracket 52. One arm of the lever 44 is bifurcated or forked as at 54 and the bifurcations thereof serve to straddle a pin 56 carried at the underneath side of a reciprocable picker carriage 58. The carriage 58 is capable of limited to and fro movement lengthwise of the machine beneath the feed magazine 20 and, toward this end, it is slidably mounted in guideways 60 existing in a pair of side plates, one of which is shown at 62 and which are bolted in opposing relationship to the insides of the side walls 14 of the framework 10. The carriage 58 carries on its upper surface a picker supporting bracket 64 to which there is bolted or otherwise secured as at 66 the picker proper 68. The vertical extent of the picker 68 may be adjusted by loosening the fastening means 66 therefor.

The picker cam 40 is so contoured and the bell crank lever 44 is so designed according to engineering exigencies that the rearward limit of travel of the picker 68 will bring this member barely clear of the rear edge of the lowermost card in the stack contained within the feed magazine 20. The cam 40 is designed for rapid acceleration during its forward stroke commencing from a stationary position. Because of the fact that no clearance between the picker 68 and the rear edge of the card is tolerated in the initial starting position of the picker, the rapid acceleration provided for will not cause damage to the cards and the cards will leave the picker at a very high rate of speed, which rate of movement will be continued by virtue of the driving feed rollers 21. The openings at the bottom of the feed magazine 20 are adjusted so that only one card may pass at a time. Each card is impelled by the picker blade until it is seized by the first pair of feed rolls 21 in the series. In passing from the feed magazine 20 through the sensing device 26 to the several receiving stations, the cards are drawn along between successive pairs of upper and lower feed rolls 21 which are so spaced apart that each pair of rolls receives the individual cards before they have passed completely from the preceding pair. The feed rolls 21 are carried upon a series of upper and lower horizontal shafts 23 and 25 respectively. The rear ends of each of the shafts 23 and 25 have mounted thereon meshing spiral gears 69 and 69' respectively, the latter gears meshing with a series of driving gears 33 which are mounted upon a shaft 35 that extends longitudinally of the machine (see Figs. 1 and 5). The shaft 35 also carries a gear 37 which is adapted to be driven from a gear train, which is designated in its entirety at 39, and which in turn derives its motion from the belt and pulley arrangement 18.

The sorting or distributing system is best illustrated in Figs. 2 and 3 and comprises means for selectively guiding the cards leaving the sensing device 26 into the different sorting bins. This means includes a series of adjustable sorting plates 72 (Fig. 19) having staggered or offset ends 74, there being provided one sorting blade for each of the sorting bins and the rear end of each blade terminating at the respective sorting bin and being attached to the rear wall of the latter as at 76 (Fig. 3) so as to cause the card to be sorted and guided into the related sorting bin. The leading staggered edges 74 of the various sorting blades 72 terminate in a common transverse vertical plane, as shown in Figs. 8 and 19, and the forward exposed underneath portion of each blade rests upon a lifting roller 78 carried upon a rela-

tively thin vertically disposed lifting plate 80, there being an individual roller and plate for each blade and all of the plates being pivotally mounted upon a horizontal supporting shaft 82 positioned adjacent the path of movement of the cards between the impelling traction feed rollers 21. The plates 80 are each provided with downwardly projecting extensions 84, all of which are disposed in transverse alignment and each of which is normally biased, as shown in Fig. 8, in a forward direction by means of coil spring 86 suitably anchored to a bracket 88 mounted on a shelf 90 disposed within the machine framework. The plates 80 are normally maintained in their lowermost position of tilting by means of a series of notched permutation bars 92 which are arranged in close proximity to each other in stacked relationship, as shown in Figs. 8, 22 and 23. The rear edges of each of the permutation bars 92 are provided with a series of decoding notches 94 capable of being brought into alignment when the bars are shifted longitudinally of themselves and transversely of the machine under the influence of a corresponding number of decoding magnets 96 (see Figs. 8 and 18). The magnets 96 are disposed in respective electrical circuits adapted to be selectively energized under the control of the sensing device 26. Inasmuch as the code which has been selected for the purpose of illustration is a four-line code, only four sensing brushes are required and, as a consequence, only four magnets 96 are required to produce selective movement of the plates 80, by means of which the sorting blades 72 are actuated to direct the cards to one of the sorting bins 31. In the event that no perforations appear at the particular column undergoing sensing none of the sorting magnets 96 will become energized and the permutation bars 92 will remain in their normal position, thus causing all of the plates 80 to remain in their lowermost position of tilting, whereupon the card being fed by the rollers 21 will pass along the upper surface of the uppermost sorting blade 72 and be conducted to the last bin in the series. This bin is commonly known as the reject pocket and has been labeled R accordingly.

