Jan. 31, 1956 J. RABINOW 2,732,900

SELECTIVE MULTIPLE PUNCH FOR CARD PERFORATING

Filed Sept. 11, 1951 2 Sheets-Sheet 1

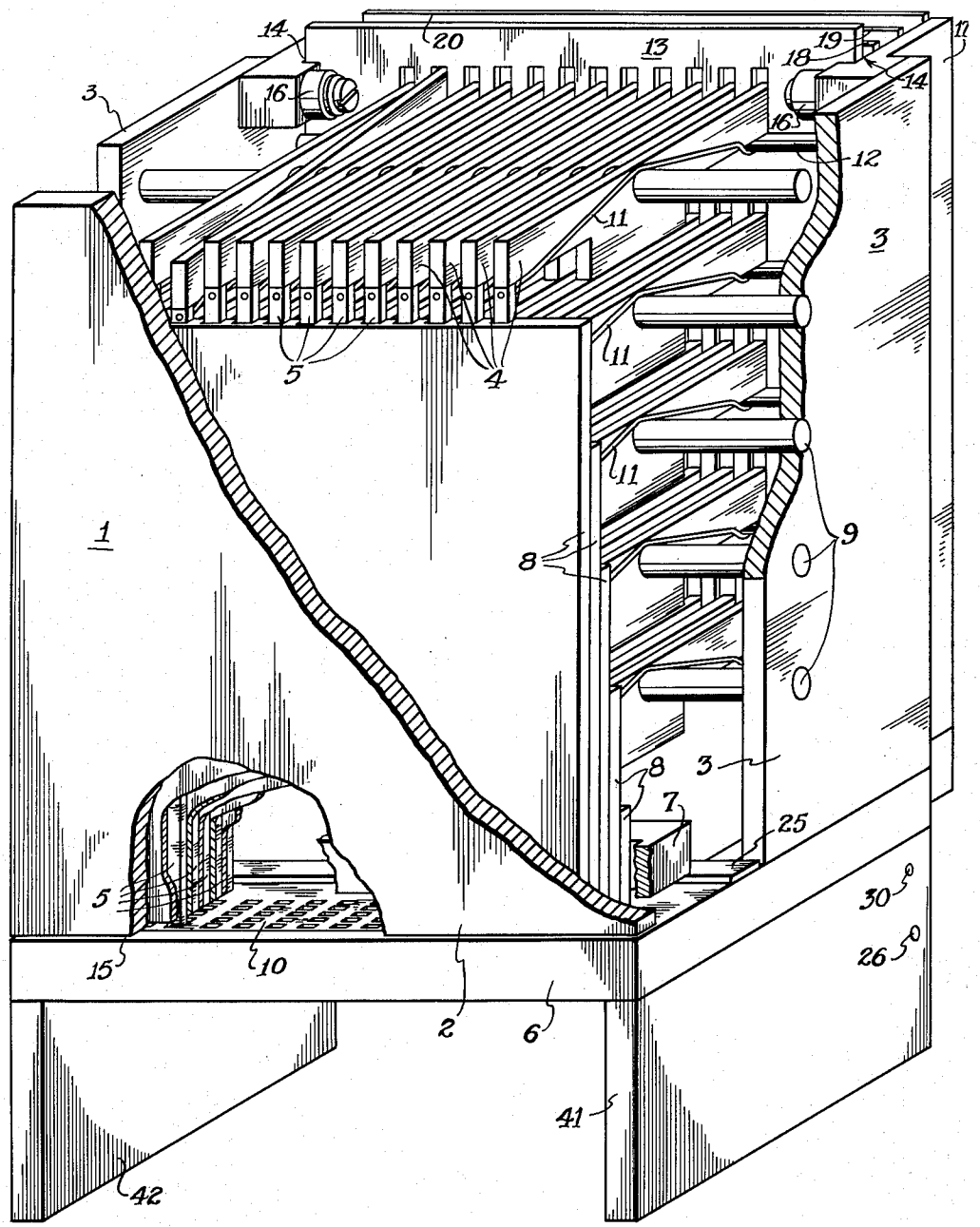


Fig. 1

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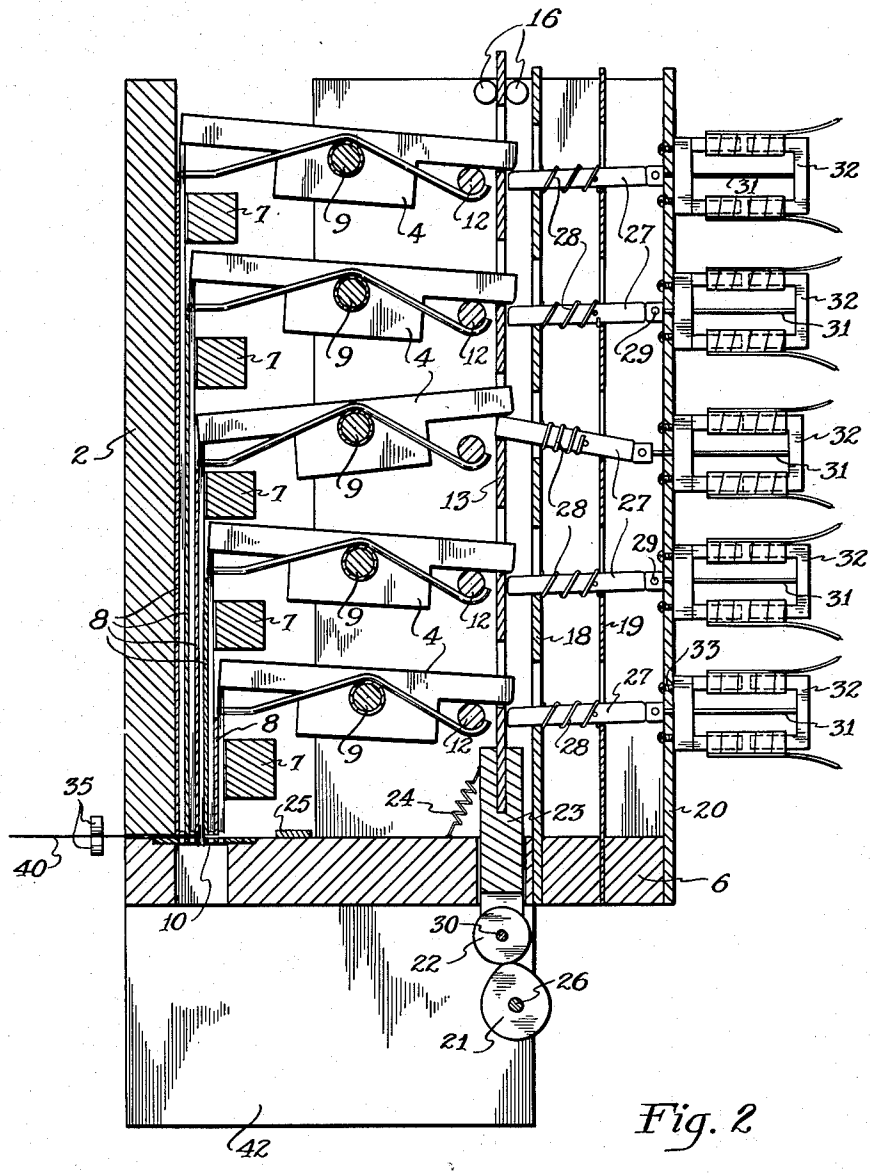


Fig. 2

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United States Patent Office 2,732,900 Patented Jan. 31, 1956

2,732,900

SELECTIVE MULTIPLE PUNCH FOR CARD PERFORATING

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Application September 11, 1951, Serial No. 246,144

6 Claims. (Cl. 164—111)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States for governmental purposes without the payment to me of any royalty thereon in accordance with the provisions of the act of March 3, 1883, as amended (45 Stat. 467; 35 U. S. C. 45).

The present invention relates to a selective multiple punch for card perforations which is capable of punching 600 cards per minute.

At present there are available machines capable of reading perforated cards at the rate of 600 cards per minute. However, the fastest punching machines known to the inventor can punch only 600 lines per minute. It can be seen from this that when the information being read from a series of cards is to be punched on other cards, the reading machine cannot be operated at full speed. Aside from this particular problem, it is in general highly desirable to have punching machines that will operate at far greater speeds than the machines presently available.

It is an object of this invention to provide a selective multiple punch that will operate at very high speeds.

It is another object of this invention to provide a selective multiple punch that will operate at speeds of the same order of magnitude as card-reading machines.

Another object of this invention is to provide a selective multiple punch for card perforating which is capable of punching 600 cards per minute.

It is a further object to provide a machine that will punch an entire card in a single punching operation.

In accordance with the present invention a die is provided with a number of apertures corresponding to all of the possible punch positions on the card. A separate movable punch is provided for each aperture, so that any or all of the punch positions can be simultaneously punched if the desired punches are actuated at the same time. The actuating means for the punches comprises a rocker arm for each punch, a continuously oscillating driven plate having slots through which a free end of each rocker arm extends, there being one slot for each arm, and individually selective elements which can be so interposed between the respective slots in the plate and the free ends of the corresponding rocker arms that the motion of the plate is transmitted through the rocker arms to actuate the respectively associated punches when the respective interposer elements are so interposed. Each interposer element is selectively actuated by an individual relay element to select the punch or punches which it is desired to operate each time the plate oscillates.

Other uses and advantages of the invention will become apparent upon reference to the specification and drawings.

Figure 1 is an isometric view of the punching machine with the front, sides, and top partially removed.

