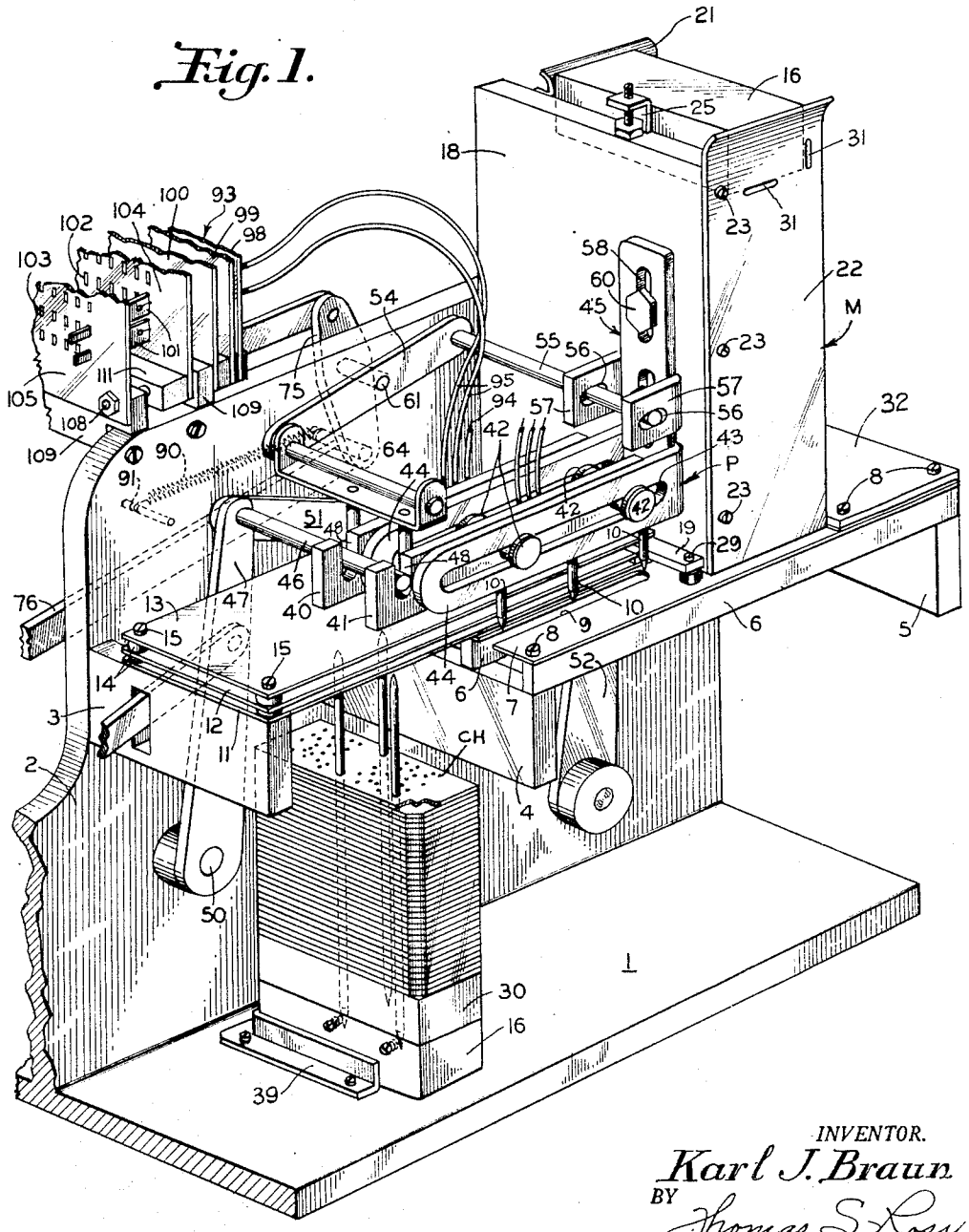
March 15, 1955 K. J. BRAUN 2,704,186

APPARATUS FOR FEEDING AND SENSING STATISTICAL CARDS

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Fig. 1.

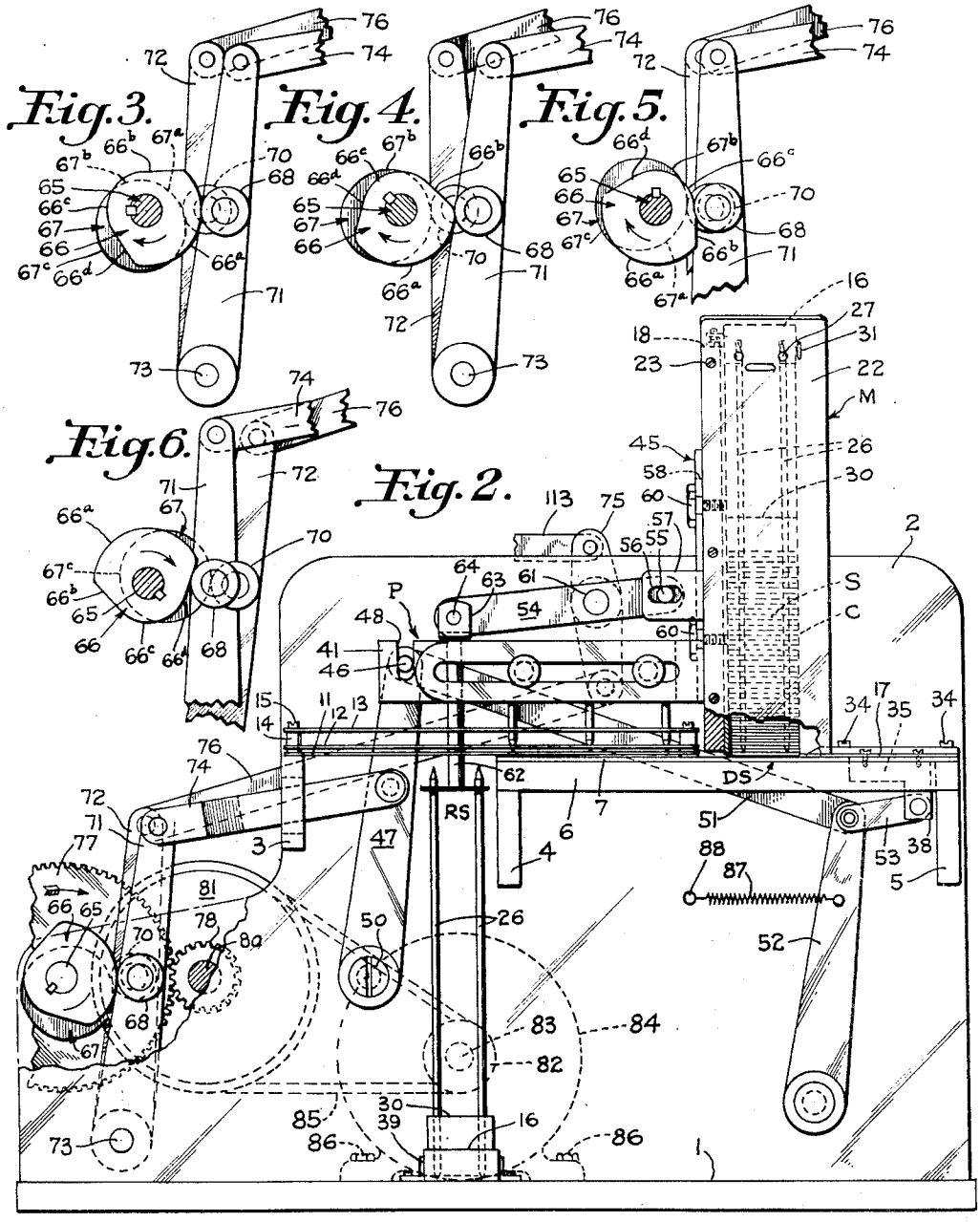


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APPARATUS FOR FEEDING AND SENSING STATISTICAL CARDS

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APPARATUS FOR FEEDING AND SENSING STATISTICAL CARDS

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Fig. 7.

