Feb. 16, 1954 H. A. HENDRICH 2,669,303

RECORD CONTROLLED PERFORATING MACHINE

Filed June 20, 1951

4 Sheets-Sheet 1

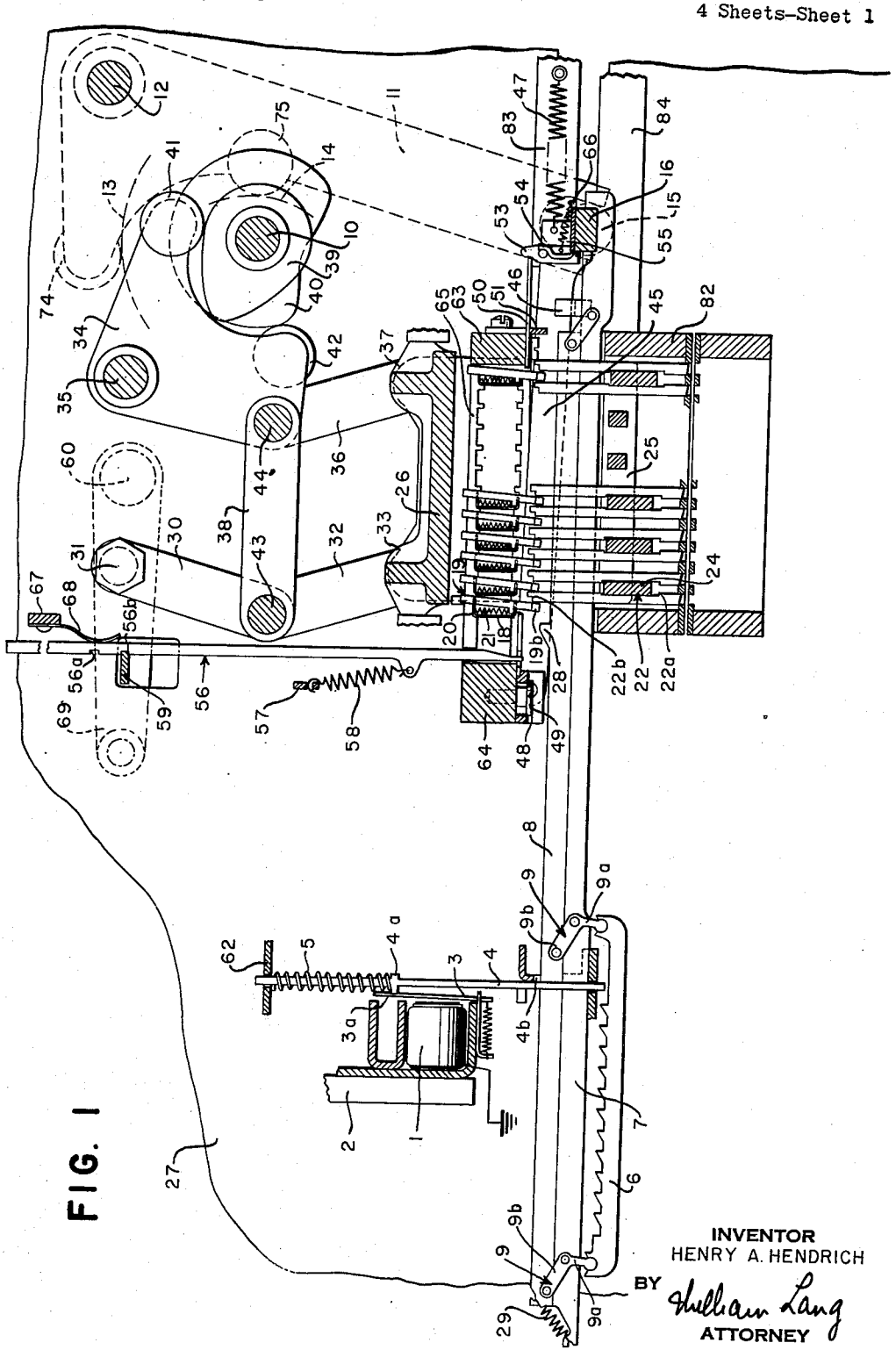


FIG. 1

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4 Sheets-Sheet 2

