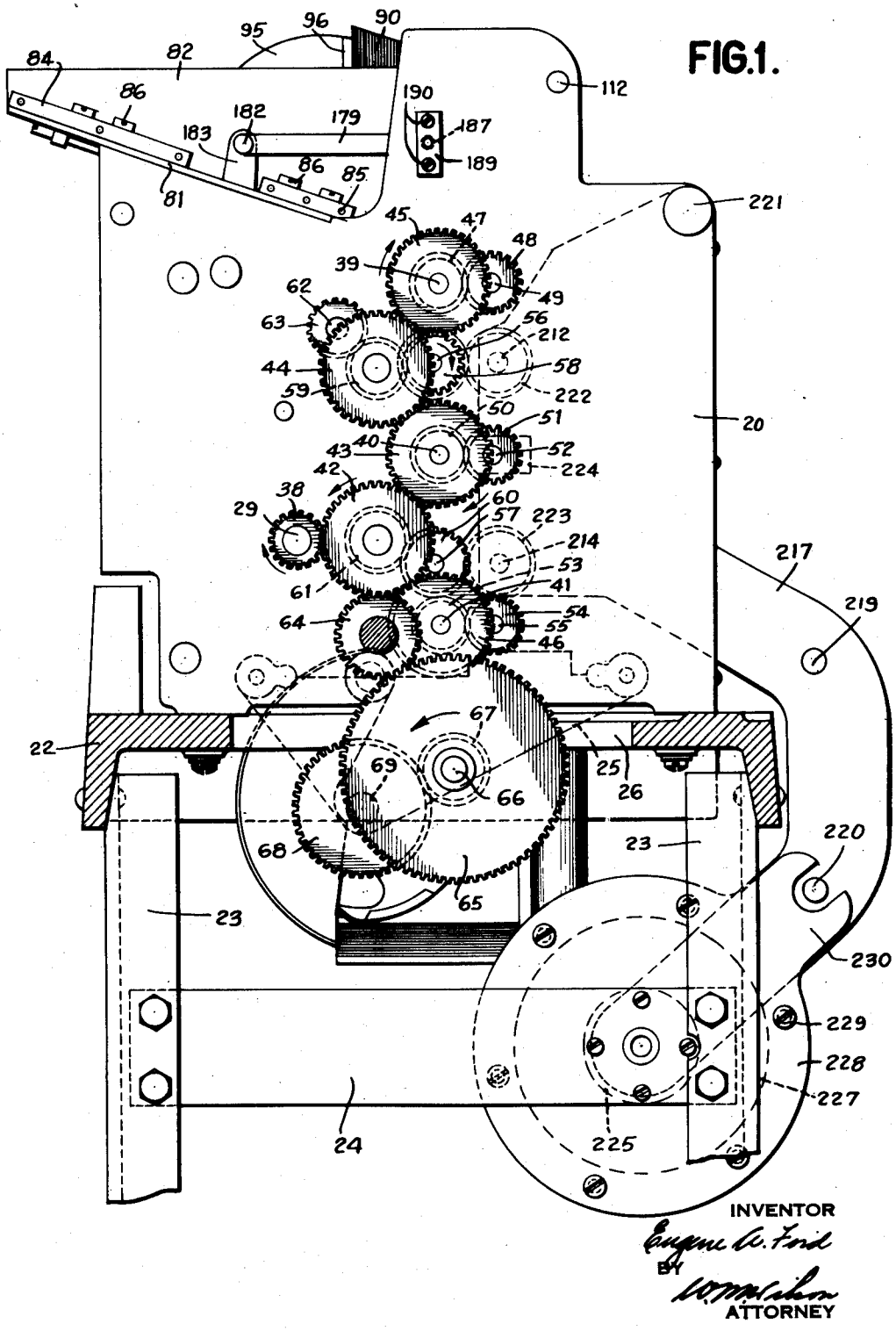
Oct. 8, 1935. E. A. FORD 2,016,711

DEVICE FOR FEEDING AND SENSING RECORD SHEETS

Filed Nov. 9, 1933 6 Sheets-Sheet 1

FIG.1.



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DEVICE FOR FEEDING AND SENSING RECORD SHEETS

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FIG.2.

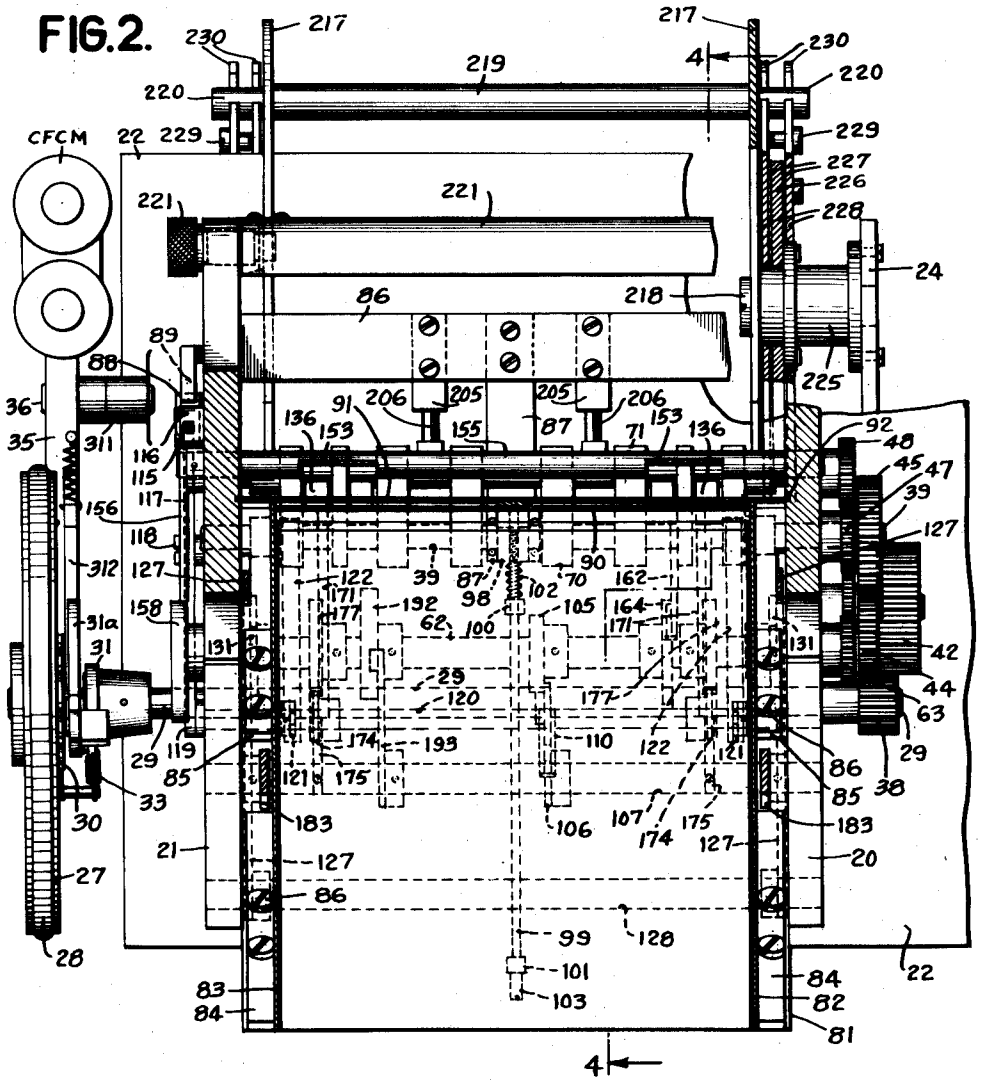
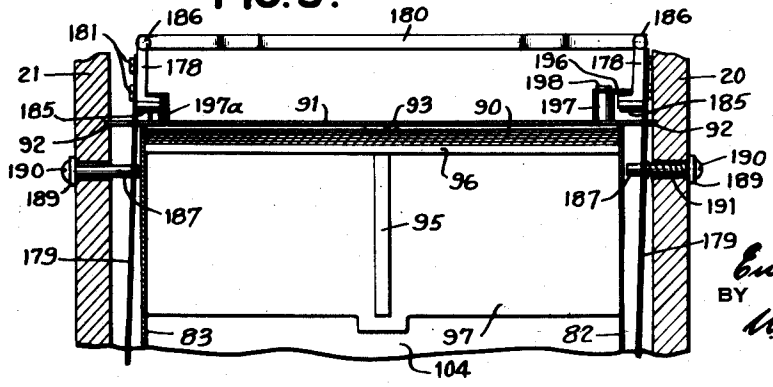


FIG.3.



