

Dec. 7, 1943.

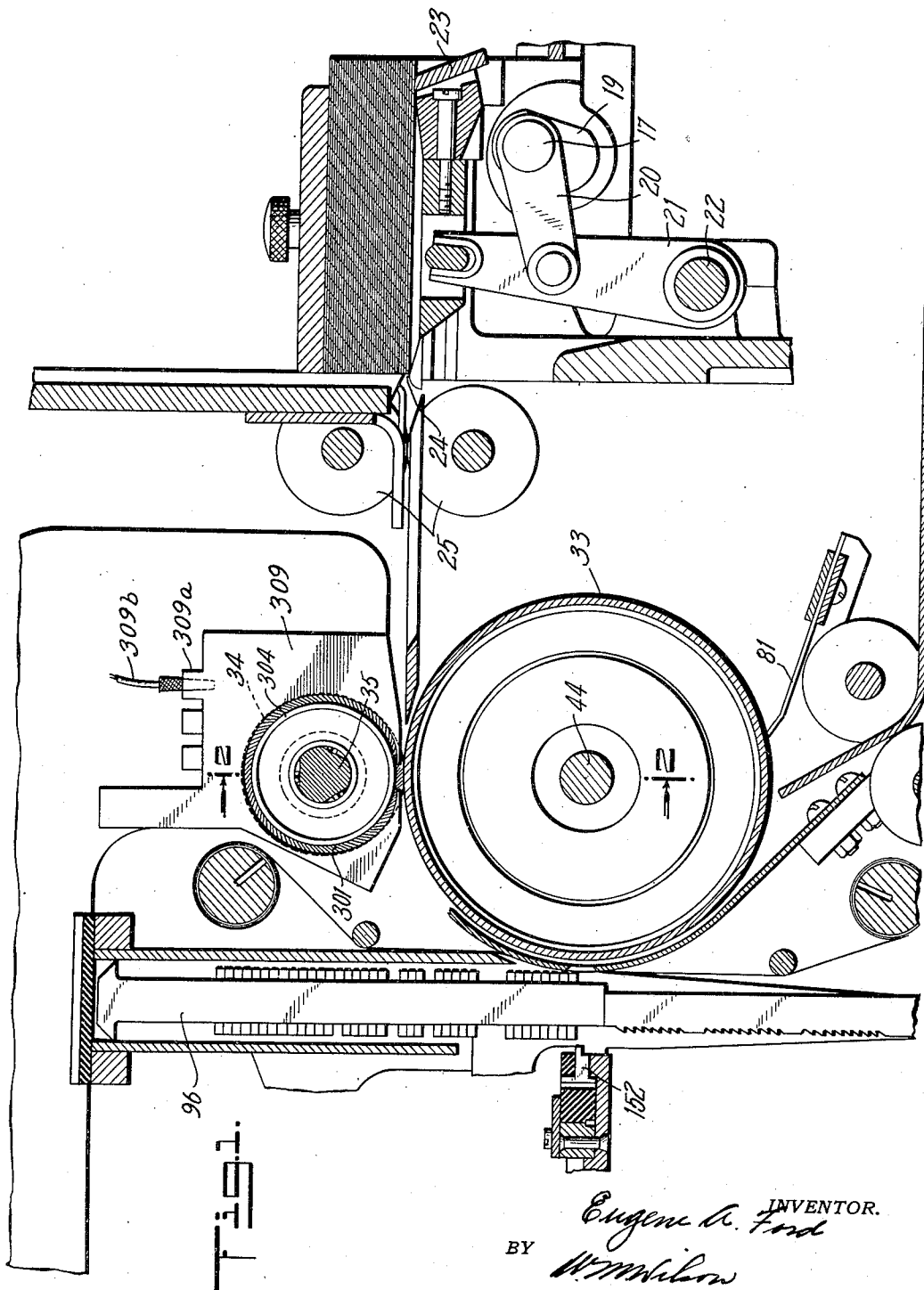
E. A. FORD

2,335,928

RECORD FEEDING AND SENSING DEVICE

Filed June 19, 1940

3 Sheets-Sheet 1



Dec. 7, 1943.