FIG. 2

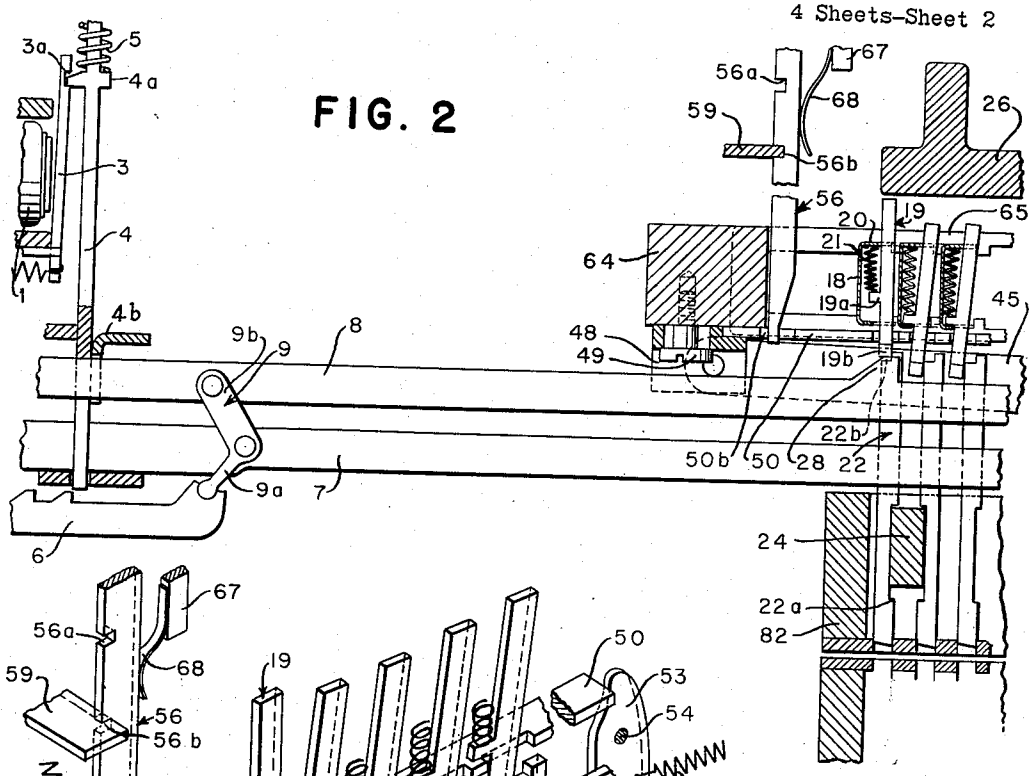
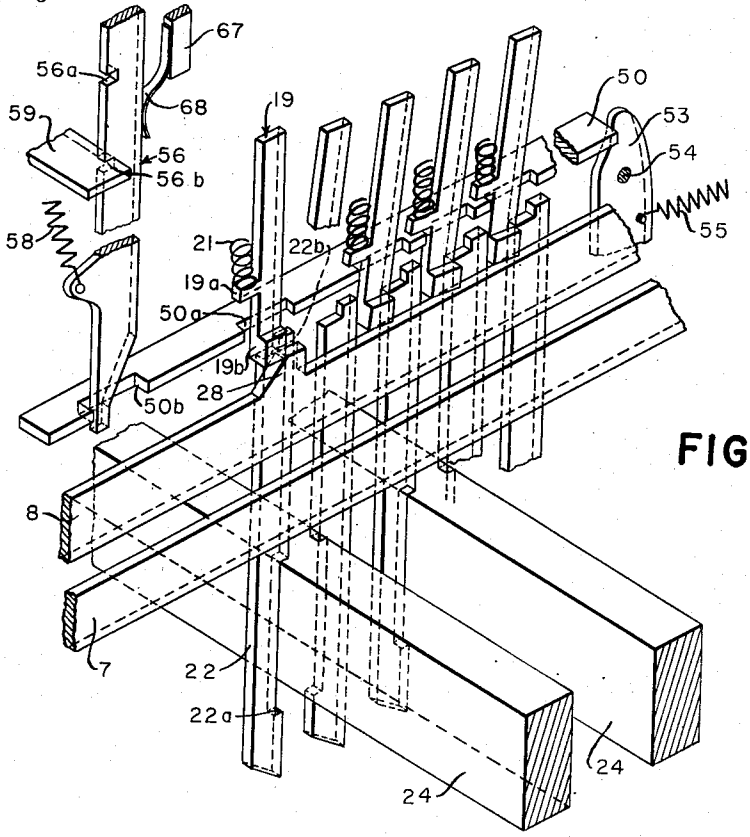



FIG. 4




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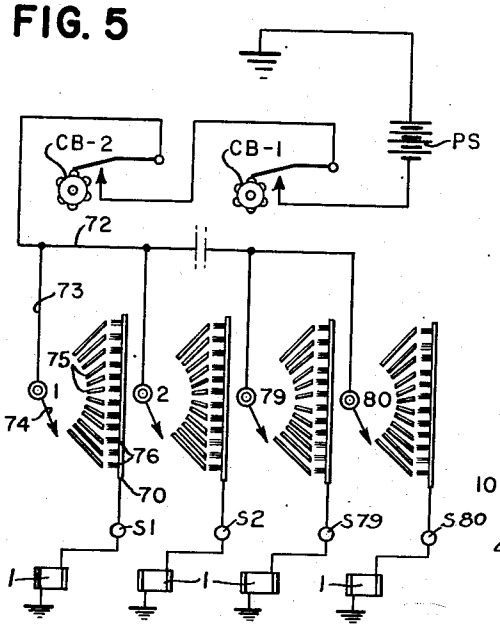
Feb. 16, 1954 H. A. HENDRICH 2,669,303