In the event that one or more of the sorting magnets 96 becomes energized under the influence of the sensing device 26, the permutation bars 92 will be shifted in such a manner that, depending upon alignment of the notches 94 according to the selected code, one of the plates 80 will become tilted in a counter-clockwise direction, as seen in Fig. 20, to elevate the lifting roller 78 and raise the particular sorting blade 72, with which it is in contact, slightly so that the leading edge of the card being fed may pass therebeneath and be guided by this particular blade to the related sorting bin. In general, the position of the leading edge of the card with relation to the ends 74 of the sorting blades 72 immediately after energization of one or more of the sorting magnets 96 will determine into which sorting bin that particular card will be guided. For carrying out proper operation of the sorting magnets 96, these magnets must be energized by receiving electrical impulses effected at different times in accordance with the digits which are perforated in code form in the cards and which control the various sorting operations. Referring now to Figs. 7 and 8, a horizontal shaft 91 extends across the framework of the machine and carries thereon a pair of guide discs 93 which project downwardly a slight distance beyond the edges of the various stacked sorting blades 72 to prevent lateral shifting movement of these blades. The shaft 91 and discs 93 are stationary.

A plurality of cam members 97 are mounted upon a shaft 99 which may be one of the shafts carrying two of the rolls 21. These cams 97 are designed for cooperation with respective lifting plates 80 for the purpose of restoring them to their normal positions after they have been elevated.

Means are provided whereby out of a stack of promiscuously arranged cards in the feed magazine 20 the various cards may be conducted to any or all of the sorting bins 31 wherein they belong. However, in an instance where, for example, the operator desires to segregate from the stack cards of a common variety, means are provided whereby all but one of the various lifting plates 80 may be locked in a selected predetermined position so as to allow only one plate freedom of movement. With the remaining plates locked in their retracted clockwise position of tilting, whenever, in the sensing device 26, a card is encountered that belongs to the selected variety, the permutation bars 92 will move to such relative positions as to allow the single free lifting plate 80 to become tilted, thus elevating its corresponding sorting plate 72 and causing the card to pass beneath this latter plate to the corresponding bin.

The locking means just referred to comprises a horizontal shaft 100 which extends transversely beneath the group of lifting plates 80. Mounted upon and rotatable with the shaft 100 are a series of cam members 102 each having a flat surface 104 which, when the cam is positioned with this surface extending parallel to the forward edge of its respective member 80, allows this member freedom of movement. The shaft 100 projects outwardly beyond one side 14 of the framework 10 and carries at its projecting end the knob and pointer mechanism 28 previously referred to. By turning the knob and pointer mechanism according to a selected indication, the various cam members 104 may be so turned as to lock all of the lifting plates 80, except the one which it is desired to have freedom of movement, in their inoperative positions. While there are eleven sorting bins, including the reject bin, there are but ten sorting plates 72 and ten lifting plates 80 and ten locking cams 102, inasmuch as the reject bin is always open for reception of any card which has not been entrapped by one of the sorting plates 72 for conduction to one of the preceding bins in the series.

The sensing device 26 is shown in Figs. 1, 2 and 3, but is illustrated in detail in Figs. 9 to 15 inclusive, while its application in the machine is diagrammatically illustrated in Fig. 18. This sensing mechanism involves in its general organization a bed plate 51 having a shallow transverse recess or channel 53 formed therein. An insulating pad 55 completely fills the recess 53 and serves to support thereon a common contact plate 57 which forms a common return line for the various sorting magnets 96, and which is adapted to be selectively engaged by one or more of a series of sensing brushes 59, which latter brushes are adapted to project through the perforations formed in the cards undergoing sensing when the latter are in position on the plate 57.