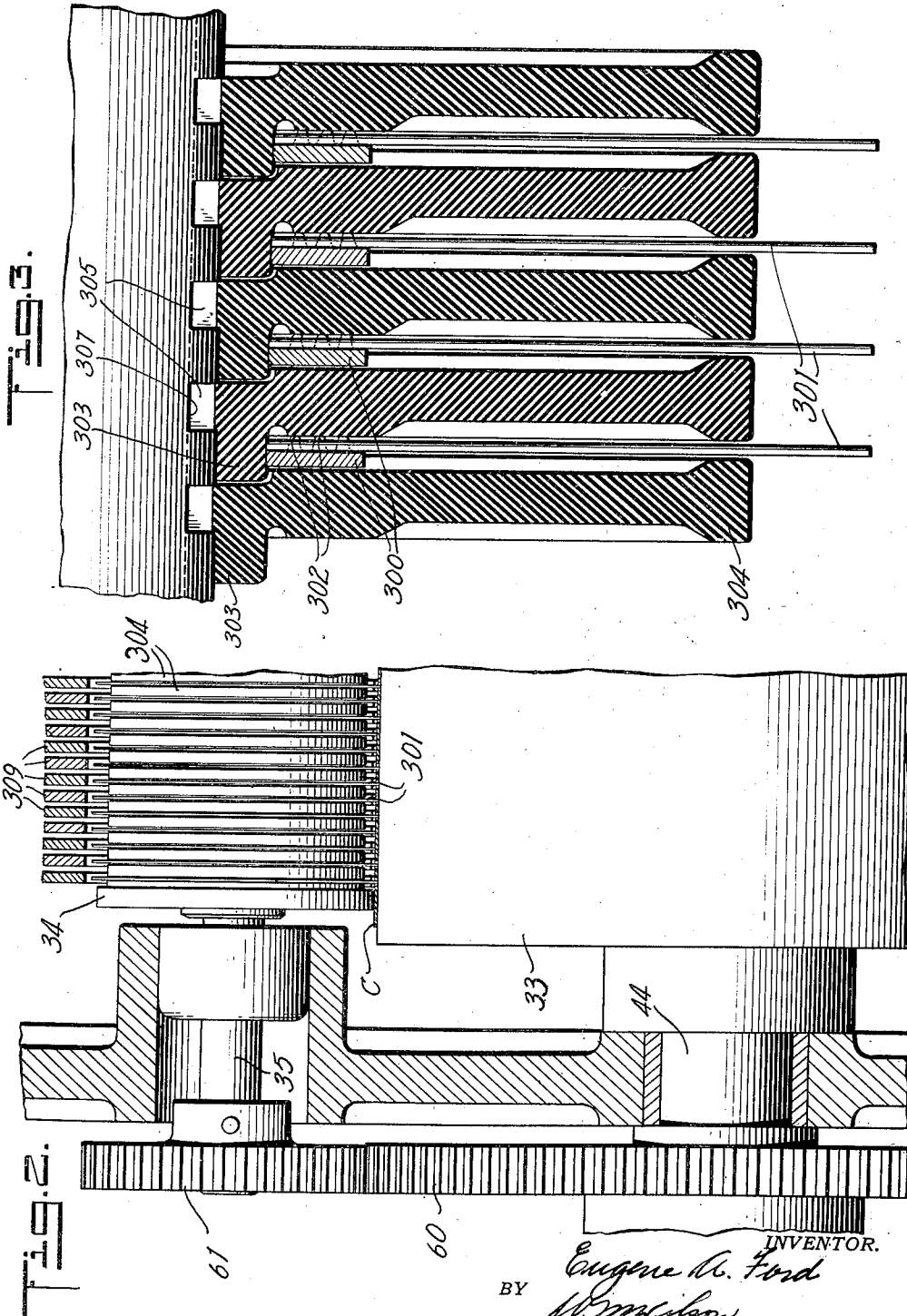
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Fig. 4.