RECORD CONTROLLED PERFORATING MACHINE

Filed June 20, 1951

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FIG. 5



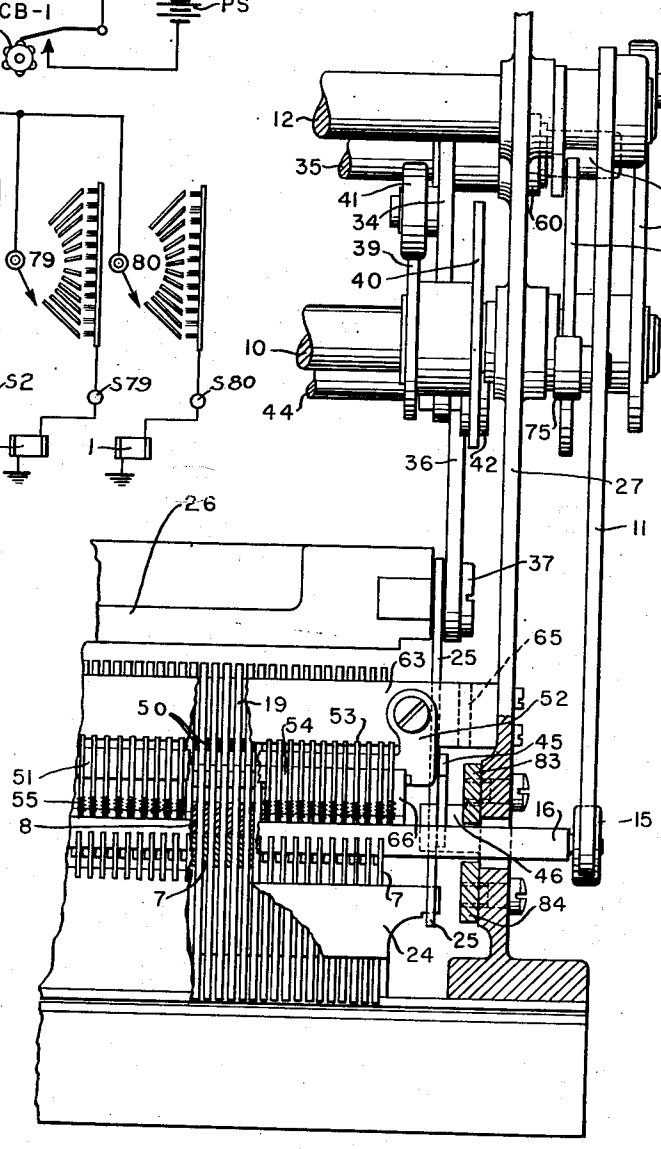




FIG. 3

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Filed June 20, 1951

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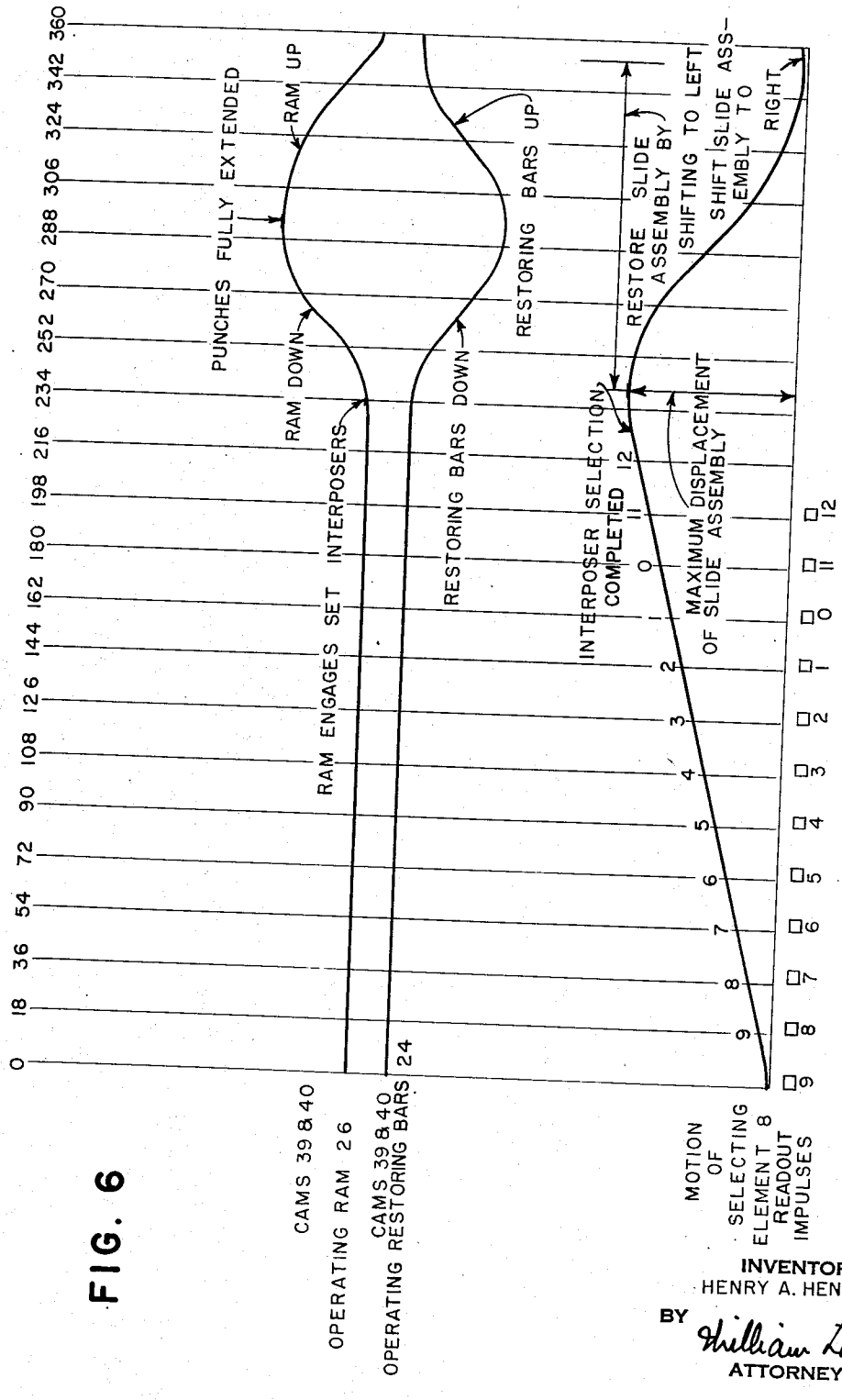