The sensing brushes 59 are in the form of wire bundles, Fig. 11, the upper ends of which are grouped together and supported in an insulating block 61 which is adjustably supportd by means of clamp screws 63 in an inverted U-shaped frame

65 having side walls 67 which extend downwardly in parallelism. The frame 65 is formed with a pair of downwardly extending lugs 71 at opposite ends thereof and with an additional pair of lugs 73, each of which is positioned a slight distance inwardly from the ends of the frame 65. The lugs 71 serve as vertical lifting followers for the frame 65, while the lugs 73 serve as horizontal impelling followers for the frame. The followers 71 and 73 are designed to be operated upon by a plurality of rotatable cam members 75 which are integral in construction and arranged in groups of three and are positioned upon and designed for rotation with a pair of respective shafts 77 (see Figs. 2, 3 and 8). A pair of rollers 101, designed for rotation by a pair of shafts 77' and located directly below the shafts 77, are rotatably supported in the side frames 14 and 14' and are adapted to drive the card while passing through the senser. The shafts 77 and 77' project outwardly beyond the back side walls 14' of the framework 10. The shafts 77 are provided with feed rollers 21' and carry at their rear ends gears 69, while the shafts 77' have mounted thereon gears 69' (Fig. 4), the latter gears meshing with gears 33, which in turn are driven from the gear train 39 as shown in Fig. 1.

The groups of rotary cams 75 each consists of three cam discs arranged in close proximity to one another on the shafts 77 and slidably keyed thereto in order that the sensing unit as a whole may be shifted transversely of the machine on the shafts 77 in order that the sensing brushes 59 may be brought into register with a selected column in the card to be sensed. The U-shaped frame 65 is positioned between the side walls 83 of a generally triangular U-shaped outer frame member 85. The side walls of the member 85 are bridged by a relatively short thrust pin 49 which is positioned directly above the U-shaped frame 65. A leaf spring 47 bears upwardly in its medial regions against the pin 49 and its outer ends push downwardly on the top of the framework 65, thus normally serving to urge the movable portions of the brush carriage downwardly. The ends of the spring 47 are bowed slightly so as to offer a minimum amount of frictional resistance to the horizontal component of movement of the carriage. The frame member 85 is provided with apertures 87 in the side walls thereof through which the shafts 77 extend. As shown in Figs. 3 and 14, the upper end of the U-shaped member 85 is formed with a block portion 91 to which there is secured a pointer 93 which overlies a horizontal transverse bar 95 that extends across the framework of the machine in the upper regions thereof. The bar 95 is formed with a suitable graduated scale or the like by means of which the location and identity of the various index columns provided in the cards undergoing sensing may be determined. The underneath side of the bar 95 is formed with a plurality of small transversely spaced indentations 97 designed for cooperation with a spring pressed follower 99, thus making it possible to place the carriage of the sensing device 26 in an exact location for each selected column of the cards.

The block portion 91 formed at the upper end of the U-shaped member 85 is provided with a threaded bore 103 in which there is received and through which there extends a threaded adjusting bar 105 (see Fig. 2). The adjusting bar 105 projects outwardly beyond one side 14 of the framework 10 and is provided with an operating handle 107, by means of which the bar 105 may be rotated. By rotating the operating handle 107 the transverse position of the sensing assembly 26 may be varied in order to select any one of the numerous index columns of the cards undergoing sensing.