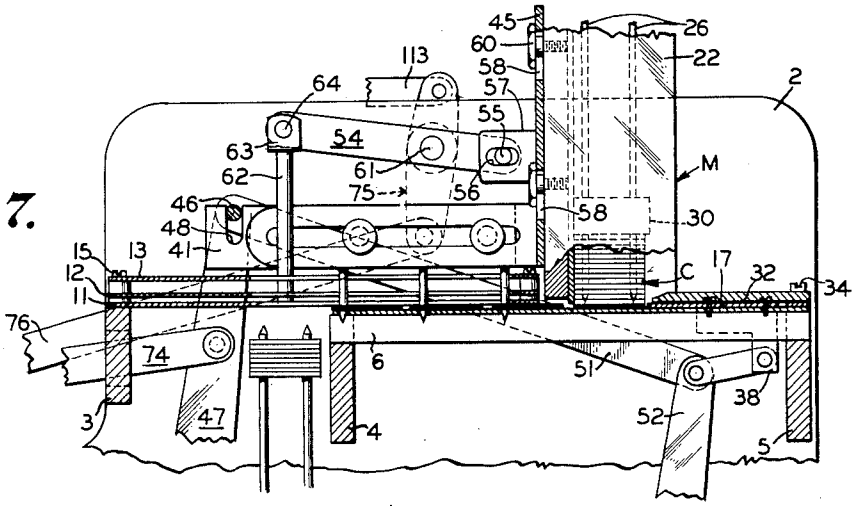


Fig. 8.

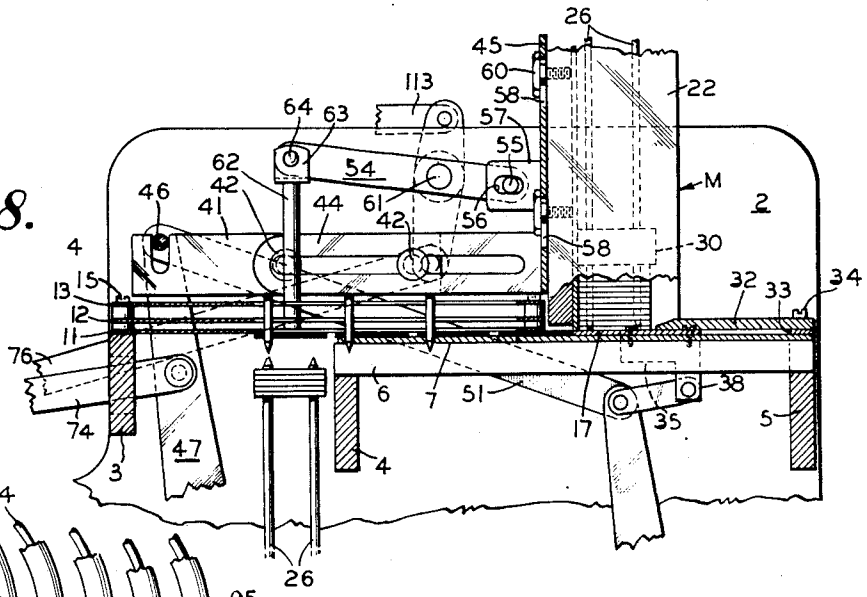
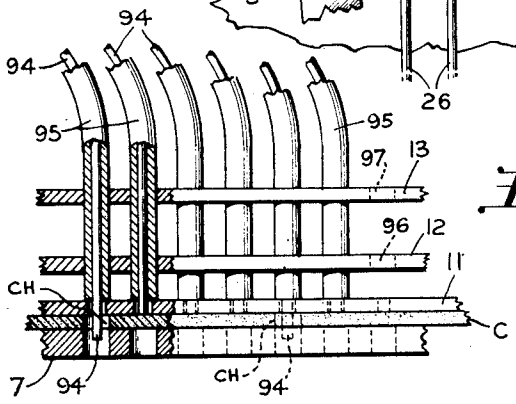


Fig. 9.



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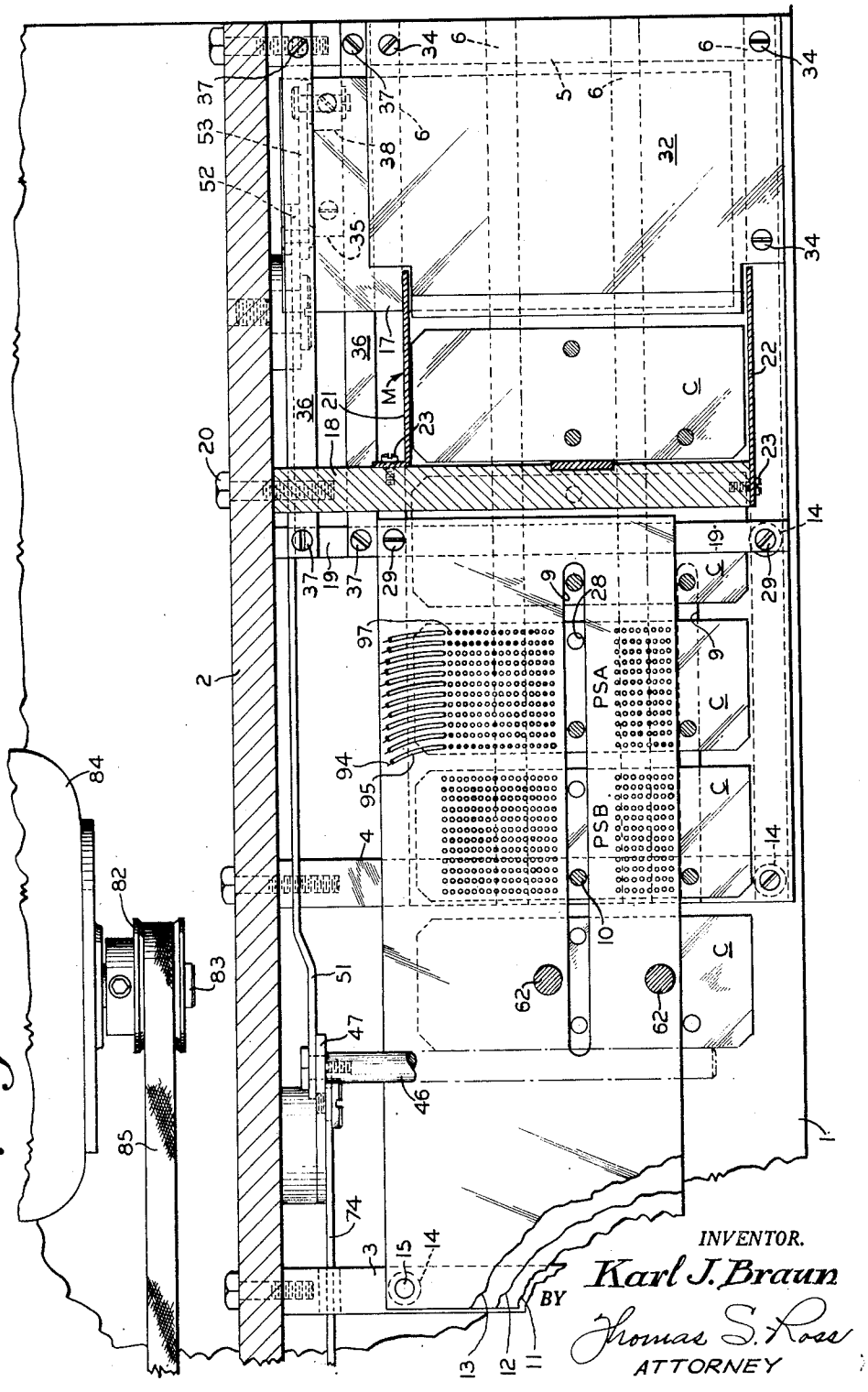


Fig. 10.