FIG. 6

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Patented Feb. 16, 1954

2,669,303

# UNITED STATES PATENT OFFICE

2,669,303

## RECORD CONTROLLED PERFORATING MACHINE

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Application June 20, 1951, Serial No. 232,502

11 Claims. (Cl. 164—115)

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This invention relates to a new and useful improvement in machines for punching perforations in the well known record cards of the type, for example, containing 80 columns of 12 punching positions wherein all possible nine hundred and sixty punching positions may be perforated at one time.

The main object of this invention is to provide an improved means for setting up the complete data to be punched on a record card and punching all selected perforations at one time in the record.

An object of the invention is to provide means to prevent restoring of the punch interposers in any or all columns, independently of each other.

Another object of the invention is to make certain operating parts of the machine self-restoring.

A further object of the invention is to increase the speed of operation of present summary and gang punching operations.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of examples, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is a section through the punch assembly showing the operating parts in the extreme left position before any punch interposer is set up.

Fig. 2 is a fragmental section through the punch assembly showing a portion of the operating parts in the right hand position after one of the punch interposers is set up and selection interposer 4 raised again to be relatched.

Fig. 3 is a fragmental front elevation partly in section of the machine.

Fig. 4 is a fragmental perspective view of the punch elements and the associated set up and restoring mechanism for one card column.

Fig. 5 is a diagram showing the card analyzing station.

Fig. 6 is a timing diagram which can be followed to understand the timing of the various operations of the mechanisms shown herein.

In the present machine, cards containing control designations are advanced to an analyzing station which is provided to sense the cards that control selection of punches for the punching operation. The cards may be advanced to the analyzing station by any suitable means such as through feeding devices geared to a main drive shaft 10 of the machine, so as to feed cards intermittently in the required quantity according to

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the type of punching to be performed. Drive shaft 10 in turn is driven from any suitable source. While control cards are being fed to the analyzing station, the cards to be punched are inserted in the die portion of a punch guide block 82 (Fig. 1). This may be done by conventional stepping as a whole card feeding means or by hand if so desired.

A row of magnets 1 is mounted to a frame member 2 of a punching machine as shown in Fig. 1. Each magnet in the row is associated with a record card column and is disposed in staggered relationship with respect to the magnets on either of its sides in order to accommodate eighty columns.

The preferred embodiment of the card analyzing station is shown diagrammatically in Fig. 5 and provides for the static sensing of a perforated card which is advanced and clamped to a card bed or plate 70. An analyzing brush 76 is provided for each of the nine hundred and sixty positions on the card. Also, readout devices of a commutator arrangement are provided for reading out the perforations analyzed to thereby transmit digit-representing impulses. A separate commutator segment 75 is related to each brush and the twelve brushes in each row are swept by a brush readout 74. The commutator arrangement is such that it is intimately structurally coordinated with the analyzing brushes so as to occupy a minimum of space and is individual to each column to eliminate the possibility of back circuits. This static sensing arrangement is described in detail in the U. S. patent to G. F. Daly dated June 4, 1950, No. 2,514,031. However, it is not intended that this invention be confined to use with a static sensing arrangement so that card analyzing mechanisms such as those which involve a card in motion or accumulator readout for preparing a summary card may be used.