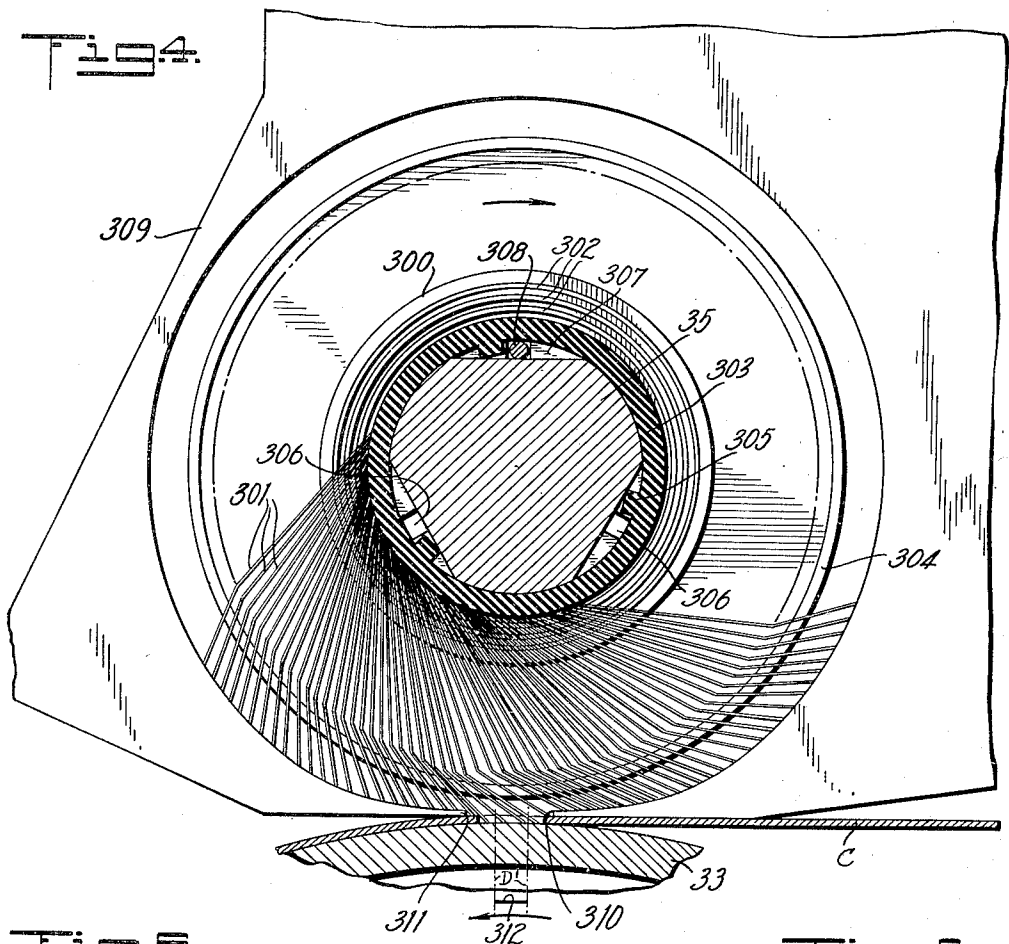


Fig. 5.

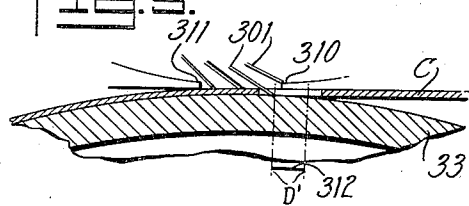
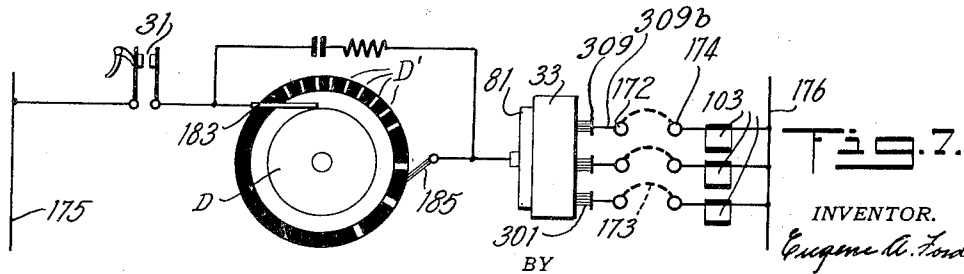
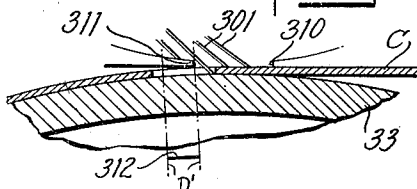


Fig. 6.