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DEVICE FOR FEEDING AND SENSING RECORD SHEETS

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FIG. 4.

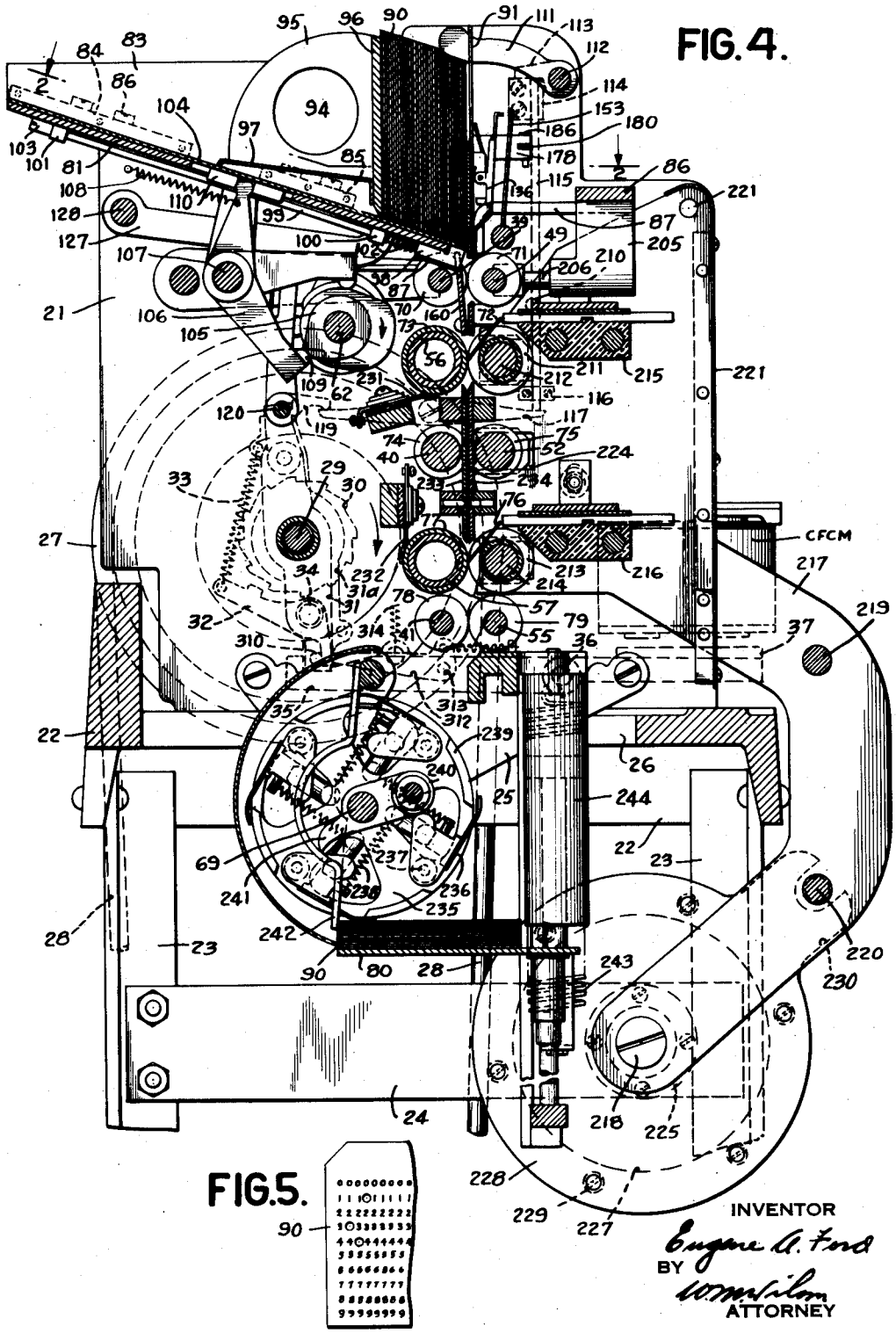


FIG. 5.

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DEVICE FOR FEEDING AND SENSING RECORD SHEETS

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FIG.6.

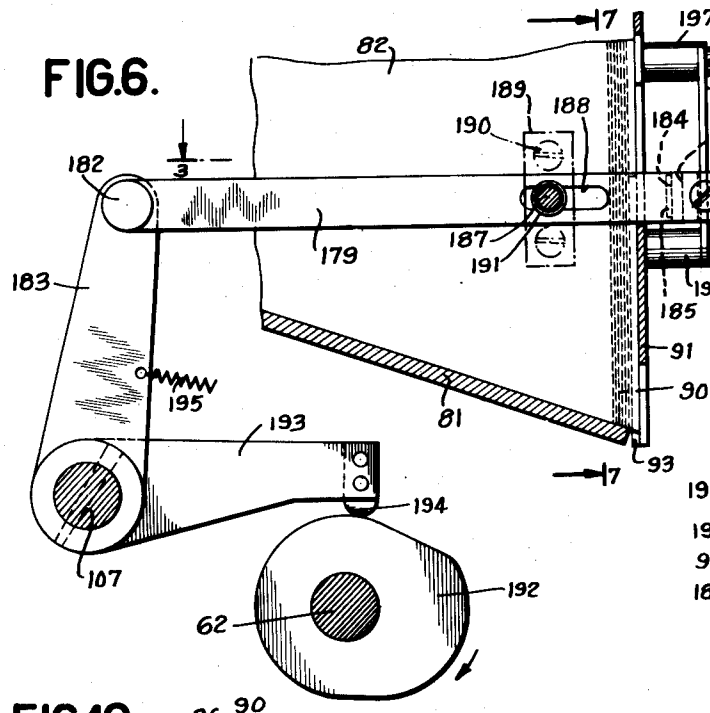


FIG.7.

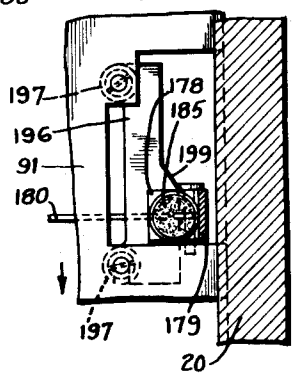
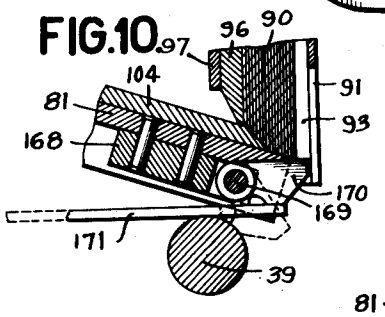


FIG.10.



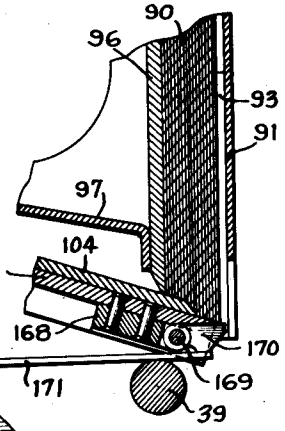


FIG.9.