The circuits whereby the perforated cards may be analyzed at the reading station are shown in Fig. 5 wherein it will be seen that for column 1 the arrangement of the sensing commutator is shown diagrammatically. Of course, this arrangement is duplicated for the eighty columns in the reading station. The sensing circuit is from ground, through a power source PS, circuit breaker contacts CB–1 and CB–2, thence to wire 72. The wire 72 has a respective wire connection 73 to the brush 74 of the first column commutator. Brush readout 74 makes successive contact with contact points 75 and the circuit will be closed through the particular brush 76 which passes

through the card perforation. Each plate 70 which carries the series of analyzing brushes 76 has a wire connection to a respective plug socket such as socket S1 in the first column. For the reading station there is a series of eighty plug sockets including S1, S2, S79 and S80, from which plug connections are made to the desired punching orders to effect the setting up of information to be punched corresponding to the perforated data. For this purpose plug connections are provided leading to each magnet 1 (Fig. 1) and the circuit is completed through magnet 1, thence back to ground.

The CB–1 and CB–2 circuit breaker contacts are timed to close and open at such times as to prevent arcing at the break and make between the brush readout 74 and the contact points 75, so as to prevent damage at this point of contact. The construction and operation of circuit breaker contacts, such as are employed herein, are well known.

In the following description of the punch mechanism and set up means therefor, only one card column will be considered, it being understood that this machine is equipped with identical parts for each of the eighty columns.

Magnet 1 is provided with an armature 3 spring biased in a clockwise direction as viewed in Fig. 1 and having a depressed portion 3*a*. A selection interposer 4 is slidably mounted in a frame member 62 and is urged downwardly by the action of a spring 5 which extends between frame member 62 and a flange portion 4*a* of interposer 4. Flange 4*a* serves as a seat for spring 5 and also as a protruding surface to coact with the depression 3*a* of armature 3. In the normal non-operating position, flange 4*a* rests in depression 3*a* thereby maintaining interposer 4 in a latched position and spring 5 is compressed. When magnet 1 is energized through a circuit, as explained above, armature 3 is moved to the left and selection interposer 4 is released. Spring 5 is then permitted to move interposer 4 downwardly to engage a tooth on a rack 6.

Rack 6 is pivotally suspended from the ends of legs 9*a* of bell cranks 9 which in turn are pivotally mounted on lower portion 7 of a slide assembly which consists of an upper portion or selecting element 8 and lower portion 7. Lower portion 7 normally acts as a support member upon which the selecting element 8 reclines. Legs 9*b* of bell cranks 9 are pivotally attached to the upper portion 8 of the slide assembly. An operating arm 11 is pivotally mounted on a supporting rod 12 which extends between the side frames of the machine as shown in Fig. 3. Operating arm 11 is provided with a pair of rollers 74 and 75 which are constantly engaged by cams 13 and 14 secured to the main drive shaft 10. Also, operating arm 11 is bifurcated on the lower end to straddle roller 15 which rides in a groove in the bifurcated end. Attached to roller 15 and extending through both machine side frames is a bar 16 which is fastened to lower part 7 of the slide assembly. A pair of guide rails 83 and 84 are secured inside both side frames to form a channel in which bar 16 is free to move laterally. (See also, Fig. 3.) When cam 13 rocks operating arm 11, bar 16 moves the slide assembly to the right. It should be understood that an operating arm 11 and the control mechanism therefor is situated on the outside of both machine side frames and bar 16 extends between the two rollers 15.

The releasing of selection interposer 4 which is forced downwardly by spring 5 to engage a tooth on rack 6, prevents further travel of the rack to the right. However, bar 16 will continue to move to the right carrying the lower portion 7 of the slide assembly with it. Rack 6 and upper portion 8 of the slide assembly are thus raised by legs 9 swinging about their pivot points on lower portion 7. It is this raising and moving to the right of upper portion 8 which causes the selected punch interposer to be set up for the ensuing punching operation as explained hereinafter.



Referring now to Figs. 2 and 4, a support frame is provided to carry the punch interposers which are moved into axial alignment with a related punch element for setting up the punch element to effect punching during the punching operation. Cross bars 63 and 64 are firmly mounted between the machine side frames and a pair of side plates 65 is fastened between the cross bars, one near each side frame. Each side plate 65 has a cut-out central portion for facilitating the mounting of channel members 18 which serve as guides for punch interposers 19. Channel members 18 slide into grooves 20 positioned at intervals on the surface of the cut-out portion and each channel 18 has a series of slots through which pass the punch interposers 19. A row of punch interposers 19 is thus formed for each card column, there being an interposer for each index point position on the card. Each interposer 19 has a lip 19*a* and a spring 21 which pushes it downwardly. In addition, each interposer 19 is offset with respect to a related punch element 22 and the lower end of each interposer bears on the side of its punch element.