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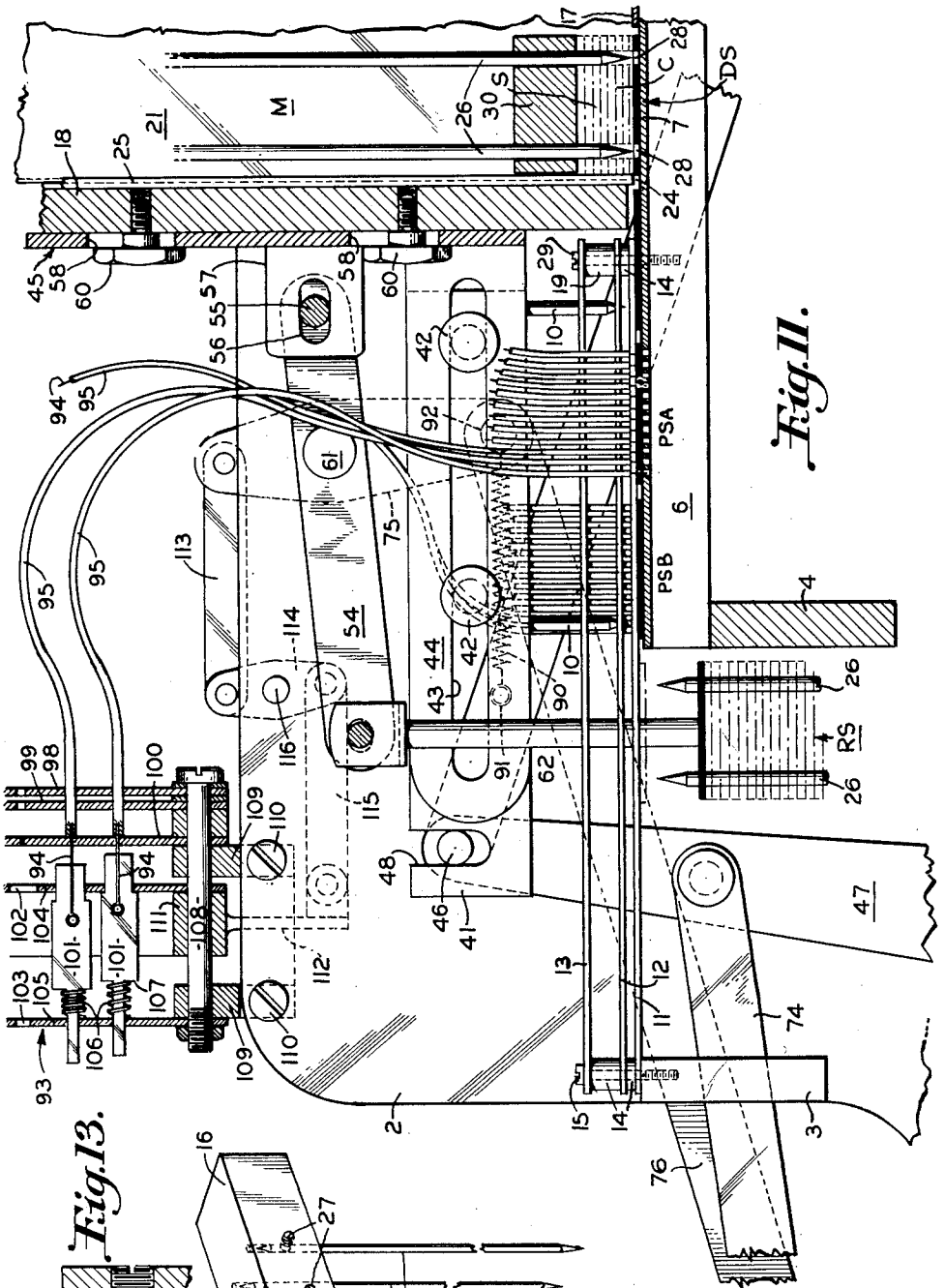


Fig. 11.

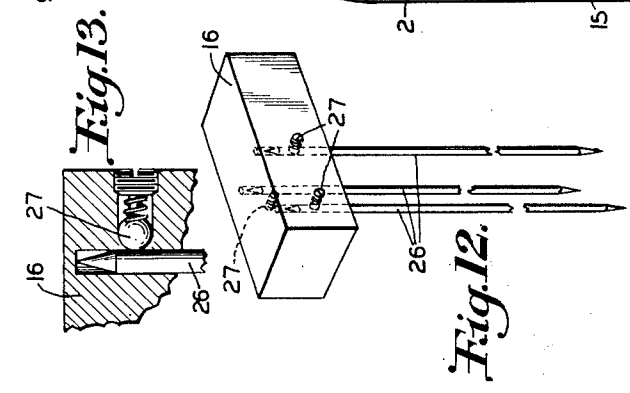


Fig. 12.

Fig. 13.

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Fig. 14.

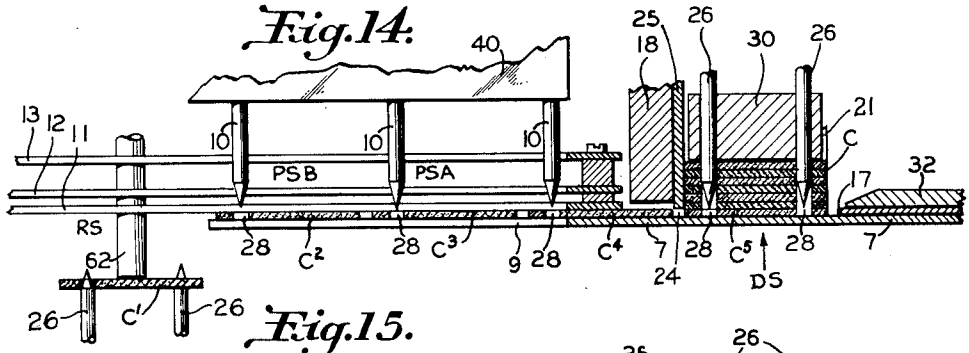


Fig. 15.

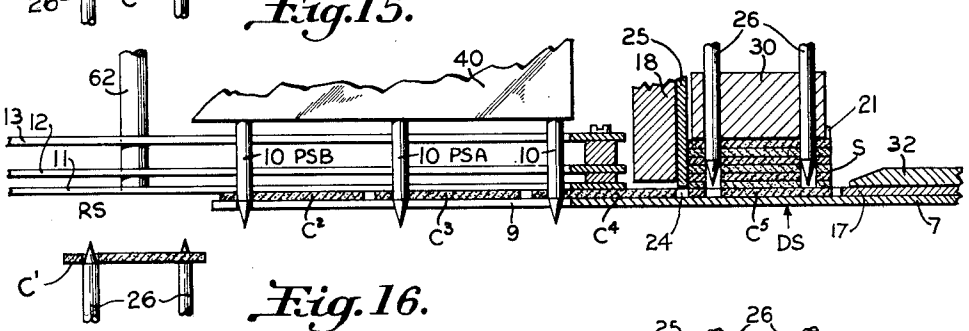


Fig. 16.