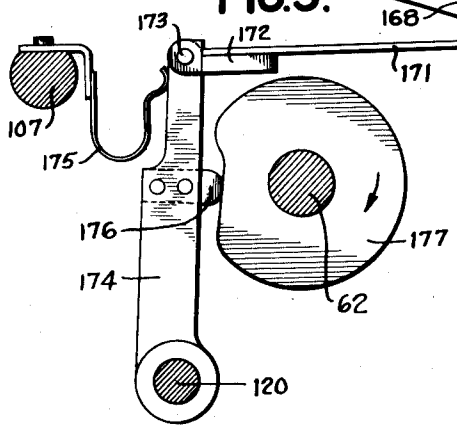
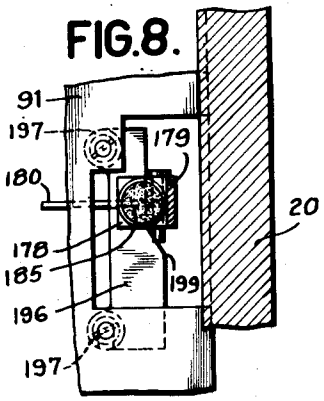


FIG.8.



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Oct. 8, 1935. E. A. FORD 2,016,711

DEVICE FOR FEEDING AND SENSING RECORD SHEETS

Filed Nov. 9, 1933 6 Sheets-Sheet 5

FIG.11.

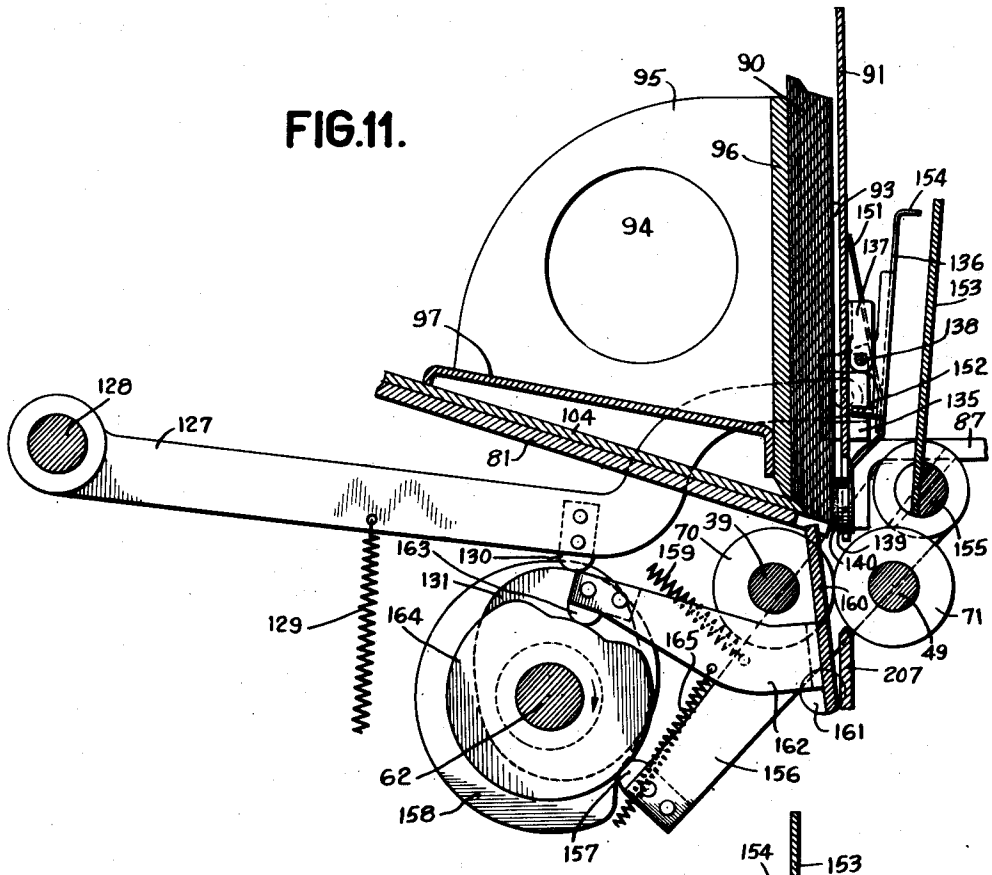
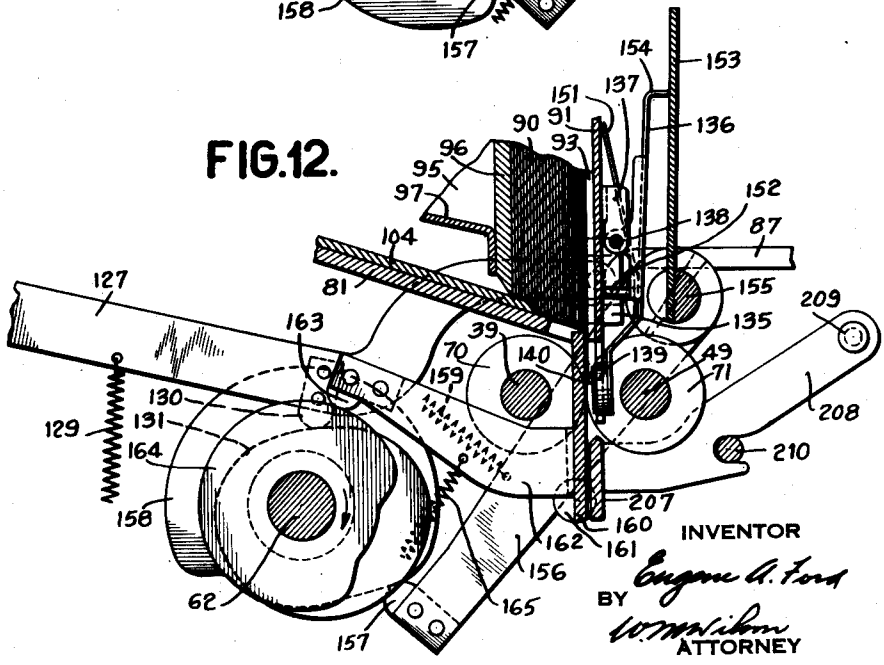


FIG.12.



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DEVICE FOR FEEDING AND SENSING RECORD SHEETS

Filed Nov. 9, 1933 6 Sheets-Sheet 6

FIG.13.

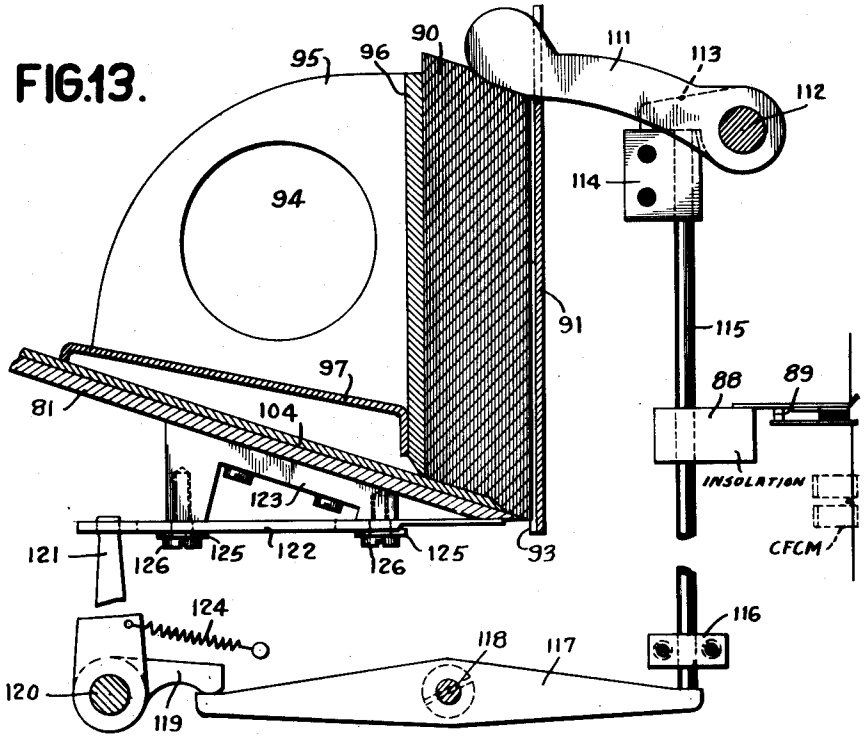


FIG.14.