The punch elements 22 are slidably arranged in a common punch guide block 82 and each punch element is provided with a notch 22*a*, the notches facing each other on alternate pairs of adjacent punch elements. A restoring bar 24 rides within the space formed by the notches 22*a* and serves as a positive restoring means for the punches. Restoring bars 24 are mounted on a pair of supporting plates 25 which in turn are secured to ram 26. (See Fig. 1.) Restoring bars 24, supporting plates 25, and ram 26 in effect form one integral structure, thereby eliminating the possibility of a jam between them when the machine is operating.

Referring again to Fig. 1, upper portion 8 of the slide assembly has a cam surface 28 which rides below a row of interposers 19. When the raising action of the upper portion 8 starts, interposers 19 are in their normal position which is out of axial alignment with their related punch elements 22. Cam surface 28 engages an extension 19*b* located at the bottom of the selected interposer 19 thereby causing the interposer to be raised and forced to the right until it is seated in a cut-out portion 22*b* on the top of the related punch element 22.

Concurrently with the raising action of the upper portion 8 of the slide assembly, selection interposer 4 is also raised by the upward travel of rack 6. Upper portion 8 raises slightly faster than rack 6, because of the unequal length of legs 9*a* and 9*b* of bell crank 9. During this raising action upper portion 8 engages a shoulder 4*b* on selection interposer 4. Consequently selection interposer 4 is disengaged from the tooth on rack 6 and raised a sufficient distance to allow it to relatch on depression 3*a* of armature 3 which is again spring urged in a clockwise direction upon deenergization of magnet 1. It is therefore readily seen that the restoration of the selection interposer 4 is effected while the punch interposers

19 are set up and the mechanism is thus termed self-restoring, since no separate restoring mechanism is required.

The machine functions described above including the energization of magnet 1, unlatching of selection interposer 4, engagement of rack 6 by interposer 4, raising of the upper portion 8 of the slide assembly, moving of punch interposer 19 into axial alignment with its related punch element 22 and restoring of selection interposer 4 are all performed within one cycle point of operation. Under ordinary operating conditions only one punch element would be set up in each column for numeric information and two punch elements for alphabetic information, but it is possible to set up all of the punch elements for one column. In setting up two or more punch elements, the right-ward movement of lower portion 7 of the slide assembly and selecting element 8 is momentarily interrupted for each punch element set.

From Fig. 6 it will be seen that displacement of the slide assembly to the right starts at about 351° and continues until about 243° of the next cycle. Selecting element 8 may be raised to shift an interposer 19 into axial alignment with a related punch element at each index point during said displacement of the slide assembly. It is noted that the index points are read out at 18° intervals in the machine cycle, which provides sufficient time for the slide assembly to move the required distance to position cam surface 28 beneath the next following interposer 19.

At about 243° cams 13 and 14 will be effective, after the selected interposers 19 are aligned with their related punch elements 22, to shift the slide assembly to the left, restoring it to its normal starting position.

A spring 29 is anchored to both upper portion 8 and lower portion 7 of the slide assembly. When selection interposer 4 is disengaged from rack 6, spring 29 returns upper portion 8 to its lower or normal position. In the event that spring 29 fails, cam 28 in its continued travel to the right will encounter the side portion of extension 19b of the next punch interposer 19 and automatically cam upper portion 8 toward the left and downwardly through a counterclockwise rotation of bell crank 9. Thus, one or more punch interposers 19 have been set up and are in a position to actuate a related punch element 22 when the ram 26 is lowered.

Ram 26 is supported and operated by the toggle link arrangement shown in Figs. 1 and 3. A toggle link 30 is rotatably mounted on machine side frame 27 at 31. Pivotally connected to link 30 through support bar 43 is a second link 32 which in turn is freely mounted on a stud 33 protruding from ram 26. A cam follower 34 is mounted for rotation on a shaft 35 extending between machine side frames. Pivotally connected to cam follower 34 through support bar 44 is a link 36 which in turn is freely mounted on a stud 37 protruding from ram 26. A rod 38 connects links 30 and 32 to the cam follower 34 and link 36 to transmit the movement of cam follower 34 to links 30 and 32. Cams 39 and 40 are fastened to drive shaft 10 and remain in continuous contact with cam follower rollers 41 and 42 respectively.

In the foregoing paragraph a description is given of a linkage and operating controls therefor situated inside frame 27 for activating ram 26. It should be understood that a similar linkage with corresponding operating controls is situated near the other machine side frame.



Again referring to Fig. 6, it is seen that at about 225° all the selected interposers 19 in a column have been positioned above their related punch elements 22. However, bar 16 and the associated slide assembly and rack 6 continue to the right end of travel until 243° of the machine cycle as previously stated. Also at 225°, cam 39 causes the downward movement of ram 26 through cam follower 34 and the toggle link arrangement described above. The shifted interposers 19 are thus moved downwardly, pushing their related punch elements through openings in punch guide block 82, thereby causing one or more holes to be punched in a card resting in the guide block. The actual punching operation starts at approximately 241° and the card is fully registered by 243°.