Figure 2 is a view partially in cross section of the interposer and punch mechanisms.

In Figure 1 there is shown a multiple punch press with the front panel and side panel partially cut away so as to show the arrangement of the rocker arms and punches.

Describing the invention in detail, the selective multiple punch 1 is supported on a base 6. The machine comprises front plate 2, two side plates each consisting of members 3 and 17, and back plate 20. Held rigidly to the front panel by means of the clamp bars 7 are the vertical punch guide plates 8. (For purposes of clarity only one of the clamp bars 7 is shown in Figure 1.) The rear surfaces of the guide plates are provided with vertical slots which form guides for the punches 5. The front surface of one plate forms the fourth side of the guide that is cut in the next adjacent plate, except, of course, for the last plate of the series for which the lowermost clamp bar 7 serves the same purpose.

The punches 5 consist of long vertical shafts the tops or driven ends of which seat against the rocker arms 4 and the bottoms of which form the punching surfaces. Situated just below the punches is the die plate 10 which carries slots through which the punches extend during a punching operation. A slot 15 is left between the base 6 and the front panel 2. This slot extends the full width of the machine and the bottom of the slot lies in the same horizontal plane as the top of the die plate 10. The slot is terminated by the metal bar 25 which acts as a guide for one end of the cards to be punched.

As can be seen in Figure 2 the punches associated with the uppermost horizontal row of the rocker arms 4 are located toward the front of the machine. The punches associated with the next highest row of rocker arms are located just to the rear of the first-mentioned set of punches. With this arrangement the number of rows of punches taken from front to back will be limited by the height and depth of the machine. The numbers of rows of punches taken along the front of the machine is limited by the length of the machine. Although the machine shown in Figures 1 and 2 has only 60 punches, it is entirely feasible to build a comparatively compact machine with 960 or more punches as can be seen from the fact that in the present arrangement the machine is approximately only 11 inches high, 6 inches deep, and 9 inches wide.

The rocker arms 4 are supported by and are pivoted about the shafts 9 which are mounted in the side panels 3. The punch return springs 11 extend from under the cross bars 12, which are supported by the side plates 3, over the shafts 9, and are fastened to the punches 5.

The guides 14 for the vertically oscillating plate 13 are fastened to the side plates 3 and extend toward the rear of the machine to form the side panels 17. These side panels support the vertical plates 18 and 19 and the back plate 20. The plate 13 fits loosely in the guides 14 but is securely held by the rollers 16.

The driven ends of the rocker arms 4 extend through slots in the oscillating plate 13. The plate is caused to oscillate by means of the cam 21, cam follower 22, and slide 23. The plate is biased downward as, for example, by the spring 24. The cam 21 is fixed to shaft 26 which will ordinarily be driven through gearing by the card-feed motor (not shown). This shaft is journaled in the two plates 41 and 42. The card-feeding mechanism is a separate unit that is well known in the art and forms no part of the present invention. However, it is necessary to synchronize the punching mechanism with the feeding mechanism so that the punches will be activated only when the card is in the proper position over the die plate 10. In the particular modification shown the punch press will stand on two vertical plates 41 and 42 which are arranged to support the press at the two side edges. These supports are not a part of the machine

of the present invention but are employed in this particular embodiment to support the machine at the required height with regard to the feeding mechanism and to support the shafts 26 and 30. The present device is employed to punch only 5 columns on the card and therefore only the last 5 columns of the card are required to pass through the machine. One end of the card 40 is guided by the plate 25, while the part that extends out past the front of the machine is carried between several sets of rollers 35, only two of which are shown. These rollers are a part of a standard card-feeding mechanism which carries the card to any number of different machines.

If a machine were made that could punch a full card, it is obvious that this sort of feeding system could not be employed, and it would be necessary to make the feeding mechanism an integral part of the punch. However, this is within the ordinary skill of any expert in this art.

The interposers 27 rest against the bottom of the slots in the plates 18 and 19. The springs 28 cause the interposers to seat firmly against the heads 29 of the actuator rods 31. These rods are actuated by means of the solenoids 32. The solenoids 32 are made up of two U-shaped core pieces 33 and 34. The coils 36 and 37 are positioned so that they completely inclose the air gaps 38 and 39 between two cores 33 and 34. The actuator rods 31 are fastened to the center of the bottom of the U-shaped cores 34 and pass through holes in the center of the bottoms of the U-shaped cores 33. When the coils 36 and 37 are energized, the cores 34 are pulled to the cores 33. The solenoids are selectively energized according to the information to be recorded on the cards by means not shown and not a part of the present invention. The solenoids are fastened to the back plate 20 by means of screws and extend outside of the cabinet of the machine. This is done to facilitate working on the solenoids if the need arises.