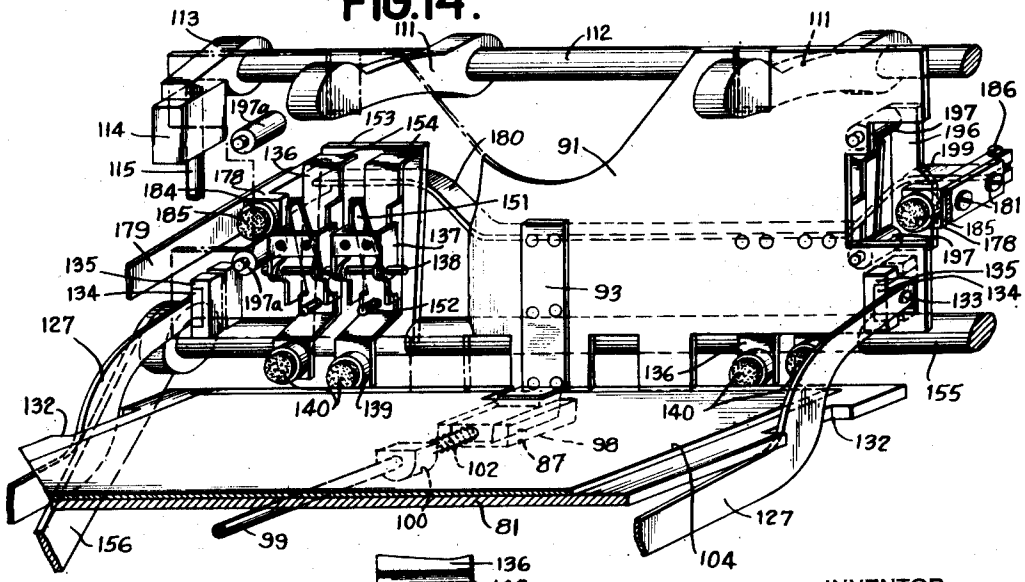
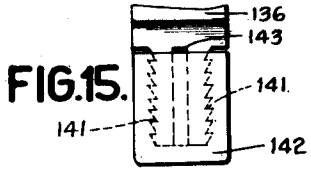


FIG.15.



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UNITED STATES PATENT OFFICE

2,016,711

DEVICE FOR FEEDING AND SENSING RECORD SHEETS

Eugene Amzi Ford, Scarsdale, N. Y., assignor to International Business Machines Corporation, New York, N. Y., a corporation of New York

Application November 9, 1933, Serial No. 697,289

17 Claims. (Cl. 271—43)

This invention relates to devices for feeding perforated record cards or paper sheets.

An object of the invention is to provide improved feeding means for handling thin cards or paper record sheets. A bunch or group of such sheets are placed in a magazine and the feeding means separates the sheets one by one and feeds them singly through a series of rollers between sensing stations.

Another object of the invention is to provide feeding devices for frictionally engaging the top sheet of a bunch of sheets and sliding said sheet off the bunch and into feeding rollers. The paper feeding action of human fingers is performed in a mechanical way.

A feature of the invention is the operation of rubber tipped feeding fingers and cooperating devices for separating the end sheet from a group of sheets and for feeding said singly past perforation sensing brushes. The feeding action is independent of the thickness of the sheets.

Another object of the invention is to provide devices for moving each sheet laterally, at right angles to the line of feeding, until it registers with an accurate reference edge before passing through the perforation sensing devices. An interchangeable cam is provided so that the lateral movement may be made in either direction. This lateral adjustment is made so that the columns of perforation index positions on each sheet are brought into accurate vertical alignment with the sensing brushes.

Another object of the invention is to provide improved magazine throat opening devices whereby paper sheets may be fed from a magazine in rapid succession.

A still further object of the invention is to provide a magazine with a shifting base plate having a beveled front edge for raising and lowering the sheets until they settle free from adjacent sheets and forced forward toward a position in vertical alignment with the throat in condition to be fed singly from the magazine. Devices are provided to press the forward sheets down toward the magazine throat in a proper position to start the feeding cycle. Cooperating with these devices is an interlock for closing the throat and disabling a card feed clutch control magnet when the sheets are not in position with respect to the throat, or when the devices are lifted out of operative position by the operator in order to place sheets into the magazine.

Feed regulating devices are provided to govern the rate of feed of a sheet out of the magazine so that the forward edge of the sheet enters feed rollers at a definite instant during the cycle of operation.

A feature of the design is the mounting of the sensing brushes on a separate swinging frame which may be lowered out of the machine, thus giving access to the sensing brush supports and wiring. Friction discs are associated with the frame to hold it in adjusted position.

These objects and other advantages of the present invention will be more apparent as this specification continues with reference to the drawings which form part of the disclosure.

In the drawings:

Fig. 1 is a side elevation view of the machine showing the driving gears for the sheet feeding and sensing rollers.

Fig. 2 is a plan view partly in section showing the driving means and connections to the controlling devices governing the feeding of the paper sheets.

Fig. 3 is a sectional plan view taken along the line 3—3 in Fig. 6, showing the devices for shifting the paper sheets laterally.

Fig. 4 is a sectional elevation view taken along the line 4—4 in Fig. 2 and showing the sets of feeding and sensing rollers through which the record sheets are fed before being deposited in the stacker at the bottom of the machine.

Fig. 5 is a detail view showing a portion of a record sheet which is perforated to represent the number 341.

Fig. 6 is an elevation view showing the operating connections for the devices which move the sheets laterally across the magazine.

Fig. 7 is a detail view of a shifting finger and a cam cooperating therewith for moving the record sheets laterally. In this view the parts are shown in normal position.

Fig. 8 is a detail view showing the lateral shifting finger in operated position.

Fig. 9 is a sectional elevation view showing the operating connections for one of a pair of magazine throat closing members.

Fig. 10 is a detail view of a throat closing member showing both the normal and the operated positions of the member.

Fig. 11 is a sectional elevation view of the magazine showing the sheet feeding fingers in the position they assume early in the paper feeding operation.

Fig. 12 is a similar section through the magazine showing an advanced stage of the paper feeding operation with a sheet of paper drawn down by friction feeding fingers and placed into engagement with feeding rollers.

Fig. 13 is a sectional elevation view through the magazine showing paper feed pressure arms and interlock members for closing the throat of the magazine and disabling the card feed clutch magnet when pressure arms are raised or lifted in the magazine.

Fig. 14 is a perspective view of the interior of the magazine with the record sheets removed and the sheet feeding plate broken away to show the friction feeding fingers. This view also shows the devices for shifting the sheets in a lateral way to bring them into register with a fixed side of the magazine in accurate alinement with the sensing brushes below the magazine.

Fig. 15 is a detail view of an alternative construction of the rubber tipped end of a feeding finger.

Referring to Figs. 1 and 2 it is noted that a pair of side frames **20** and **21** are supported on a base **22** mounted on legs **23** comprising the support for the machine. Cross bars **24** act as braces between the legs **23**.

Suspended from the bottom of the side frames **20** and **21** (Figs. 1 and 4) are a pair of brackets **25** which protrude down through an aperture **26** in the base **22** and act as a bearing for the sheet stacker.