At 292½° cam 40 will be effective to move ram 26 upwardly, restoring it to its normal position. While ram 26 is moving downwardly during the punching operation, restoring bars 24 are also descending. When cam 40 restores ram 26 at 292½°, the restoring bars will move upwardly to restore to its normal position any punch element 22 which has been activated. The card is removed from the die portion of the punch guide block 82 at 360° or slightly before. Removal of the card may be done by conventional card discharging means or by hand if so desired.

A pair of draw bars 45 are positioned at each end of the punch mechanism and ride on support members 46 which are fastened inside both machine side frames. Each draw bar is biased toward the right as viewed in Fig. 1 by a spring 47, which is fastened to a machine side frame at a point not shown. A bail 48 is pivotally connected to the other ends of the draw bars and is slidably held in position by screws 49. A punch interposer restoring bar 50 operates in conjunction with the aforementioned bail and draw bar mechanism to restore interposers 19. Referring to Figs. 2 and 4, restoring bar 50 is provided with a plurality of notches 50a which permit free vertical movement of punch interposers 19 but limit their horizontal movement and a notch 50b for receiving a lock bar device described hereinafter. The restoring bar 50 is supported on one end by bail 48 and moves freely over support bar 51 which depends from cross bar 63 by lugs 52. (See Fig. 3.) Secured to bar 16 is an angle plate 66 having a rod 54 extending the entire width of the plate. The vertical arm of plate 66 has a series of cut-out portions giving that member a comb appearance. A series of pawls 53 are pivotally mounted on rod 54 and reside within the cut-out portions of plate 66. Springs 55 urge pawls 53 in a counterclockwise direction and toward contact with a related restoring bar 50.

When bar 16 nears the completion of its return stroke, a pawl 53 is moved against its related restoring bar 50 thereby pushing it toward the left. The movement of restoring bar 50 causes any punch interposer 19 which has been set up to be unseated from the top of its corresponding punch element 22. The unseated interposer 19 is then forced downwardly by spring 21 to return it to the normal inoperative position. Also, near the completion of the return stroke of bar 16, draw bars 45 are engaged by bar 16 forcing them to the left against the action of springs 47. Bail 48 is thus moved to the left permitting the movement of restoring bar 50 to the left. When bar 16 is actuated for another punching operation,

bail 48 is returned by action of springs 47 and restoring bar 50 is also returned by the bail 48 to permit the setting up of one or more punch interposers 19 during the next card cycle.

A feature of this invention is the provision of a means for selectively locking restoring bars 50 to prevent restoring of the punch interposers 19, thereby retaining information in the selected columns for the purpose of repetitive punching of common information in all cards. In Figs. 1 and 4, a lock bar 56 is shown positioned for vertical movement with respect to restoring bar 50. Lock bar 56 has a tapered lower end and is secured to a support rod 57 through spring 58 which urges the lock bar upwardly so that the narrowest portion of the tapered end rests in notch 50b of restoring bar 50. It is readily seen from Fig. 4 that there is sufficient clearance between the sides of notch 50b and lock bar 56 in this position to allow horizontal movement of restoring bar 50. The upper portion of lock bar 56 has two depressions designated 56a and 56b which are adapted to engage a latch bail 59 and when in the inoperative position shown in Figs. 1 and 4 depression 56b is seated on bail 59. Spring 68 fastened to cross rod 67 continually urges lock bar 56 toward engagement with latch bail 59 which is mounted to a handle 69 through a cut-out portion 61 of frame 27. The handle 69 is pivotally mounted outside of side frame 27 at 60 to provide a manual means for actuating all the lock bars 56 at one time. A similar arrangement is provided outside the other machine side frame, thereby allowing manual operation of lock bars 56 from both sides of the machine. Rods 57 and 67 extend between and are supported by the machine side frames.

When lock bar 56 is depressed, depression 56a is engaged by bail 59 which holds it in the down position. The thick portion of the lock bar taper is then situated in the notch 50b of restoring bar 50 leaving no clearance between the lock bar and restoring bar for horizontal movement of restoring bar 50. It is thus seen that restoring bar 50 is held firmly by lock bar 56 and its movement to the left, under pressure of pawl 53 when bar 16 nears the completion of its return stroke, is thereby prevented. It is readily seen that restoring bar 50 cannot then unseat any interposer 19 which has been previously set up. The lock bars 56 can be depressed individually manually, thereby allowing selective depressing of the lock bars in only those columns in which repetitive punching of information is desired.

In the case where repetitive punching of information is to be done in all the columns of all the cards, handle 69 is manually rotated in a counterclockwise direction as viewed in Fig. 1 and latch bail 59 moves downwardly. The downward movement of latch bail 59 causes all lock bars 56 to be pushed downwardly, into the locking position described in the preceding paragraph.