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2,335,928

RECORD FEEDING AND SENSING DEVICE

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Application June 19, 1940, Serial No. 341,273

8 Claims. (Cl. 235—61.11)

This invention relates to record card controlled statistical machines and more particularly to a machine such as is disclosed in my Patent No. 2,076,713, granted April 13, 1937. In the machine of such patent, record cards are fed in succession past a sensing device comprising a single row of wire brushes and a cooperating contact roller. As the cards arrive at the sensing device, their leading edges engage the brush ends and raise them from the roller, so that the card passes the brushes with the latter bearing upon the card and making electrical contact through the data designating perforations.

The rubbing of the cards against the brush ends causes wear of the brushes resulting in shortening thereof. It is one object of the present invention to provide a brush sensing device wherein the wear on the brushes, due to rubbing of the cards or records sensed thereby, is eliminated. This is effected by constructing the brushes on a rotating axle driven in synchronism with the card speed so that the brushes now "roll" over the card with no frictional resistance.

A special advantage of the sensing device of the present invention is obtained where the records are of the thickness of ordinary paper. Such thin records cannot be fed through a sensing device such as shown in the patent referred to, because the paper records do not have sufficient strength and rigidity to lift the fixed sensing brushes from their contact roller, with the result that the records become mutilated. The rotary brush structure of the present invention, on the other hand, offers no resistance to the feeding of such thin records and in fact assists their proper feeding.

A further object of the invention, therefore, is to provide an improved sensing device for handling paper-thin records.

A still further object is to provide an improved sensing device in which wear of the contact making parts is reduced and in which the time relationship of the entry of sensing brush strands into the record perforations is controlled within predetermined limits.

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 central section through the card feeding and sensing section of the machine.

Fig. 2 is an enlarged detail taken substantially along lines 2—2 of Fig. 1.

Fig. 3 is a further enlarged detail showing the brush structure and manner of assembly.

Fig. 4 is a further enlarged detail of one of the columnar brushes.

Figs. 5 and 6 are position views showing the action of the brush strands as a perforation in the record passes the sensing position.

Fig. 7 is a portion of the circuit diagram of the machine.

The general operation of the machine will first be briefly explained, utilizing the reference characters of Patent No. 2,076,713 for like elements, so that ready reference may be made to the patent for further details of construction and operation.

The records are advanced one by one from the bottom of the supply hopper by the picker 23 which is reciprocated in suitable guides by an oscillating lever 21 pivoted at 22. Oscillation is obtained through a link 20 connected at 17 to a crank 19. The advanced record passes through a throat 24 to feed rollers 25 which convey the card to the sensing position where it is gripped between the contact drum 33 and a cooperating roller 34. From here the card passes around with the drum to a printing position opposite a printing hammer 152. The type bars 96 are differentially positioned in the usual manner under control of perforations sensed in the record cards, and the drum 33 is brought to rest for a short period so that the type may be pressed against the record to print thereon.

Referring to Fig. 2, the drum 33 is secured to shaft 44 which has a gear 60 meshing with a gear 61 on shaft 35 which carries at each end a card feed roller 34. The rollers 34 (only one of which is shown in Fig. 2) traverse the edges of the records to secure positive feeding of the records. As usual, the record cards are provided with 80 data receiving columns, and for each column there is provided a sensing brush whose structure will now be explained.

Referring to Figs. 3 and 4, for each card column there is a metallic ring 300 with which a plurality of wire strands 301 are integral and from which the strands radiate as shown in Fig. 4. The shanks of the strands are secured to the ring 300 in any suitable manner, the preferred method being to first form the ring 300 with a plurality of concentric ridges 302 across which the shanks of the strands are laid diagonally (Fig. 4) and then pressed into the ridges. The ridges are then pressed over the shanks of the

strands to hold the same firmly in position. When the operation is finished, the strands 301 will have formed their own spirally radially aligned mounting slots in the ridges 302 as shown in Fig. 3. After the ring 300 has the wire strands 301 secured thereto, the former is tightly pressed on the hub 303 of a disk 304 of insulating material. The inner surface of ring 300 is knurled and pressed on the hub 303 so that the parts are fixedly secured together. The hub 303 is provided with inwardly extending projections 305 spaced to cooperate with keyways 306 formed in the shaft 35. In assembling the entire brush sensing mechanism, the separate disks 304 are slid along the shaft 35 with the projections 305 moving in the keyways 306. The shaft 35 is transversely tangentially slotted by cuts 307 which are spaced in accordance with the spacing of the columns on the records. Each disk 304 when in position has its projections 305 in line with one of the cuts 307, and the disk is then slightly rotated to the position shown in Fig. 4 where the projections are out of line with the keyways 306. With all the disks 304 rotated to such position, a wire key 308 is inserted in one of the keyways to lock the disks in the position shown. When so assembled, each disk is locked against rotation along the shaft and is also secured in position against axial movement. The entire assembly of rings of brushes will, therefore, rotate with the shaft 35 and, as this shaft is geared to the shaft 44 carrying the contact drum 33, the brushes as they rotate will successively contact the drum along the common line of centers without slipping thereon.