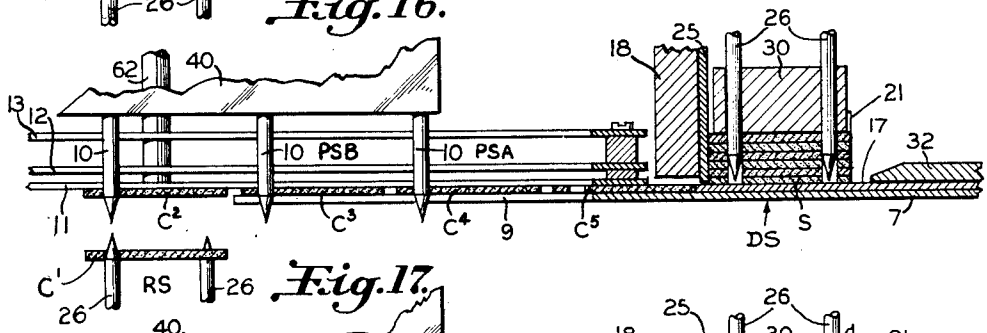
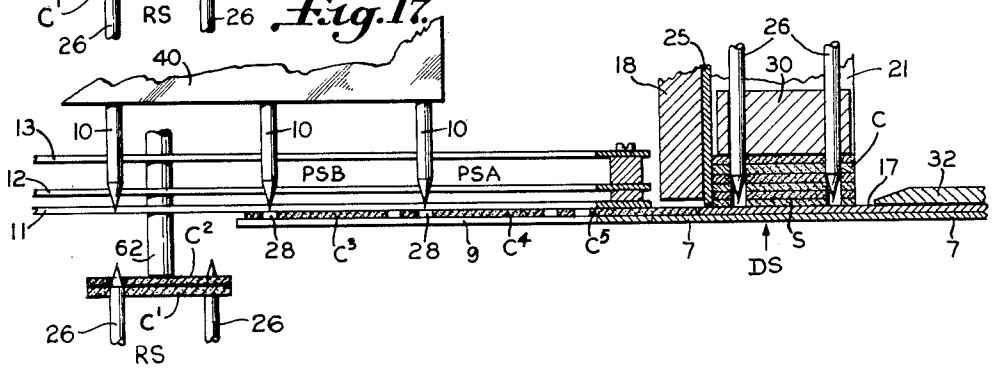


Fig. 17.



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APPARATUS FOR FEEDING AND SENSING STATISTICAL CARDS

Karl J. Braun, Glenbrook, Conn.

Application April 23, 1951, Serial No. 222,401

17 Claims. (Cl. 235—61.11)

This invention relates broadly to improvements in card feeding and sensing mechanisms, and more particularly to new and novel method and apparatus for feeding and sensing statistical record cards, for example, punched cards or tags of the kind disclosed in my copending patent application Serial No. 184,423, filed September 12, 1950, for a Tag Marking Machine.

In prior statistical record card feeding and sensing devices it has been the customary practice to place a stack of uniformly sized cards in a magazine and successively feed the bottom card from the stack through a controlled slot by a reciprocating picker knife. The cards are then subsequently fed by rotating mechanisms such as skid rolls, eject rolls, and the like. However, this type of card feed has numerous disadvantages, since the feed is not positive and its accuracy depends to a large degree upon the cards being of uniform size and in good condition, that is, not torn, creased or otherwise mutilated. Furthermore, in card feeding and sensing devices wherein the cards are fed by skid rolls and like rotating devices which depend entirely upon friction for the driving force, there is a tendency for the cards to intersort at the discharge end of the machine thus destroying a given sequence of the cards.

The present invention contemplates the provision of an improved and simplified method and means for feeding statistical record cards that will eliminate the above mentioned disadvantages of prior card handling devices.

The invention further contemplates an improved card feeding and sensing device that is automatic and requires a minimum of attention; one that will intermittently feed cards in a positive manner; one that will feed intermixed cards of various length; one that will feed cards of various lengths and/or widths in the same run; one that will accurately feed cards which may have been widely circulated and handled, or cards that have been torn, creased, or the dimensions of which have been changed due to atmospheric conditions, or otherwise mutilated to adversely affect them from the standpoint of feed handling or sensing the punched information contained therein; one which employs no skid rolls or other friction feeding devices; one which does not depend upon the marginal edges or size of the card in any manner; one in which the cards cannot be put into the delivery station in reversed position; one which positively prevents feeding one card beneath another card, or intersorting at the discharge end or removal station of the machine; and one which preferably discharges the cards horizontally and in a positive manner to a controlled stack so that card sequence is not lost.

A still further important feature of the present invention is the provision of a card feeding apparatus wherein the feeding means not only serves to feed the cards but simultaneously acts as a positive locating means for the cards at one or more operating stations along the path of card travel between the delivery station and removal station or stations.

A still further object of the invention is to provide card feeding and sensing apparatus of a character which is simple in structure yet rugged in nature and one that will more satisfactorily perform the functions required of it.

Having regard to the foregoing and other objects and advantages which will become apparent as the description proceeds, the invention consists essentially in the novel combination and arrangement of parts hereinafter

described in detail and illustrated in the accompanying drawings in which:

Fig. 1 is a fragmentary isometric view of a statistical card feeding and sensing device embodying the principles of the present invention, the power operating mechanism of which is not shown due to lack of space.

Fig. 2 is a side elevation of the invention, partly in vertical section.

Figs. 3 to 6 are progressive side elevational views of the cams, follower rollers and part of the linkage for controlling the intermittent card feed, sensing and ejecting mechanisms.

Fig. 7 is a fragmentary side elevation partly in vertical section of the card feeding and ejecting mechanism at the beginning of a card feeding cycle.

Fig. 8 is a view similar to Fig. 7 illustrating the position the parts assume at the end of a card feeding cycle.

Fig. 9 is a fragmentary detail view partly in vertical section of a portion of one of the probing or sensing stations, the scale being highly magnified.

Fig. 10 is a sectional plan view of Fig. 1 the section being taken just below the traveling carriage for the card feeding and locating pins.

Fig. 11 is an enlarged fragmentary side elevational view partly in vertical section to clearly illustrate the card sensing or probing stations and portions of the sensing mechanism.

Fig. 12 is a perspective detail of the card stacking control means.

Fig. 13 is a fragmentary sectional view illustrating the detent means for the pins used in the card stacking control means, and

Figs. 14 to 17 respectively are fragmentary longitudinal sectional views illustrating one complete card feeding and sensing or probing cycle of the machine.

In order that the invention may be more fully understood one construction according thereto will now be described, by way of example, with reference to the accompanying drawings which illustrate the invention as applied to a machine for feeding and sensing statistical record cards.

In the construction shown, the framework for the card feeding and sensing mechanism comprises a base plate **1** (see Figs. 1, 2 and 10) from which rises a vertical frame plate **2** that extends substantially from the front to the rear of the base plate. For purposes of description only, the front of the machine will be considered to the left and the rear of the machine to the right in all views.

Spaced above the base plate **1** and projecting horizontally from the frame plate **2** are three spaced supporting arms indicated at **3**, **4** and **5** respectively. Mounted upon the arms **4** and **5** are four equally spaced supporting bars **6** to which a card supporting plate or table **7** is secured in any convenient manner, as for example by screws **8**. As best shown in Fig. 10, the card plate or table **7** is provided with parallel elongated clearance slots **9** for the card feeding and locating pins **10** for reasons presently described.