The two groups of cam members 75 are substantially identical both as regards their construction and their orientation on their respective shafts 77. The two outer discs 75' of each group are designed for cooperation with the lifting followers 71 in raising the oscillatable brush carrying frame 65, while the inner cam 79 of each group is designed for cooperation with the follower 73 in imparting to and fro movement to the frame 65 in a horizontal direction. The inner and outer cams 75' are so oriented with respect to each other that upon rotation of the shafts 77 in unison in the same direction the movable carriage formed by the insulating block 61 and frame 65 will be moved in a horizontal direction over the surface of the bedplate 51 at the same rate of speed as the card traveling along this bed plate therebeneath. Exact registry of the brushes with the perforations provided in the column undergoing sensing is attained by virtue of the design of the cam members 75', which in addition to serving their impelling function on the oscillatable carriage also serve in cooperation with the series of rollers 101 therebeneath as feed rolls for the cards. A pair of rollers 81 are rotatably supported on the inner side of each of the frames 14, 14' and are adapted to move the cards under the sensing device. The upper rollers 81 are mounted upon a stud 87 and are driven by a gear train 24 (see Fig. 1) which operates under the influence of the shaft 77. The lower rollers 81 are carried by a shaft 25 which is driven by a gear 33, shaft 35 and gears 37 and 39. During that period of time while the frame 65 is moving in a horizontal direction rearwardly, the brushes will remain in register with such perforations as they may encounter in the column undergoing sensing and, as a consequence, such brushes as do register with the sensed perforations will make electrical contact with the insulated contact plate 57. A period of time during which electrical contact is established between the brushes 59 and plate 57 is of relatively long duration due to their common period of travel. As the oscillatable frame 65 approaches the limit of its rearward stroke, the two outer cam discs 75' of the two groups of cams will cooperate with the lifting follower 71, thus raising the sensing carriage and brushes 59 out of contact with the plate 57 and with the card, thus freeing the latter in order that the same may pass into the distributing mechanism previously described. The carriage is then in its elevated position and is again moved forwardly and is subsequently lowered for registry and engagement with the next succeeding card in the series of cards undergoing sensing. Rotation of the groups of cams 75 may be relatively rapid in order that a high speed of oscillation will be imparted to the sensing carriage. Despite the relatively high speed of oscillation that may be obtained by the sensing carriage, the duration of contact between the sensing brushes and the contact plate 57 through the perforations in the card C will be relatively long considering the fact that the cards and sensing carriage are moving in the same direction and at the same rate of speed.

Referring now to Fig. 18 wherein the electrical connections for the four sorting magnets 96 and for the sensing device 26 are diagrammatically shown, each of the sensing brushes 59 is elec-

trically connected to one terminal of the winding of a respective electromagnet. For convenience of illustration, the four sensing brushes, each of which is adapted to sense a particular index point position in a column, have been labeled *1a*, *2a*, *3a* and *4a* and their respective magnets have been similarly labeled. The other terminal of the winding of each magnet **96** is electrically connected to one side of the battery B or other source of current supply. The battery is also connected to the common sensing plate **57** carried in the insulating pad **55** contained in the recess **53** of the bed plate **51**. Each of the electromagnets **96** is provided with an armature **106** which is connected by a link **108** to one end of a bell crank lever **110**, the other end of the lever being connected to one of the permutation bars **92**. In Fig. **18** the permutation bars **92** are, for convenience of illustration, shown as being arranged in alignment but it will, of course, be understood that these permutation bars are actually arranged in side by side relationsnip as previously set forth and as shown in Figs. 8 and 23.

Because of the fact that during the actual sensing operation as performed by the four brushes **59**, the brushes do not move relative to the card, such brush or brushes as may have occasion to engage the common contact plate **57** will remain in contact with this plate for a relatively long period of time as compared to conventional sensing devices wherein the cards move rapidly past the brushes. This feature is of paramount importance in connection with the present invention and by virtue thereof the magnets **96** corresponding to those brushes which become operative will remain energized for a correspondingly longer period of time. Upon energization of one or more of the magnets **96**, shifting of their respective permutation bars **92** will take place, and because of the fact that the magnets do remain energized for a relatively long period of time the permutation bars **92** will assume their adjusted positions and remain in these positions for an ample period of time to allow the lifting plates **80** to register and fall into the slots **94** formed in the adjacent edges of the permutation bar and assume definite fixed positions therein. When this occurs, the lifting rollers **78** associated with the lifting plates **80** bear upwardly against the underneath surface of their respective deflecting plates **72** and cause an entrance to be created between two adjacent plates for the cards passing from the sensing device **26**. Were it not for the fact that the sensing carriage, including the brushes **59**, insulating block **61** and frame **65**, move in unison with the cards undergoing sensing during a fraction of each cycle of oscillation thereof the magnets **96** would not, under high speed conditions of operation, become fully energized or at least they would not remain energized a sufficient length of time to permit the lifting plates **80** to fall into their positions of registry within the aligned slots in the permutation bars **92**. Thus it will be seen that by such an arrangement the speed of operation of the machine, and consequently the rate at which cards may be passed therethrough, is materially increased.