For each ring of brushes there is provided a metallic encircling brush guide member 309 (see Fig. 2) upon which the strands 301 wipe as they are rotated. The edges of members 309 on which the strands 301 wipe are substantially circular and concentric with shaft 35 but, opposite contact roller 33, are somewhat reduced in radii so as to be slightly non-circular. Each member 309 is cut away at the non-circular portion thereof to provide a definite brush dropping point 310 and a brush lifting point or cam 311, so that as the brushes are rotated in the clockwise direction as viewed in Fig. 4, the strands will in turn drop from the member on to the record C of their own resiliency and will be later lifted or cammed from the record when they engage the lifting edge 311. When a perforation in the record moves past the sensing position, the strands drop from the edge 310 directly through the perforation to make contact therethrough with the contact drum 33. The plates 309 serve as a common contact member for the brush strands 301 and for that purpose, as shown in Fig. 1, are provided with staggered lugs 309a which are formed with sockets for a connecting wire 309b which extends to the brush plug sockets 172 of the machine.

Fig. 5 shows a perforation in the record card C at the point where the first strand 301 has dropped into the perforation.

Fig. 6 shows the position of the parts just as the last strand is about to lift out of the perforation by engagement with the lifting edge 311. The edges 310 and 311 provide a definite time in the cycle of operations for the making of an electrical contact through the perforation and in breaking such contact.

In Fig. 7 is shown a part of the circuit diagram of the machine which will be explained to point out the significance of the timing control by

the edges 310 and 311. When a perforation is sensed, a circuit is completed from line 175 through the usual card lever contacts 31, a wiper 183 to the common ring of a commutator disk D, thence through commutator segments D', brush 185, common contact wiper 81, drum 33, brushes 301, plate 309, plug socket 172, plug connection 173, plug socket 174, type bar positioning magnet 103 to line 176. The purpose of the commutator D and the segments D' is to prevent the making and breaking in the circuit at the record card itself which might result in undesirable arcing. For this reason the commutator is provided with a segment D' for each possible index point position in which a perforation might occur. The period during which the segment D' is in contact with the brush 185 is less than the period during which the strands 301 make contact through the perforation. This period is indicated by a short line 312 in Figs. 4, 5 and 6, wherein Fig. 5 indicates that the circuit is not closed by segment D' until after a strand has entered the perforation, and Fig. 6 indicates that segment D' has broken the circuit before the last strand has been raised out of the perforation.

With the provision of a complete circle of strands, the wear on the contacting ends is minimized. In fact, there is really no appreciable wear because the records do not wipe across the brushes as in the patent, so there is no tendency for the brush strands to pick up lint and dust from the record as it passes by.

The greater advantage of this form of sensing brush lies in the ability to feed and sense records made of thin paper stock. As such thin records are fed to the brushes, the latter offer no resistance and in fact help the movement of the paper since they are rotating at a peripheral speed which is the same as the linear speed of the paper passing therethrough.

Another advantage of this form of sensing device is that the edges of the perforations cannot be torn or worn by the brushes since it is obvious that the dropping and lifting of the brushes is not controlled or effected by the trailing or leading edges of the perforations. It frequently happens that a row of identical perforations appears in a card thereby greatly weakening the card at that point, as for example, in recording an amount like "98999.92," making the card very easily torn through the "9" perforations, particularly where the card is thinner than usual. Such tearing is not likely to occur with the brushes constructed as described above.