The feeding and sensing devices of the machine are driven by a motor which is connected to a pulley wheel **27** (Figs. 2 and 4) by means of a belt **28**. The wheel **27** is loosely mounted on the end of a shaft **29** (Fig. 2) and has secured to its side a ratchet wheel **30** (Fig. 4).

Adjacent the ratchet wheel **30**, Fig. 2, there are a pair of levers **31** and **31***a* on shaft **29**. The lever **31** is secured to shaft **29** and carries a pawl **32** which is adapted to cooperate with the ratchet **30** and form a driving connection between wheel **27** and shaft **29**. The other lever **31***a* is loose on shaft **29** and carries a pin **310** which engages a short arm on pawl **32**. The ends of lever **31***a* are advanced a slight amount beyond lever **31** in a clockwise direction, so that the hooked end of a latch lever **35** may engage lever **31***a* and, through pin **310**, rock pawl **32** about pivot **34** on lever **31** and disengage the clutch before lever **31** is stopped. Latch lever **35** is pivoted on a stub shaft **36** extending from a bearing **311** on base **22**. A spring **33** tends normally to engage the pawl **32** with ratchet **30**, but the pawl is held disengaged between pin **310** and an arm **312** pivoted at **313** on lever **35**. The end of lever **35** carries an armature block **37** located underneath an operating magnet CFCM. This card feed clutch magnet CFCM is energized whenever a record sheet feeding and sensing operation is desired. Energization of the magnet attracts the end of lever **35**, rocking it in a counterclockwise direction (Fig. 4) against the tension of spring **314**, releasing levers **31** and **31***a* and allowing the pawl **32** to engage the continuously rotating ratchet wheel **30**, thus rotating shaft **29**. The magnet is maintained energized and the shaft **29** continues to rotate as long as sheets are presented for feeding. When the magnet is deenergized, latch **35** rocks in a clockwise direction to engage lever **31***a* and hold pawl **32** out of engagement, stopping shaft **29**.

Referring to Fig. 2, it is noted that the shaft **29** extends across the machine through both side frames and at one end carries a driving gear **38** (Fig. 1). A series of driving connections are established between shaft **29** and the three sheet feeding drive shafts **39**, **40** and **41** by a train of gearing comprising gears **42**, **43**, **44**, **45**, and **46**. Each sheet feeding driving shaft is connected by gearing to an oppositely located shaft to form connections whereby pairs of rollers are rotated to draw the record material down between them. For example, a gear **47** is attached to gear **45** and cooperates with a gear **48** mounted on shaft **49**. In the same manner, gear **43** carries a smaller gear **50** which meshes with a gear **51** carried on shaft **52**. In a like manner, gear **46** has attached thereto a gear **53** cooperating with a gear **54** on shaft **55**.

The machine has two record sensing stations at which there are contact and feed rollers mounted on shafts **56** and **57**. These shafts are driven by gearing attached to the train of gearing mentioned hereinbefore. A gear **58** on shaft **56** meshes with a gear **59** attached to gear **44**. At the other sensing station, a gear **60** is attached to shaft **57** and meshes with a gear **61** mounted alongside of gear **42**.

The machine is provided with a cam shaft **62** upon which there are mounted a number of cams for operating the various feeding devices in the magazine. This shaft carries a gear **63** which meshes with the gear **59** connected to gear **44**.

The sheet stacker at the bottom of the base is driven by a train of gearing leading from gear **64** mashing with gear **42**. A large gear **65** rotating on a stud **66** projecting from the side of one of the brackets **25**, meshes with the gear **64** and carries a pinion **67** which in turn cooperates with a gear **68** attached to the operating shaft **69** of the stacker.

The record sheets **90** which the machine handles may be in the form of well known Hollerith tabulating cards, such as the portion of a record shown in Fig. 5. These records may consist of thin cards or paper strips cut to an exact size and provided with vertical columns and horizontal rows of index points which may be perforated to represent various data such as names, numbers, amounts, or dates. The records may be perforated as shown in Fig. 5 with a single hole in each column representing a denomination or figure of data or the perforations could be arranged in combinations whereby two or more perforations in a column represent an item of information.

In the ordinary form of tabulating machines, the record cards are of a substantial thickness and feeding is performed by engaging the edge of the end card with a reciprocating extension, known as a picker, thus separating one card from the others and forcing it away from the bunch and into feeding rollers. In the present invention it is contemplated that either a thin paper or card material may be used for the record sheets and that the sheet is to be separated from the rest of the group by engaging it with friction fingers to slide it away from adjacent sheets. This is an imitation of the action of the human fingers in pressing upon the top sheet of a stack and sliding the sheet away from the lower sheets. It is a type of feed which operates regardless of the thickness of the sheets.

The path followed by a sheet after it is drawn off the bunch may be noted in Fig. 4. There it is seen that as a sheet is pushed down out of the magazine, it is drawn into a pair of feed rollers **70** and **71** mounted on shafts **39** and **49**, respectively. Then the sheet passes between a line of upper brushes **72** and the cooperating contact roller **73** mounted on a tube forming part of shaft **56** The sheet passes between other feed rollers **74**, **75** before entering the lower sensing station comprising brushes **76** and contact roller **75**

77 on shaft 57. A bottom pair of feed rollers 78, 79 serves to usher the sheet into engagement with the stacker which then deposits the sheet on top of the plate 80.

The operation of the mechanism in the magazine and the feeding of the sheets from the magazine into the first feed rollers will be described before a detailed description is given of the various sensing, feeding, and stacking stations.

Referring to Fig. 4, it is noted that the magazine is supported on a base plate 81 which is held in place on the side frames 20 and 21 by screws 86 which go through blocks 84 and 85 on the plate and thread into lugs on the side frames. Riveted to the blocks 84 and 85 are a pair of side plates 82 and 83 forming the side walls of the magazine.

At the front of the magazine there is placed a vertical sliding feed plate 91 which serves both as an end stop and a feeding actuator for the record sheets. The plate 91, Fig. 3, extends across the machine, between the side frames 20 and 21, and slides in elongated notches 92 cut into the inner surface of the frames. A strip 93, Fig. 14, is riveted on the inner face of plate 91. It is against this strip that the bunch of record sheets 90 Fig. 4 are pressed lightly by a retainer 94.

A web 95 acts as a brace between a front piece 96 and a bottom section 97 of the retainer 94. The retainer is loose in the magazine and slides down the incline formed by plate 81, thus pressing against the rear of the bunch of sheets to hold them in a compact group with the front sheet against strip 93.

A bar 86, Fig. 2, extending across the machine between the side frames, carries a bracket 87. This bracket extends from the center of the bar and contacts with the back of the plate 81 directly behind the strip 93, thus acting to prevent buckling of the plate at the throat of the magazine.

At the center of the magazine and adjacent the strip 93, Fig. 14, is a throat block 98 which is adjustably held on the base plate 81 by a grooved guide member 87 riveted to plate 81. The block is set so that a narrow opening appears between it and the strip 93. This opening permits the descent of a single sheet off the bunch. A rod 99, Fig. 4, is threaded in the block and supported in two bearings 100 and 101 extending from the bottom of the base plate 81. A spring 102 on the rod tends to bring the block 98 against the strip 93, but is held from doing this by an adjustable screw head 103 which is fastened on the end of the rod 99 and drawn against the side of bearing 101 by spring 102. The size of the opening between block 98 and strip 93 may be varied by turning head 103.

Resting on top of the base plate 81, Fig. 4, is a shifting plate 104 extending across the magazine underneath the sheets 90 and retainer 94. This plate 104 has a beveled front end which lowers and raises the sheets 90 to jostle them into position and force them forward toward the throat of the magazine.