Positioned above the card plate **7**, are three horizontally disposed parallel plates **11**, **12** and **13** respectively, which are spaced from one another and from the card plate **7** by spacers **14** as clearly shown in Fig. 11. The front ends of the plates **11**, **12** and **13** are supported by the horizontal supporting arm **3** and secured to this arm by screws **15**, while the rear or opposite ends of the plates **11**, **12** and **13** are secured to the bar **19** by screws **29**.

Card magazine

According to the present invention the punched record cards C may be fed seriatim from a magazine M by means of a picker knife or sliding plate **17**. However, it should be made clear at this time that should it be desired to feed intermixed cards of various lengths and widths in the same run, the magazine M may be dispensed with, or enlarged to accommodate the largest size card as will be presently understood as the description proceeds. The forward wall of the magazine M is formed by a vertical plate **18** secured to the frame plate **2** by screws **20** (Fig. 10) and the side walls **21** and **22** of said maga-

zine may be formed from sheet metal and attached to the wall **18** by suitable means such as the screws **23**. The bottom edge of wall **18**, of the card magazine M, is spaced from the card plate **7** (Fig. 11) to provide a card slot **24**, and a vertically adjustable throat bar **25**, slidably mounted within a groove in wall **18**, serves to provide a micrometer slot through which only the lowermost card C from the stack S will pass, during each operating cycle of the picker knife **17** in a manner well understood in the art.

The statistical record cards in the stack S are positively held in stacked relation relative to one another by a plurality of pins **26**. In the present embodiment of the invention there are preferably three of the pins **26**, as best shown in Fig. 12, and these pins are detachably held in a substantially rectangular block **16** by suitable spring pressed ball detents **27** as illustrated in detail in Figs. 12 and 13. It should also be noted that both ends of the pins **26** taper to a point to facilitate their insertion into the locating holes **28** (Fig. 11) in the record cards C. It is this pin arrangement that prevents the record cards C from being put into the delivery station DS in reversed position relative to one another.

Before placing a stack S of cards C upon the pins **26**, an oblong weighted block **30** (drilled to receive the pins) is slipped upon the pins to insure proper positioning of the bottom card of the stack relative to the picker knife **17**. To insure that the pins **26** are held free of and above the bottom card C in stack S, the side walls **21** and **22** of the magazine M are provided with inwardly projecting indentations **21** (Fig. 1) to form a seat for the block **16**.

As stated earlier, the punched record cards C are fed seriatim from the magazine M, or delivery station DS, by means of a sliding plate or picker knife **17**. This plate is confined to horizontal reciprocating movement between the card plate **7** and a cover plate **32**, the latter being suitably spaced from plate **7** (see Figs. 7, 8 and 10). The cover plate **32** is rigidly secured by screws **34** passing through the spacers and received by threaded holes in the two outer supporting bars **6** as best illustrated in Fig. 10.

Plate **17** is guided, during its movement fore and aft of the machine, by a block **35** secured thereto and slidable between parallel bars **36** supported by supporting arm **5** and cross bar **19** and secured thereto by screws **37** or other suitable fastening means. Reciprocating movement is imparted to block **35**, and in turn plate **17** through a depending arm **38** of the block in a manner and by means presently described.

Card feeding mechanism

For a clearer understanding of how the record cards C are progressively and intermittently fed by the card feeding and locating pins **10**, previously briefly mentioned, attention is now directed especially to Figs. 1, 7, 8 and 14 to 17 respectively.

By reference to these figures it will be observed that in the present embodiment of the invention, three pairs of spaced feeding and locating pins **10** are used. These pins are carried by a reciprocating pin carriage indicated as a whole by reference character P. As clearly shown in Fig. 1 this pin carriage comprises a pair of parallel sliding bars **40—41** each of which has a pair of shoulder studs **42** slidable within elongated slots or runways **43** in the lower parallel arms **44** of a bracket member **45**. The pins **10** project downwardly from the lower edge of their respective bars **40—41** and the pins of each pair are in transverse alignment relative to the path in which the cards are fed fore and aft of the machine.

The bars **40—41** and pins **10** are moved forwardly in a horizontal plane, upwardly in a vertical plane, rearwardly in a horizontal plane, and downwardly in a vertical plane during each card feeding cycle in a manner clearly illustrated in Figs. 14 to 17. Forward and rearward movement is imparted to the bars **40—41** by a shaft **46** projecting laterally from the upper end of a lever **47** and received by notches **48** in said bars. The lower end of lever **47** is pivoted upon a stud **50** mounted in the frame plate **2**. The means for moving lever **47** will presently be described, but it will be noted at this time that forward and rearward movement of the card feeding plate or picker knife **17** is effected through movement of lever **47** by a long link **51**, lever **52** and a short link **53**. As best shown in Fig. 2, the forward end of long link **51** is pivotally connected to the upper end of lever **47** and the other end of said link is pivotally connected to the upper end of lever **52**. The short link **53** is pivotally connected between the upper end of lever **52** and the depending arm **38** of block **35**. It will now be apparent that whenever forward and rearward movement is imparted to the bars **40—41**, forward and rearward movement is simultaneously imparted to the picker knife **17** due to the linkage just described.

As previously stated, the bars **40—41** are given vertical movement in addition to horizontal movement, and the vertical movement of said bars occurs in a downward direction at the beginning of a card feeding cycle (Fig. 15), and in an upward direction after the bars reach their extreme forward travel (Fig. 17). The means for imparting vertical movement to the bars **40—41**, and in turn the card feeding and locating pins **10**, comprises a rock lever **54**, the rear end of which has a shaft **55** that rides in slots **56** formed in short arms **57** formed upon the bracket member **45** above the lower arms **44**. The bracket **45** has vertical slots **58** to receive the shoulder studs **60**, and the studs are screwed into the vertical plate **18** as clearly shown in Fig. 11. In this manner bracket **45** is caused to slide upwardly upon the front face of plate **18** when lever **54** is rocked counterclockwise upon its pivot pin **61** (Figs. 1, 2 and 11) and downwardly when said lever is rocked clockwise upon said pin **61** (Figs. 7 and 8).

Card eject or stripping means

A feature of construction of the card feeding means is that the cards C are positively ejected in a horizontal plane at the removal station RS by successively stacking them upon a set of the pins **26** in the manner clearly illustrated in Figs. 1 and 2. To this end a pair of card stripper bars **62** are provided and guided for vertical reciprocating movement within aligned holes in the plates **11**, **12** and **13** respectively. The upper ends of the stripper bars **62** are secured to a U-shaped bail **63** which in turn is pivotally carried by a shaft **64** projecting laterally from the forward end of the rock lever **54**. It is obvious, therefore, that whenever lever **54** is rocked clockwise upon its pivot **61** (Figs. 7, 8, 15 and 16) stripper bars **62** will be elevated until their lower ends are raised slightly above the lower surface of plate **11** and out of the path of travel of the cards C when they are moved to the removal station by certain of the pins **10**. Conversely, when lever **54** is caused to rock counterclockwise on its pivot pin **61** the stripper bars **62** will be moved downwardly (Figs. 2, 11, 14 and 17) to strip the card C from the pins **10** adjacent the removal station RS and transfer it to the pins **26** at said station. In this manner it is impossible for the cards to lose their sequence as they are positively controlled from the time they leave the pins **26** at the delivery station DS, until they are deposited upon the pins **26** at the removal station RS, as will be clear from Fig. 11.

Up to the present point of the description it is understood that rocking motion of the lever **54**, upon its pivot pin **61**, effects vertical motion of the bracket **45** and stripper bars **62**, and further understood that when the stripper bars **62** are moved in a downward direction, the feeding pins **10** will be moved in an upward direction to withdraw them from the cards C before being moved horizontally in a rearward direction by the shaft **46** in the manner previously described.