It should be understood that the scope of this invention is not limited to the manual means shown in the drawings for operating the lock bars 56. Any suitable means may be employed for operating this mechanism which gives the desired result.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art, without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. In a punching machine, a row of punches, a row of interposers, one interposer for each punch, each having a normal ineffective position and movable to an active position for operating the selected punch, a slide assembly including a selecting element and a support member upon which said element reclines, means for moving said assembly along said row of interposers with a continuous movement, with respect to any selected interposer, selectively effective means for causing said element to leave its reclining position on said support member and engage any of said interposers during said continuous movement to move the same to its active position, and means for thereafter causing the selected interposer to operate its related punch.

2. In a punching machine, a row of punches, a ram extending across said row of punches, a row of interposers, one for each punch, located between the ram and said punches, normally out of axial alignment with the punches and movable into axial interposing alignment, movement of the ram toward the punches causing activation of the same through aligned interposers, a slide assembly including a selecting element and a support member upon which said element reclines, means for moving said assembly along said row of interposers with a continuous movement, with respect to any selected interposer, selectively effective means operative as the element is adjacent any interposer for causing said element to leave its reclining position on said support member and shift the interposer into axial alignment with its related punch, and means for thereafter moving the ram to operate the selected interposer and punch.

3. The machine set forth in claim 2 wherein control means is provided to cause repeated operation of said selectively effective means, during a single movement of the selecting element across the row of interposers to align a plurality of interposers in a column and thereby operate a plurality of punches upon movement of the ram.

4. In a punching machine, a plurality of rows of punches, a row of settable interposers for each row of punches, a plurality of slide assemblies, one for each row of interposers, each slide assembly including a selecting element and a support member upon which said element reclines, means for concurrently moving said assemblies with a continuous movement, as regards any selected interposer, each across its related row of interposers, selecting means effective during said continuous movement for causing each element to leave its reclining position on said support member and engage any of said interposers during said continuous movement to effect a setting of any interposer in its related row while the element is in motion across the row, and means for thereafter actuating the punches through the set interposers.

5. In a cyclically operable punching machine, a row of punches, a row of related interposers settable to select punches for operation, a slide assembly including a selecting element and a support member upon which said element reclines, means for moving said assembly across the row of interposers with a continuous movement, as regards any selected interposers, to arrive at successive interposers at predetermined

time intervals during a cycle of operation, selecting means effective during any of said timed intervals for causing said element to leave its reclining position on said support member and engage the interposer adjacent thereto at such times thereby causing said interposer to be set, and means for actuating the punches through said set interposers within said cycle of operation.

6. In a punching machine having a row of punches and a corresponding row of interposers, settable to render the related punches effective, the combination therewith of a setting mechanism for said row of interposers including a slide assembly comprising a selecting element and a support member upon which said element reclines, means for moving said assembly along the row of interposers with a continuous movement, as regards any selected interposer, and in a straight path, and means effective when the slide assembly is in line with any interposer for projecting said element out of its straight line path into engagement with the interposer to set the same, said means causing the element to return to its straight line path before it reaches the next succeeding interposer.

7. The invention set forth in claim 6 in which control means is provided to cause repeated projection of the element out of its straight line path to effect setting of a plurality of interposers, in a column, in a single transit along the row of interposers.

8. In a punching machine, a plurality of rows of punches, a row of settable interposers for each row of punches, a plurality of slide assemblies, one for each row of interposers, each slide assembly including a selecting element and a support member upon which said element reclines, means for concurrently moving said slide assemblies with a continuous movement, as regards any selected punch-interposer, each across its related row of interposers, selecting means effective during said continuous movement, as regards any selected interposer for causing each element to leave its reclining position on said support member and engage any of said interposers during said continuous movement to effect a setting of any interposer in its related row while the element is in motion across the row, means for thereafter actuating the punches through the set interposers, means effective after actuation of the punches for restoring the interposers in each row, and means for selectively locking said restoring means to prevent the restoration of the set interposers in the selected row.



9. In a punching machine, a row of punches, a row of interposers, one for each punch, each having a normal ineffective position and movable to an active position for operating the selected punch, a slide assembly comprising a selecting element, a rack and a support member, said element and rack being interconnected and pivotally mounted to said support member at common pivot points, means for moving said assembly along said row of interposers with a continuous movement, as regards any selected interposer, a member selectively operable to engage said rack, thereby causing said element to move outwardly and away from said support member and engage any of said interposers during said continuous movement to move the same to its active position, and means for thereafter causing the selected interposer to operate its related punch.

10. In a punching machine, a row of punches, a row of interposers, one for each punch, each having a normal ineffective position and movable to an active position for operating the selected punch, a slide assembly comprising a selecting element, a rack, a support member and a pair of bell cranks interconnecting said element and rack, said bell cranks being pivotally connected to said support member, means for moving said assembly along said row of interposers with a continuous movement, as regards any selected interposer, a selection interposer selectively operable to engage said rack and effect rotation of said bell cranks, thereby causing said element to move outwardly and away from said support member and engage any of said interposers during said continuous movement to move the same to its active position, and means for thereafter causing the selected interposer to operate its related punch.

11. The machine as set forth in claim 10, in which spring means is provided to extend between said element and the support member to positively restore said element after engagement with any of the interposers in a row.

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