The shaft 62 carries a cam 105 which serves to slide the plate 104 back and forth at the beginning and end of the sheet feeding cycle. A bell crank 106 pivoted on a shaft 107 is turned by a spring 108 so that a follower 109 on the lower crank arm is held in constant touch with the periphery of cam 105. The end of the upper arm of the crank is rounded and fits into a notch in a bearing block 110 attached to the lower surface of plate 104. The base plate 81 is cut away to allow block 110 to extend down therethrough and move freely along the bottom of the magazine. Early in each operation, the crank 106 is rocked in a counterclockwise direction to draw the shifting plate 104 back toward the rear of the magazine. Late in the cycle the plate is shoved under the sheets back to normal position. As this takes place, the sheets near the magazine throat are lowered and raised to effect the settling of the sheets toward the throat.

As a further aid in keeping the sheets down near the throat in readiness for feeding, a pair of pressure arms 111, Figs. 4, 13 and 14, extend from a shaft 112 and rest lightly on the top of a number of sheets at the front of the magazine. The ends of the arms are rounded so that as the forward sheets are fed, the other sheets pass under the arms without the tops of the sheets being creased or torn. The passage of the sheets in an erect position under the arms 111 is aided by the jostling action of plate 104. The arms exert pressure by virtue of the force of gravity which tends to swing the arms down in a counterclockwise direction. The arms may be swung in a clockwise direction by the operator when placing sheets in the magazine.

An interlock is provided to prevent feeding of the sheets when the arms 111 are lifted by improperly positioned sheets, or lifted by the machine operator to refill the magazine. One end of shaft 112 extends through side frame 21 and carries a stop arm 113, Fig. 14, which normally abuts against the top of a rectangular bar 114, Fig. 13, riveted on the outside of the frame 21. A vertical rod 115 slides in the bar 114 and is guided at the lower end by a block 116 secured to the frame 21. The lower end of rod 115 is in contact with the end of a lever 117 pivoted on a screw 118 in the frame. An arm 119 secured to a shaft 120 cooperates with the other end of lever 117. Attached to this same shaft 120 is a pair of arms 121 situated between the side frames and extending upwardly in the interior of the machine. The upper ends of the arms 121 protrude into slots cut in slide members 122 supported by washers 125 and screws 126 on brackets 123 secured to the bottom of base plate 81. The ends of the slides 122 are normally withdrawn from the throat of the magazine. Springs 124 attached to arms 121 urge the slides to a throat closing position and press arm 119 on lever 117 and tend to raise rod 115. However, the weight of arms 111 overcomes the tension of springs 124 and keeps the parts normally in the position shown in Fig. 13. When, for any reason, the arms 111 and 113 are lifted, the rod 115 is allowed to rise and springs 124 are effective to shove slides 122 into a position, blocking the magazine throat and preventing the feeding of record sheets while arms 111 are raised.

The interlock controls are also effective to deenergize the card feed clutch magnet CFCM and disable the card feed drive gearing. An insulation bar 88 on rod 115 cooperates with one of a pair of contacts 89 which are wired in series with magnet CFCM. When the rod 115 is allowed to rise, contacts 89 are opened.

From the sections of the description given hereinbefore, it is noted that the record sheets 90 are supported and acted upon on all sides in the magazine. The sheets rest on the shifting plate 104 and are guided on the sides by side pieces 82 and 83. The retainer 94 presses from the rear and the arms 111 press on the top of the sheets to force them towards the throat of the

magazine. The front sheet presses against the strip 93 on the feeding plate 91 in readiness for the descent through the throat when the plate is lowered.

The devices for lowering and lifting the feeding plate 91 may be noted from the showing in Figs. 2, 11, 12 and 14. A pair of levers 127 are loosely pivoted on a shaft 128 and are drawn down by springs 129 so that follower blocks 130 on the levers cooperate with cams 131 fixed on shaft 62. The ends of the levers 127 are curved upward through openings 132, Fig. 14, in plate 81 and are pivoted at 133 on short slide sections 134 fitted in blocks 135 assembled on feed plate 91. The plate is slotted to receive the two blocks 135 which are keyed thereon and held in position when sections 134 are slid into the grooves in the blocks, a slide section and the lever end carried thereon closing a slot opening in plate 91.

From the shape of cam 131 in Fig. 11, it may be noted that the levers 127 and plate 91 are lowered during the first quarter of the feeding cycle, and raised to normal position in the second half of the cycle.

The feeding plate 91 carries four feeding fingers 136, Fig. 14, which are adapted to frictionally engage a record sheet and push it down through the throat of the magazine when plate 91 is lowered. The fingers are divided into two groups so that there is a pair of fingers on each side of the magazine. A set of four brackets 137 are riveted to the back of the plate 91. Each bracket is formed in the shape of a U with side flanges that are perforated to carry a short rod 138. The rod acts as a bearing for the finger 136 which is formed with two side flanges that encircle the rod. A description of one finger, applies as well to the others since they are similar in construction.

The lower end of each finger 136 carries a cup 139 from which protrudes a rubber tip or disk 140. This tip is designed to establish a frictional contact with a record sheet during feeding. The end of the tip may be flat, rounded or cupped for a suctional effect. Or the tip may be formed as shown in Fig. 15 where it is seen that the end of finger 136 is formed with teeth 141 designed to hold a rubber sleeve 142. The teeth face upward so that the sleeve 142 may be easily assembled, but firmly held on the finger. A slot 143 in the finger 136 is provided so that a worn sleeve 142 may be cut in half and removed.

A leaf spring 151, Figs. 11 and 14, fastened to finger 136, presses against the back of plate 91 and urges the rubber tipped end of the finger into contact with the forward sheet 90 in the magazine. The stud 152 holding the spring on the finger, extends far enough to abut the plate 91 and prevents an excessive rocking movement of the finger when the magazine is empty.

The rocking movement of the fingers 136 to and from feeding position is controlled by a pair of rectangular cam plates 153, Figs. 11, 12 and 14, each of which cooperates with the offset lugs 154 on two of the fingers. As the fingers 136 reciprocate down and up with the plate 91, cam plates 153 are moved to push on the lugs 154 and rock the fingers out of engagement with the record sheet at the end of the down stroke and during the upward return stroke, see Fig. 12. The plates 153 are riveted to milled sections of a shaft 155 extending between the side frames. Outside the left side frame 21, Fig. 2, the shaft 155 carries an arm 156 with a follower 157 cooperating with a cam 158 on shaft 62. A spring 159 attached to arm 156 tends to keep the follower on the periphery of the cam. At the end of the cycle, the cam 158 presents a sharp decline to the follower 157, permitting arm 156, shaft 155 and cam plates 153 to rock in a clockwise direction, Fig. 11, releasing fingers 136 and allowing the rubber tips 140 to again press against the forward sheet 90.

As the fingers 136 draw a record sheet 90 out of the magazine, the rubber tips 140 move below the throat of the magazine where the sheet is no longer backed up by the other sheets in the magazine. At this point, a backing plate 160 is moved up alongside the sheet to back it up and maintain the pressure of the tips 140 on the sheet. The plate 160 is provided with trunnions 161 which pivot loosely in the side frames. An arm 162 is attached to the plate and carries a follower 163 which rests on a cam 164 on shaft 62. A spring 165 attached to the arm 162 keeps the follower in contact with the edge of cam 164. At the beginning of the feeding cycle, the plate 160 is slightly removed from the path of the record sheet, but the cam 164 is shaped so that as soon as the sheet is moved, the plate 160 is rocked to back up the sheet below the throat of the magazine.

The magazine throat opening and closing devices shown in Figs. 9 and 10 control the rate of descent of the record sheet 90 through the throat, the time in the cycle that the sheet leaves the throat, and the time that the sheet enters the top set of feeding rollers. There is provided a pair of such devices, similar in construction, one on each side of the magazine. The timing and position of the record sheet at each point in the cycle are important, because the perforations in the record control other devices in the machine by virtue of the time at which they are sensed.