The means for rocking the lever **54** will now be described in connection with the driving mechanism.

Driving mechanism

The driving mechanism for the machine will be described with reference to Figs. 1 and 2. Secured to a shaft **65**, journaled in the frame plate **2**, are two cams designated **66** and **67** which cooperate with and actuate the follower rollers **68** and **70**, carried by the levers **71** and **72** respectively. The lower end of levers **71—72** are pivoted upon a stud **73** mounted in the frame plate **2**. The upper end of lever **71** is connected to lever **47** by a link **74**, while the upper end of lever **72** is connected to the lower end of a two armed lever **75** (fast on the pivot pin **61** which is journaled in the frame plate **2**, as best illustrated in Fig. 1), by a link **76**.

Also fast on the shaft **65**, is a gear **77** which meshes

with a smaller gear 78 journaled on a shaft 80 that projects outwardly from the frame plate 2. Fixed for rotation with small gear 78, is a large pulley 81 which is rotated by a small pulley 82 fast on the motor shaft 83 of an electric motor 84 through a belt 85. The motor is preferably mounted upon and secured to the base plate 1 by screws 86. It will now be clear that when electric motor 84 is energized, shafts 80 and 65 will be rotated by means of the pulley 82, belt 85, pulley 81, and gears 78 and 77 respectively to rotate the cams 66—67. The follower roller 68 is held against the periphery of cam 66 by a spring 87, one end of which is anchored to a stud 88 (Fig. 2), projecting from the frame plate 2 and the other end attached to the lever 52. Similarly, follower roller 70 is held against the periphery of cam 67 by a spring 90 (Figs. 1 and 11), one end of which is anchored to a stud 91 on the frame plate 2 and the other end attached to a stud 92 carried by the lower arm of the two armed lever 75.

Timing

In describing the timing of the various parts of the machine, reference should be made to the contours of the cams 66—67 used for controlling the pin carriage P, card stripper bars 62, picker knife 17 and sensing mechanism indicated generally by reference numeral 93 in Figs. 1 and 11. Fig. 3 is a view in side elevation of the cams 66 and 67 in the positions, with respect to rollers 68 and 70, which they occupy when the pin carriage P is in its extreme rearward position and being lowered to engage the pins 10 with the locating holes 28 in the record cards C. As the cams turn clockwise in Fig. 3, roller 68 continues to roll over the dwell portion 66*a* of cam 66, which permits the pin carriage P to remain in its extreme rearward position while it is being lowered by the roller 70, which at this time is following the descending portion 67*a* of cam 67 to rock the lever 54 clockwise on its pivot pin 61. When the cams 68—70 reach the positions shown in Fig. 4, the pin carriage P has reached its lowered position to engage the pins 10 with the cards C and roller 68 now starts to descend portion 66*b* of cam 66, which imparts forward motion to the pin carriage P and picker knife 17 through the linkage heretofore described. While the roller 68 is descending portion 66*b* of cam 66, roller 70 continues to roll over the dwell portion 67*b* of cam 67 to permit the pin carriage P to remain in its lowered position while it is being moved in a forward position to feed the cards C toward the removal station.

As the cams 66—67 continue to rotate clockwise in Fig. 5, roller 68 rolls over the dwell portion 66*c*, of cam 66, to permit the pin carriage P to remain in its extreme forward position while it is being raised by the roller 70, which at this time is following the ascending portion 67*c* of cam 67 to rock the lever 54 counterclockwise on its pivot pin 61.

When the pin carriage P is fully elevated at its extreme forward position (Fig. 17) it is moved to its extreme rearward position (Fig. 14) by roller 68, which at this time is following the ascending portion 66*d* of cam 66 to rock the lever 54 counterclockwise on its pivot pin 61. When the pin carriage P reaches its extreme rearward, and elevated position (Figs. 2 and 14) it is again lowered by roller 70 following the descending portion 67*a* of cam 67 to rock the lever 54 clockwise on its pivot pin 61.

It will now be understood that for each revolution of the cam shaft 65, the cams 66—67 cause the pin carriage P to be moved in the following manner: (*a*) vertically in a downward direction to engage the pins 10 with the locating holes 28 in cards C, (*b*) horizontally in a forward direction to positively feed the cards forward, (*c*) vertically in an upward direction to remove the pins 10 from the cards C, and (*d*) horizontally in a rearward direction to return the carriage to the starting position for another cycle of operation.

Sensing mechanism

So far it has been explained how the record cards C are positively fed by the pins 10 from the delivery station DS, to the removal station RS. However, according to the present invention, the card feeding pins 10 not only serve to positively feed the punched record cards C, but also serve to accurately position the perforated information in such cards adjacent one or more sensing or probing stations along the path of card travel between the delivery station DS and removal station RS. In the present disclosure, and for the sake of simplicity, only two sensing or probing stations are shown but it is to be clearly understood that any number of such sensing stations may be employed, as desired without departing from the principles of the invention.

The sensing mechanism about to be explained in detail is a radical departure from all prior card sensing mechanisms employing "Bowden" wires, since all conventional locking mechanisms for the wires have been eliminated, and sensing of the perforated information is accomplished directly by the wires, and the information is decoded directly from the set positions of the wires in a manner hereinafter explained.

Referring now to Figs. 1, 9, 10 and 11, a Bowden wire 94 is provided for each code hole CH (Fig. 1) in the record cards C, and in the present disclosure provision is made for two hundred and eighty-eight such wires at each of the sensing or probing stations PSA and PSB. Accordingly, the plates 11, 12 and 13 are each provided with five hundred and seventy-six holes, or two hundred and eighty-eight holes adjacent each of the sensing stations PSA and PSB respectively, as best illustrated in Figs. 9, 10 and 11.

Each Bowden wire 94 operates within a tubular casing 95, and one end of each casing 95 is inserted within the holes 96 and 97 in plates 12 and 13 respectively as clearly shown in Fig. 9. The other end of each casing 95, is similarly inserted in aligned holes in the plates 98 and 99 shown in Figs. 1 and 11. The length of each casing 95 is such that it is held in the plates 12, 13 and 98, 99 respectively entirely by friction. This construction permits flexibility in the location of the sensing mechanism 93. However, in the present embodiment the sensing mechanism 93 is shown supported by the frame plate 2. One end of each Bowden wire 94 passes through a hole in plate 100 (Fig. 11) and is anchored in a hole in its associated sensing slide 101, while the other end passes through a hole in the plate 11 when entering a code hole CH in a card C in a manner presently described.

The sensing slides 101 are slidably supported in slots 102—103 punched in the plates 104—105 respectively (Figs. 1 and 11), and a spring 106 encircles the reduced end of each slide 101 so that one end seats against the plate 105 and the other end against the shoulder 107 of the slide.

The plates 98, 99, 100 and 105 are rigidly supported in parallel relation relative to one another upon the stud shafts 108 which in turn are carried by bars 109 fastened to the frame plate 2 by screws 110. Plate 104 is secured to a bar 111 that is slidably mounted upon the stud shafts 108, and the bar is provided with a depending arm 112. Horizontal movement of the bar 111, and in turn the plate 104, is effected by the link 113, bell crank 114 and link 115. The bell crank 114 is pivotally mounted upon a stud 116, projecting laterally from the frame plate 2. One end of link 113 is pivotally connected with the upper arm of the two armed lever 75 previously described and its other end is pivotally attached to the upper arm of the bell crank 114. The rearward end of link 115 is pivotally connected with the lower arm of bell crank 114 and its forward end is pivotally attached to the depending arm 112 of bar 111. It will now be clear that when lever 75 is rocked clockwise on its pivot pin 61, as previously described, bell crank 114 will be turned clockwise upon its stud 116 thus moving the bar 111 and plate 104 to the left as viewed in Fig. 11. Conversely, when lever 75 is rocked counterclockwise on its pivot pin 61, bar 111 and plate 104 will be moved to the right upon the stud shafts 108 for reasons explained under operation of the machine which follows.