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. In combination; sensing means for sensing successive cards one card at a time while the card is in motion including a pair of cooperating elements between which the card moves at a fixed rate of speed, one of said elements being a roller, the other of said elements being a circular brush structure composed of a multiplicity of flexible wire strands arranged with their free ends in a circle in a single plane; means for

rotating the roller at a peripheral speed equal to the speed of the card; means for rotating the brush structure so that said ends, at the point of contact with the card, have the same peripheral speed as the card so that the brushes successively contact the card on a line in a plane passing through the center lines of said roller and brush structure, and means coacting with the ends of said strands to limit the duration of contact of each strand with the roller through a perforation in the card to a predetermined interval for each perforation.

2. In combination, a contact element; a circular contact structure cooperating with said element and comprising a ring of flexible radiating wire strands having their free ends arranged in a circle and lying in a common plane and having a predetermined diameter when free, an enclosing member having a substantially circular opening smaller than said predetermined diameter, said ring of strands being positioned within said opening with the strands flexed in their common plane to fit within the opening, said member having a channel transversely cutting said plane to provide an opening along the diameter of the circular opening; and means for rotating the ring of strands within said opening whereby as each strand passes said channel the resiliency thereof will cause the strands to extend through the channel into engagement with the contact element, the period during which the strand in extended being determined by the peripheral extent of said channel.

3. In a machine of the class described, a record sensing brush comprising a circular rotatable supporting member provided with a row of flexible strands about its periphery; and a contact member for said brush formed with a guideway in which the ends of said brushes ride when the brush is rotated, said contact member being formed with a gap in said guideway through which the ends of the brush strands may extend radially beyond the guideway, said contact member adjacent said gap being formed to guide the ends of the brush strands into said gap, the width of said gap determining the number of projections of said strand ends through said gap.

4. In combination, a circular contact structure comprising a ring of wire strands radiating in a common plane, means to mount the strands for rotation in said plane, a cooperating contact roller engaged by the ends of said strands on a line in a plane passing through the center lines of the contact structure and roller, means for driving said mounting means and roller so that the outer ends of the strands and the surface of the roller have the same linear speed at their point of contact with a record having a designating perforation fed between said roller and said structure, and means for flexing the strands during their travel and releasing them for a predetermined interval as they pass the point of contact with the roller whereby, from their resiliency they will make contact with the roller through the perforation for said predetermined interval.

5. A record card sensing mechanism comprising a rotary sensing brush having a plurality of

strands rotating in a common plane with their free ends arranged in a circle, a contact roller engageable by the ends of said strands, means for rotating the roller and brush in opposite directions so that they have the same peripheral speed at the point of contact of the strand ends with the contact roller, and means engaging the ends of said strands to enable the free ends of only a predetermined number of strands to move into and out of contact with said roller at said point of contact.

6. A record sensing device comprising a rotary contact roller and a rotary brush, said rotary brush including a mounting element and a plurality of brush strands disposed about the periphery of the mounting element and a contact element for said strands formed with a contact surface on which the ends of the brush strands ride when the brush is rotated, said contact element having a gap formed therein producing a break in the contact surface through which gap the ends of the brush strands successively project into engagement with said roller, said contact element adjacent said gap being dimensioned to accurately control the engagement and disengagement of the ends of the brush strands with said roller and limiting the engagement of said brush strands to a small number at one time, and means to rotate said roller and said brush with a common peripheral speed at the point of contact of the ends of the brush with said roller.

7. In combination, a record sensing device comprising a movable support member having a row of flexible wire strands all secured at one end to the movable member and having their free ends lying in a common plane, means for moving said member to move the free ends of the strands in succession past a fixed contacting position; means engaging the ends of the strands prior to their arrival at said position to flex said strands and maintain them in a flexed condition and to release said strands upon arrival at said position, said means reengaging the strands to again flex them after they have passed the contacting position; and electrical contact means engaged by said brushes at said position, said flexing of said strands enabling the strands to engage the contact means with sufficient pressure at their ends to make good electrical contact with the contact means.

8. In combination, a rotary contact element, a rotary sensing brush having a row of flexible strands capable of engaging the contact element through a perforation in a record fed between said rotary brush and said contact element; and a guide member for said brush having a contact surface on which the ends of the strands ride and having a gap in said surface dimensioned to permit a limited number of said strand ends to engage said contact roller, said contact roller and said brush being rotated so that both the peripheral speed of the contact roller and the peripheral speed of the ends of the brushes at the point of contact of said ends with said roller are the same as the linear speed of feed of the card at the point of said contact.

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