Bearing blocks 168, riveted to the bottom of base plate 81, carry rods 169 on which are pivoted the throat opening members 170. When in normal position, the end of each member extends across the throat opening and directly under the bottom edge of the record sheet 90. The member is supported in such a position by an actuating strip 171 which rides on top of the shaft 39. The one end of strip 171 cooperates with a cam formation on the lower side of member 170, and the other end is secured to an arm 172 pivoted at 173 on a cam follower lever 174 fulcrumed on shaft 120. A leaf spring 175 extending from shaft 107 bears against lever 174 and forces follower 176 thereon into constant contact with a cam 177 on shaft 62.

Early in the sheet feeding cycle, the cam 177 rocks the lever 174 counterclockwise and draws strip 171 to the left, Fig. 9. Then as the strip withdraws beneath member 170, the member is lowered by its own weight until it assumes the position illustrated by dotted lines in Fig. 10. The contour of cam 177 and the formation of the lower surface of member 170 are designed to govern the time and the rate of descent of the record sheet which follows behind the member as it is lowered. Near the end of the feeding cycle, after the sheet has passed cam 177 allows strip 171 to move rapidly to the right, lifting member 170 under the sheet which is about to be fed.

It is of importance that each sheet be positioned accurately in the magazine by being brought to register at one side or the other before feeding. This is done because the columns of record perforations in the sheet must line up with the related sensing brushes. The means

for accomplishing this alignment is brought about by a lateral shifting means shown in Figs. 3, 6, 7, 8 and 14. A pair of shifting fingers 178, Fig. 14, are drawn into contact with the record sheet and then shifted to the right to bring the sheet to register against the side of the magazine. Cups 184 hold rubber tips 185 on the inner ends of fingers 178.

The fingers 178 are mounted on a frame composed of two side links 179 and a cross link 180, Fig. 3. Screws 181, Fig. 6, hold the fingers on the inside of the links. The ends of the links 179 are pivoted at 182 on a pair of arms 183 which are fastened to shaft 187. At the other end of the links 179, studs 186 form a loose connection between bearings on fingers 178 and the ends of link 180.

The frame is supported and guided on a pair of studs 187, Fig. 3, which protrude inside the side frames and fit in slots 188, Fig. 6, in links 179. The studs 187 are fixed in removable strips 189 which are secured to the side frames 20 and 21 by screws 190. On the right hand stud 187 there is wound a spring 191 which presses against the side of link 179 and tends to shift the entire frame to the left. This movement is possible because of the loose connections at 186, Fig. 6, and 182. The studs 187 are made removable so that the spring 191 may be assembled on either stud interchangeably to exert pressure on either side of the frame for a lateral shift in either direction.

The lateral shifting frame is normally positioned with the rubber tips 185 spaced from the first record sheet in the magazine, but in the second half of each feeding cycle, a cam 192 on shaft 62 acts to draw the frame forward to bring the fingers into contact with the sheet. An arm 193 secured to shaft 187 carries a follower 194 in contact with cam 192. A spring 195 attached to arm 183 urges the frame into normal position and keeps arm in cooperation with cam 192.

The shifting movement of the fingers 178 is controlled by a cam plate 196, Figs. 7, 8 and 14, secured by screws 198 to studs 197 on the vertical reciprocating feed plate 91. A cam shoulder 199 on cam plate 196 cooperates with the inner side of the right hand finger 178, Fig. 3, as the feed plate 91 slides down and up. Spring 191 keeps the finger in contact with the cam plate.

In the normal position of the feed plate 91, the relation between the finger 178 and cam plate 196 is as shown in Fig. 7 where it is seen that the finger is over to the right on the shoulder of the cam. Then, as the feed plate is lowered, the finger 178 (and the other finger connected thereto by link 180) is allowed to move to the left as in Fig. 8. This movement to the left is not effective to shift the record sheet, because up to this point in the cycle the cam 192 has not yet drawn the fingers into contact with the sheet. However, before the feed plate 91 is raised to normal position, the fingers are drawn into contact with the next sheet to be fed from the magazine. Then, as the feed plate and cam plate 196 are lifted, the fingers 178 are moved to the right, shifting the sheet against the side of the magazine.

The feed plate 91, Figs. 3 and 14, carries another pair of studs 197a on which the same cam plate 196 may be secured. The cam plate is formed so that it is reversible and may be assembled on the right or left side of the feed plate. When it is assembled on the left side, the spring 191 is transferred to the left side and the lateral shifting alignment movement of the record sheet is made towards the left instead of the right.

The record sheet is shifted into position at the end of one cycle, and then fed down out of the magazine early in the next cycle. The sheet encounters various feeding rolls, sensing and stacking devices on its downward movement.

The top feeding rollers 70, 71, Figs. 2 and 4, are held together by spring pressure so that if the sheets jam, the rollers may be separated. The cross bar 86 carries a pair of brackets 205 from which protrude plungers 206 having ends shaped to fit around a section of shaft 48. Thus, the rollers 71 on shaft 48 are pressed against rollers 70.

As a record sheet passes down between rollers 70, 71, it is guided between the backing plate 160 and a guide plate 207, Figs. 11 and 12. The guide plate 207 is the cross bar of a bail having arms 208, Fig. 12, loosely pivoted at 209 on the side frames. The bail is normally held with plate 207 in a guiding position by a stud 210 engaging in a notch in an arm 208. The stud is movable, being mounted on a swinging sensing brush holder to be described hereinafter. When the stud 210 moves to the right, plate 207 swings about center 209 and away from plate 160 so that access may be had to the space under rollers 70 and 71 for the removal of sheets. When the stud 210 moves to the left it contacts the lower side of arm 208 and raises guide plates 207 to normal position.

The several upper sensing brushes 72, Fig. 4, are separated by circular grooves in an insulation feeding bushing 211 mounted on a shaft 212. In a like manner the lower brushes 76 are supported and insulated by a bushing 213 on a shaft 214. The shafts 212, 214, and insulation blocks 215, 216 holding the brushes, are mounted in a swinging frame comprising side arms 217 pivoted on screws 218 below the base 26. The side arms 217 are spaced and braced by rods 219 and 220 and carry a cover 221. The frame is held in normal position by shouldered screws 221 threaded in the main side frames and adapted to project into apertures in arms 217. When the frame is in the normal position, a gear 222, Fig. 1, on shaft 212 and a gear 223 on shaft 214 are adapted to mesh with driving gears 58 and 60, respectively. Thus, the bushings 211 and 213, Fig. 4, not only serve as insulating means, but also as rotating feed rollers. The side arms 217 are notched at 224 to clear shaft 52. The stud 210, previously mentioned, is shown in Fig. 4 in the position wherein it is fixed on side arm 217.

When the operator of the machine swings the sensing brush frame back out of the machine, it is desirable to have the frame remain in an extended position. For this purpose, friction devices are provided to cooperate with the side arms of the frame to hold it in any adjusted position. There is a friction device on each side of the frame. Since they are similar in construction, a description of one applies as well to the other.

Secured to the brace bar 24, Fig. 2, is a standard 225 carrying a fixed disc 226. The screw 218 which acts as a pivot for side arm 217 is threaded into the end of the standard and guides the side arm to swing adjacent the fixed disc. On each side of the fixed disc 226 there is placed a friction disc 227. Outside the friction discs are a pair of pressure plates 228 which are held together by a series of screws 229, Fig. 1, that may be tightened

to press the friction discs between the fixed disc and the pressure plates. The pressure plates are formed with open ends 230 which engage an extending portion of the brace rod 220. In this way, any positive movement of the swinging frame and side arms 217 carries the pressure plates 228 along therewith. When once adjusted into a desired position, the frame is kept there by the friction devices.

Opposite the sensing brushes are contact rollers or cylinders 73 and 77 already mentioned. In contact with the cylinders are thin metal strips 231 and 232 held between the side frames, but insulated therefrom. These strips serve a dual purpose. They act as conducting brushes to carry current to the cylinders. They also act as scrapers to remove lint from the cylinders when soft paper is used for the record sheets.