Operation

The record card feeding and sensing apparatus above described is prepared for operation as follows: A stack S of cards C is mounted upon the free ends of one set of the pins 26, the other ends of which pins are detachably held in one of the blocks 16 by the ball detents 27. The controlled stack of cards is then placed in the magazine M with the block 16 seating upon the indentations 31 as illustrated in Figs. 1 and 2. The electric motor 84 is then energized to rotate the cams 66—67.

One complete machine cycle will now be described and the manner in which the cards are fed will be considered first with reference to Figs. 14 to 17. At the beginning of a card feeding cycle the parts will be in the positions shown in Fig. 14, wherein the bottom card C in the magazine M is resting on the card supporting plate or table **7** in the path of the picker knife **17**. The card feeding pins **10** are elevated and in their extreme rearward position, and the stripper bars **62** are in lowered position. As the cams **66—67** are rotated clockwise (Fig. 2) the pin carriage P will be lowered to engage the feeding pins **10** with the locating holes **28** in cards C^2, C^3, and C^4 (Fig. 14) and the stripper bars **62** will be raised as illustrated in Fig. 15. Further rotation of the cams **66—67** then causes the pin carriage P to be moved forward from its position in Fig. 15 to its position in Fig. 16. During this forward movement of the pin carriage, picker knife **17** moves card C^5 forwardly from the bottom of the stack S to the position formerly occupied by card C^4 while the pins **10** advance the cards C^4, C^3 and C^2 one position to the left at which time the cards C^3 and C^4 are adjacent the sensing or probing stations PSB and PSA respectively and card C^2 is beneath the stripper bars **62** as illustrated in Fig. 16.

Still further clockwise movement of the cams **66—67** causes the pin carriage P to be elevated to withdraw the pins **10** from the cards C^3 and C^4, resting adjacent the sensing stations, and the stripper bars **62** to be lowered to transfer card C^2 from its pair of pins **10** to a set of pins **26** projecting upwardly from their block **16**, the latter being held in proper alignment relative to the pins **10** by a framework **39** mounted upon base plate **1** as best shown in Figs. 1 and 2.

The perforated information in the cards C^2 and C^3 is simultaneously sensed by the Bowden wires **94** during the time the cards are adjacent the sensing stations PSA and PSB respectively.

As the lever **54** turns counterclockwise on its pivot **61** under control of the cam **66**, to elevate the pin carriage P by means heretofore described, plate **104** is moved rearwardly, or to the right (Fig. 11). Springs **106** then urge the sensing slides **101** to follow the plate **104** until the free ends of the wires **94** are stopped by the cards C^2 and C^3, standing at the sensing stations, unless there is a code hole CH in alignment with such wires, in which event the wire passes through the code hole CH permitting further travel of its associated slide **101**.

The positions of the sensing slides **101** can then be utilized for numerous controls. For example, the displacement of the slides **101** can be conveniently utilized to (*a*) control a punching mechanism for the purpose of reproducing another record card, such as a key-sort card or the like, (*b*) be decoded for use in reproducing tabulator cards or the like, (*c*) serve as the set-up means for timing elements which control delayed actions of card sorting mechanisms or the like, (*d*) serve as card comparing mechanisms and the like, (*e*) control accumulator setting mechanisms or the like for computing purposes, and (*f*) control printing instrumentalities and the like.

It may be pointed out now that although the cards C are not held by the pins **10**, while being sensed, they are held by pressure of the springs **106** for all wires **94** which are stopped by the cards due to the absence of code holes CH adjacent such wires, as clearly illustrated in Fig. 9.

Still further rotation of the cams **66—67** returns the pin carriage P from its position in Fig. 17 to its position in Fig. 14 thereby completing one card feeding cycle of the machine. The sensing slides **101** are all returned to their normal forward positions by the forward movement of plate **104** effected simultaneously with the lowering of pin carriage P at the beginning of the next card feeding cycle as heretofore explained.

From the foregoing detailed description of the feeding and sensing apparatus for punched record cards, and operation of the same, it will now be obvious that the cards are positively handled at all times, that is, from the time they leave the delivery station DS until they are deposited horizontally upon the receiving pins **26** at the removal station RS. Thus it is impossible to lose a given sequence of the cards, as so often happens in prior card feeding and sensing mechanisms.

Furthermore, the cards can be run through the machine any desired number of times in exact sequence by changing the block **16** from one end to the other of the pins **26**.

While there have been shown and described and pointed out the fundamental novel features of the invention by means of a single illustrative embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. For example, the operating stations PSA and PSB, located between the delivery station DS and removal station RS, are illustrated as sensing stations but it will be readily apparent to those skilled in the art that the operating stations between the delivery and removal stations may be utilized for printing, punching, comparing or other operations besides sensing operations without changing or altering the manner or method in which the cards are accurately fed and located at such stations by the novel feeding mechanism of the instant invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

The invention claimed is:

1. In a machine for feeding irregular sized statistical record cards having feeding and locating holes therein interspersed with the perforated information in the cards, the combination of a card delivery station; a card removal station; at least one operating station intermediate said delivery and removal stations; a first pin means at said delivery station cooperating with said card feeding and locating holes to retain the cards in a given relation relative to one another; a second pin means subsequently engageable with said card feeding and locating holes to intermittently feed the cards to said operating station and accurately position the perforated information in said cards adjacent said last named station; and a third pin means adjacent said removal station cooperable with said holes to insure card sequence identical to that in which they leave the pins at said delivery station.

2. In a perforated record card feeding and sensing device, the combination of a card delivery station; a card removal station; at least one card sensing station located between said delivery and removal stations; means to intermittently feed cards between said delivery and removal stations including a plurality of feeding pins; means to engage said pins with feed holes in said cards; means to move said pins toward said removal station during their card feeding stroke; means to withdraw said pins, at the end of their feeding stroke, from engagement with said cards; means to return said pins toward said delivery station while they are disengaged from said cards; and means to sense the perforated information in said cards while they are adjacent said sensing station.

3. In a perforated record card feeding and sensing device as claimed in claim 2 wherein the means to sense the perforated information in said cards while they are adjacent said sensing station comprises flexible wires and sensing slides.

4. In a perforated record card feeding and sensing device, the combination of a card delivery station; a card removal station; at least one card sensing station located between said delivery and removal stations; positive means to intermittently feed cards between said delivery and removal stations comprising, a plurality of feeding pins; means to engage said pins with feed holes in said cards; means to move said pins horizontally toward said removal station during their card feeding stroke; means to withdraw said pins, at the end of their feeding stroke, from engagement with said cards; means to return said pins toward said delivery station while they are disengaged from said cards; means to sense the perforated information in said cards while they are adjacent said sensing station including flexible wires; and sensing slides directly connected to and moved by said wires.

5. A perforated record card feeding device comprising in combination, a magazine for supporting a stack of perforated record cards having feeding holes therein; a reciprocal plate adapted, on its forward stroke, to engage said stack to feed a card therefrom; a pin carriage mounted for horizontal and vertical movements; feed pins mounted to move with said carriage; and means to move said carriage vertically to engage said pins with said feed holes in the cards, horizontally to feed the cards in a direction away from said magazine, vertically to remove said pins from said card feed holes, and horizontally toward said magazine during the time the pins are disengaged from the feed holes in said cards.