In the form of the invention illustrated, the sensing brushes are caused to travel with the cards and effect an electrical connection for the sorting magnets while they are moving throughout a distance equal substantially to one and one-half times the length of a card perforation. In conventional sorting machines in which the sensing brushes or pins are stationary and the cards are pulled past the stationary brushes, a relatively small period of time elapses during which a brush is allowed to enter one of the perforations in the card. Thus, the rate of feed of the cards is limited by the length of time which it takes to completely energize the sorting magnet. In the present instance, however, the length of time that the sensing brushes or pins make their electrical contact is many times greater than in the case of stationary sensing brushes and, therefore, the limit of speed of the machine is based not upon any consideration of duration of electrical contact but upon the mechanical ability of the machine elements to withstand rapid movement.

The invention is not to be limited to the exact arrangement of parts shown in the accompanying drawings or described in this specification as various changes in the details of construction may be resorted to without departing from the spirit of the invention. Only insofar as the invention has been particularly pointed out in the accompanying claims is the same to be limited.

What is claimed is:

1. A record controlled machine including analyzing means for successively analyzing columnar index points in perforated records while the latter are in motion, an analyzing station, means for successively moving the records past said station in a columnar direction at a predetermined rate of speed, said analyzing means comprising a stationary frame positioned at said analyzing station, a carriage mounted in said frame for vertical movement and for horizontal movement in the direction of travel of the records, a plurality of sensing elements mounted on said carriage and movable therewith, cam means for imparting a vertical component of movement to the carriage, additional cam means for imparting a horizontal component of movement to the carriage and means for concurrently operating each of said cam means so as to cause the carriage to move in a closed path whereby the sensing elements will move into sensing engagement with successive records moving past said analyzing station and travel with said records a predetermined distance while maintaining such sensing engagement.

2. A record controlled machine including analyzing means for successively analyzing columnar index points in perforated records while the latter are in motion, an analyzing station, means for successively moving the records past said station in a columnar direction at a predetermined rate of speed, said analyzing means comprising a stationary frame positioned at the analyzing station, a carriage mounted in said frame and having both horizontal and vertical components of movement therein, a plurality of sensing brushes mounted on said carriage, a pair of rotary cams having cam surfaces thereon bearing against said carriage and adapted upon rotation of the cams to move the carriage horizontally during which movement said brushes are adapted to sense the perforations in the records, an additional pair of rotary cams having cam surfaces bearing upon said carriage and adapted upon rotation thereof to move said carriage vertically to withdraw said brushes from sensing engagement with the records, and means for rotating said cams in unison.

3. A record controlled machine including analyzing means for successively analyzing columnar index points in perforated records while the records are in motion, an analyzing station, means

for successively moving the records past said station in a columnar direction at a predetermined rate of speed, said analyzing means comprising a stationary frame positioned at said analyzing station, a carriage mounted in said frame for vertical movement and for horizontal movement in the direction of travel of the records, a plurality of sensing elements mounted on said carriage and movable therewith, said carriage being provided with a pair of vertically disposed cam engaging surfaces and with a pair of horizontally disposed cam engaging surfaces, a pair of complementary rotary cams each of which is designed for engagement with one of said vertically disposed cam surfaces and operable upon rotation thereof to impart a horizontal component of movement to said carriage, a second pair of rotary cam members each of which is designed for cooperation with said horizontally disposed cam surfaces and operable upon rotation thereof to impart a vertical component of movement to said carriage, and means for concurrently operating each of said cam means so as to cause the carriage to move in a closed path whereby the sensing elements will move into sensing engagement with successive records moving past said analyzing station and travel with said records a predetermined distance while maintaining such sensing engagement.

WARD LEATHERS.