The record sheets are guided between the sensing stations by guide plates 233 and 234 secured to the frames.

As the record sheets descend through the rollers 78 and 79 they are grasped by a rotating stacker and stacked on plate 80. The rotating frame 235, Fig. 4, of the stacker is secured to shaft 69 and carries four grippers 236 pivoted on studs 237. Springs 238 tend to rotate the grippers so that the free ends thereof contact against transverse segments 239 on the rotating frame. A fixed cam plate 240 inside the frame is in the path of a rounded end on each gripper and serves to open each gripper momentarily as it passes a position wherein a descending record sheet is inserted between the gripper and the segment 239. When a gripper passes cam plate 240 it rocks to normal position and pinches the record sheet between the gripper end and the segment. The sheet is carried around in a clockwise direction until the gripper strikes another cam surface 241 which opens the gripper and frees the sheet so that it is stopped in a horizontal position by the stripper 242.

When it is desired to remove the stacked sheets 90, the operator may push the plate 80 down against the tension of a spring 243. The return movement of the plate 80 is cushioned by a dash pot 244.

Although the illustrated embodiment of the invention is a desirable one, it is to be understood that various changes, additions or omissions may be made in the construction or mode of operation without departing from the spirit of the invention as expressed in the following claims.

What is claimed is:

1. In a sheet feeding device, a magazine for holding the sheets, a throat in said magazine through which the sheets may pass one at a time, a reciprocating plate at the throat, a set of feeding fingers pivotally mounted on said plate, rubber tips projecting from said fingers, springs for rocking said fingers and pressing said tips against the sheet at the throat, means for moving said plate and said fingers to feed the sheet, said moving means also being adapted to restore said plate back to normal position, and a cam plate adapted to cooperate with lugs on said fingers to rock the fingers and draw the tips away from the sheet during the restoring movement of the reciprocating plate.

2. A sheet feeding finger having an end formed with teeth on the sides and a slot in the center, and a rubber sleeve which is slipped over, and held by, said teeth, said slot adapting said sleeve to be cut in half and removed.

3. In a device for feeding a sheet off a stack of sheets, friction fingers for frictionally engaging the end sheet of the stack, means for moving the fingers to push said sheet off the stack, a backing plate, and means for moving said plate adjacent the edge of said stack for holding said sheet against said fingers.

4. In a sheet feeding device, a magazine for holding a bunch of sheets in a vertical position, a magazine throat through which the sheets may pass down one at a time, a shifting plate at the bottom of the magazine and substantially perpendicular to said sheets, said plate being shaped with a beveled edge facing said throat, means for reciprocating said plate and pushing said beveled edge under the ends of said sheets to arrange and hold the sheets toward the throat, and means for feeding the sheet at the throat out of the magazine.

5. In a sheet feeding device, a magazine for holding a plurality of sheets, a throat in said magazine through which the sheets may pass one at a time, pressure arms resting on the edge of said sheets opposite the throat, slides adjacent said throat, connections between said arms and said slides for moving said slides to a throat closing position when said arms are lifted, and means for feeding said sheets out of the magazine when the throat is open.

6. In a sheet feeding device, a magazine for holding a plurality of sheets, a throat in said magazine through which the sheets may pass one at a time, pressure arms resting on the edge of said sheets opposite the throat, slides adjacent said throat, connections between said arms and said slides for moving said slides to a throat closing position when said arms are lifted, and means for feeding said sheets out of the magazine when the throat is open, a magnet for controlling the operation of said feeding means, contacts in series with said magnet, and means associated with said connections for opening said contacts when said arms are lifted.

7. In a sheet feeding device, a magazine for holding sheets, a throat in said magazine through which the sheets may pass one at a time, means for feeding the sheets out of the magazine, members normally closing said throat and obstructing a sheet at the throat, and means for gradually moving said members away from said throat and along the path of the sheet during feeding in order to control the rate of feeding.

8. In feeding and sensing devices for record sheets, a magazine for holding the sheets, a throat in said magazine through which the sheets may pass one at a time, a line of sensing brushes adapted to sense said sheets after they pass out of the magazine, an impositive means for feeding said sheets, pivoted members normally closing said throat and holding a sheet at the throat, and means for rocking said members away from said throat and along the path followed by the sheet during feeding in order to determine the time that the sheet cooperates with the sensing brushes.

9. In record sheet feeding and sensing devices, a magazine for holding record sheets, record sensing brushes, shifting fingers, means for bringing said fingers into contact with the first sheet in the magazine, means for moving said fingers transversely to bring the sheet against the side of the magazine in alignment with the sensing brushes, and means for feeding the sheets one by one out of the magazine and under the sensing brushes.

10. In feeding and sensing devices for record

sheets containing columns of perforation index positions, sensing brushes for sensing said perforations, a magazine for holding the sheets, shifting fingers, a frame carrying said fingers, means for mov'ng said frame to bring the fingers into contact with the first sheet in the magazine, a cam for moving said frame in another direction to shift the fingers and the sheet so that the columns of index positions thereon coincide with the sensing brushes, and means for feeding said sheet after said moving means operates said frame to move the fingers away from the sheet.

11. In feeding and sensing devices for record sheets containing columns of data perforations, brushes for sensing said perforations, a magazine for holding said sheets, a throat in said magazine through which the sheets may pass one at a time, a reciprocating plate at said throat, feeding fingers mounted on said plate, means for moving said fingers into engagement with said sheets for feeding a sheet during one stroke of said plate, shifting fingers, a frame carrying said shifting fingers, means for moving said frame to bring the fingers into contact with the first sheet in the magazine, and a cam on said reciprocating plate for moving said frame and fingers laterally on the return stroke of said plate to align the columns of perforations on the first sheet with the sensing brushes.

12. In feeding and sensing devices for record sheets, a magazine for holding said sheets, record sensing brushes, shifting fingers, a frame carrying said fingers, means for moving said frame to draw said fingers in and out of contact with the first sheet in the magazine, a reversible cam for moving said frame in either direction laterally to shift the fingers and the sheet to either side in the magazine in alignment with the sensing brushes, and means for feeding the sheet out of the magazine and under the sensing brushes.

13. In record sheet feeding and sensing devices, a magazine for holding record sheets, a throat in said magazine through which the sheets may pass one at a time, means for feeding the sheets, sensing brushes for sensing the record sheets after they pass out of the magazine, a removable holder for carrying said brushes, a bail comprising a cross bar which acts as a sheet guiding means under the throat, means for rocking said bail and lowering the cross bar when the sensing brush holder is drawn out of the device, and means on said holder for restoring said bail when the holder is moved back into the device.

14. In a record sheet feeding and sensing device, a series of record feeding rollers, sets of record sensing brushes, means for feeding the sheets through the rollers and under the brushes, a pivoted holder for carrying said brushes, means for securing said holder in the device, and means for swinging said holder out of the device to gain access to the brushes and rollers.

15. In a record sheet feeding and sensing device, record sensing brushes, means for feeding record sheets under said brushes, a movable holder for carrying said brushes, means for moving said holder out of the device, and friction means for retaining said holder in adjusted position.

16. In a paper feeding device, means for holding the paper before it is fed, a movable feeding plate near said paper, feeding fingers movably mounted on said plate and tipped with friction material, means for moving said finger into engagement with the paper to feed it when said plate makes one movement, a cam plate cooperating with said fingers to move them out of cooperation with said paper when said feeding plate makes another movement, and means for operating said cam plate in synchronism with the movements of said feeding plate.

17. In a device for feeding a sheet off a stack of sheets, fingers for engaging the end sheet of the stack, means for moving the fingers to push said end sheet off the stack, a backing plate normally away from the end of the stack, and means for moving said plate in synchronism with said fingers so that it is placed near the end of the stack to hold the sheet against the fingers when the fingers go beyond the edge of the stack in pushing the end sheet.

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