6. A perforated record card feeding mechanism comprising in combination, a magazine for supporting a vertical stack of perforated record cards having feeding holes therein; a reciprocal plate adapted, on its forward stroke, to engage said stack to feed the lowermost card therefrom; a pin carriage mounted for both horizontal and vertical movements; feed pins mounted for movement with said carriage; and means to move said carriage vertically to engage said pins with said feed holes in the cards, horizontally to feed the cards in a direction away from said magazine, vertically to remove said pins from said card feed holes, and horizontally toward said magazine during the time the pins are disengaged from the feed holes in said cards, said last named means acting to reciprocate said plate during horizontal movements only of said pin carriage.

7. In a machine for positively feeding and sensing perforated statistical record cards comprising the combination of a card delivery station including a magazine having a card removal slot adjacent the bottom thereof; adjustable means to vary the height of said card slot; a first card feeding means including a plate mounted for reciprocating movement fore and aft of the machine and effective to feed cards from said magazine one at a time; a card removal station; at least one analyzing or probing station; a second positive card feeding means including a plurality of feed pins operable to intermittently advance cards, fed from said magazine by said first card feeding means, to said analyzing or probing station; card probing means effective to analyze the perforated information in each card while it is adjacent said probing station; means to strip certain of said cards from certain of said feeding pins after they have passed said probing station; and means cooperable with said card stripping means to effectively prevent intersorting of the cards at said card removal station thereby maintaining a given sequence of the cards identical to that in which they are removed from said delivery station, said last named means comprising a plurality of stacking pins disposed in axial alignment with certain of said first named pins as the latter reach said removal station.

8. In a record card feeding apparatus, the combination of a card delivery station; a card removal station; positive propelling means for successively and intermittently moving the cards in a horizontal path from said delivery station toward said removal station, said propelling means including a plurality of feed pins adapted to enter feed holes in the cards to move the latter during movement of said propelling means in one direction only; means to positively remove said cards from the feed pins adjacent the removal station; means to withdraw the feed pins from engagement with the feed holes in said cards; and means to drive said propelling means in a direction toward said delivery station during the time said pins are disengaged from the cards, and in a direction away from said delivery station when said pins are engaged with said cards.

9. In a record card feeding apparatus as specified in claim 8 wherein the means for driving the pin propelling means includes a pair of cams and linkage driven by the cams and connected with the propelling means substantially as described.

10. In a perforated record card feeding and sensing mechanism of the character described, the combination of a card delivery station; a card removal station; at least one card sensing station located between said card delivery and removal stations; card feeding means adapted to intermittently feed cards between said delivery and removal stations comprising a plurality of spaced pairs of feeding pins; means to effect engagement of said pins with feed holes in said cards; means to move said pins away from said delivery station and toward said removal station when feeding cards; means to effect disengagement of said pins from the feed holes in said cards at the end of the card feeding stroke of said pins; means to move said pins away from said removal station and toward said delivery station during the time the pins are disengaged from said cards; and means to sense the perforated information in said cards while they are adjacent said sensing station, said last named means comprising a plurality of flexible wires adapted to shift predetermined distances according to the perforated information in said cards, said wires being connected with corresponding sensing slides which are moved by the wires to set positions according to said perforated information in the cards.

11. In a perforated record card feeding and sensing mechanism of the character described; the combination of a card delivery station; a card removal station; at least one card sensing station located between said card delivery and removal stations; card feeding means adapted to intermittently feed cards between said delivery and removal stations comprising a plurality of spaced pairs of feeding pins; means to effect engagement of said pins with feed holes in said cards including a pin carriage; means to move said pins and carriage away from said delivery station and toward said removal station when feeding cards; means to effect disengagement of said pins from the feed holes in said cards at the end of the card feeding stroke of said pins; means to move said pins and carriage away from said removal station and toward said delivery station during the time the pins are disengaged from said cards; and means to sense the perforated information in said cards while they are at rest adjacent said sensing station, said last named means comprising a plurality of flexible wires adapted to shift axially predetermined distances according to the perforated information in said cards, said wires being directly connected with corresponding sensing slides which are directly moved by the wires to set positions according to said perforated information in the cards.

12. Apparatus for feeding intermixed documents or cards of widely varying sizes in the same run comprising, a card delivery station; a card removal station; vertical pin means at said delivery station serving to retain predetermined information areas or zones on said intermixed and widely varying sized cards in accurate vertical alignment within said delivery station; positive card propelling means for successively and intermittently advancing the cards from said delivery station to said removal station including aligned pairs of feeding pins adapted to enter and be withdrawn from spaced feed holes in the cards; vertical stacking pins at said removal station; and positive means operable to transfer said cards, one at a time, from the pair of feed pins adjacent the removal station to said stacking pins to insure card sequence identical to that in which they leave the pins at said delivery station.

13. Apparatus for feeding records of intermixed irregular sizes, each record having a plurality of combined feeding and locating holes therein comprising: a record delivery station; a first pin means at said delivery station cooperable with the feeding and locating holes in the records to maintain accurate alignment of predetermined information zones or areas on said irregular sized records relative to one another; a record removal station; at least one recording station intermediate said delivery and removal stations; record feeding means including a second pin means cooperable with the feeding and locating holes in said records to intermittently feed the records from said delivery station, past said recording station and to said removal station; a third pin means adjacent said removal station; and means to positively transfer said records from said second pin means to said third pin means to insure stacking of the records on said third pin means in a sequence identical to that in which they are removed from said first pin means.

14. Apparatus for feeding records as set forth in claim 13 wherein the record delivery station includes a magazine within which the irregular sized records are stacked upon the first pin means; and a weight bearing on said stack, and guided by said first pin means insures proper feeding of the records downwardly along said first pin means towards said second pin means.

15. In apparatus of the character described, the combination of: means for feeding record cards of mixed sizes having predetermined information zones or areas thereon comprising, a card delivery station; pin means at said delivery station passing through holes in the cards to maintain accurate vertical alignment of the information zones or areas of the cards regardless of their mixed lengths and widths; a card removal station; at least one operating station intermediate said delivery and removal stations; and means to feed the cards one at a time from said delivery station, past said operating station, and to said removal station including a second pin means to maintain accurate registration of the information zones or areas on said cards of mixed sizes as they pass said operating station and reach said removal station.

16. In apparatus of the character described, the combination of: means for intermittently feeding and sensing record cards of intermixed sizes in the same run comprising, a card delivery station; pin means at said delivery station passing through holes in the cards to maintain accurate vertical alignment of zones or areas of punched information contained in the cards regardless of their mixed lengths and/or widths; a card removal station; at least one sensing station intermediate said delivery and removal stations; and means to intermittently feed the cards one at a time from the pins at said delivery station, past said sensing station, and to said removal station, said last named means including a second pin means to maintain accurate registration of the zones or areas of punched information in said cards of intermixed sizes as they pass said sensing station and reach said removal station.

17. In a device of the character described for intermittently feeding statistical records of irregular sizes in the same run, each record having a plurality of feeding and locating holes therein, the combination comprising:

a record delivery station; pin means at said delivery station passing through said feeding and locating holes in said records to maintain accurate vertical alignment of the zones or information areas of said records of irregular sizes; a record removal station; at least one operating station intermediate said delivery and removal stations; a reciprocating pin carriage; and record feeding and locating means including pairs of horizontally aligned pins carried by said carriage and cooperating with the feeding and locating holes in said records to intermittently feed the records from said delivery station to said operating station and from said operating station to said removal station.

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