The operation of the machine is as follows: A card is presented to the machine and positioned over the die plate 10. While the card is being presented the cam is so positioned that the oscillating plate is in its down position. Also at this time the punches to be actuated are determined and the proper solenoids 32 are energized. This causes the back half of the solenoid cores to be pulled forward which in turn moves the rods 31. The selected interposers which seat against the heads 29 of the rods are pushed forward and enter the slots in the plate 13 under the driven ends of the rocker arms 4. The slots in plate 13 are made of such size with respect to the end portions of the rocker arms that when the plate 13 is in the up position the bottom of the slots will just touch the bottom of the arms, while, when the plate is in the down position, the top of the slots will just touch the top of the rockers. Therefore the movement of the vertical plate alone will not cause any motion to be imparted to the rocker arms. However, when certain ones of the solenoids are energized and the interposers are pushed into the slots under the rocker arms to be actuated, these rocker arms are raised on the next upward motion of the oscillating plate 13. The ends of interposers which are toward the front of the machine are caught between the bottoms of the slots in plate 13 and the bottoms of the rocker arms and are moved upward as the oscillating plate moves up. As the fronts of the interposers are carried up, the interposers pivot about the bottoms of the slots in the plate 19.

Since the rocker arms are pivoted about the rods 9, the front or driving ends of the arms will go down as the back ends go up. This will drive the punches 5 down through the card 40 and into the corresponding holes in the die plate.

On the downward stroke of the oscillating plate 13 the tops of the slots in 13 will contact the rocker arms and return them to their initial positions. The springs 11 pull up on the punches and return them to the starting position. When the plate 13 reaches its lowest position the interposers 27 are released and the springs 28 return them to their inactivated position. The relays 32 are so controlled that they are deenergized before the plate 13 reaches its down position.

It can be seen from this description that any number and any pattern of punches can be actuated during one cycle of the reciprocating plate 13 and in this way it is possible to punch an entire card in a single operation. As pointed out previously, the prior art machines could punch approximately 600 lines per minute. The machine according to the present invention is capable of punching 600 cards per minute or one card in the time it took to punch one line in the prior art machines.

It will be apparent that the embodiments shown are only exemplary and that various modifications can be made in construction and arrangement within the scope of my invention as defined in the appended claims.

I claim:

1. A selective multiple punch comprising: a die plate having a plurality of rows of closely spaced perforations; a punch for each perforation positioned at a right angle to said plate and constrained to travel into and out of its perforation with a punching motion, said punches being arranged in rows corresponding to the rows of perforations, the punches of each row being of approximately the same length, the length of the punches of adjacent rows being successively different; a motion-transmitting element for each punch extending at right angles from the top of each punch in the same plane and substantially parallel to the other motion-transmitting elements of the same row of punches to provide successively adjacent rows of motion-transmitting elements for the successively adjacent rows of said punches; a common driving member having a plurality of slots, there being one slot for each of said motion-transmitting elements, the end of each of said motion-transmitting elements remote from said punches being inserted in a separate one of said slots, means for periodically moving said common driving member, the dimension of said slots in the direction of said motion being larger than the corresponding dimension of said motion-transmitting elements by an amount greater than the motion of said common driving member, a plurality of interposers, means for selectively moving each of said interposers into a separate one of said slots adjacent to the ends of said motion-transmitting elements, the dimension of the ends of said interposers and said motion-transmitting elements being such as to substantially fill each slot in the direction of motion of the common driving member.

2. A selective multiple punch for card perforating comprising a plurality of vertical punches with driven ends and punching ends, a plurality of guide plates, said plates containing recesses, said recesses forming guides for said punches, a plurality of horizontal rocker arms with driving ends and driven ends, said driving ends of said rocker arms contacting said driven ends of said punches, a first vertical plate, said driven ends of said rocker arms extending into slots cut in said first vertical plate, second, and third vertical plates, a plurality of horizontal interposers, said interposers lying in slots in said second and third vertical plates, the slots in all three of said plates being in horizontal alignment, a plurality of solenoids, one of said solenoids associated with each interposer, cam means for imparting a vertical oscillatory motion to said first vertical plate, means actuated by said solenoids for moving the said interposers into the slots in the first vertical plate under the driven ends of said rocker arms.

3. The invention according to claim 2 including means for actuating any number or arrangement of punches in a single punching operation.

4. A selective multiple punch comprising a plurality of punches, a plurality of rocker arms, said punches and rocker arms being arranged in a pattern of closely spaced rows and columns, the rows of rocker arms being pyramided to define columnar groups of rows corresponding to each column of punches one end of each of said rocker arms being positioned to contact one end of a separate one of said punches, a continuously oscillating member having a plurality of slots, a second end of each of said rocker arms being positioned in a separate one of said slots, the dimension of said slots in the direction of the oscillatory motion being larger than the corresponding dimension of said rocker arm by an amount at least as great as the displacement of said oscillating member, a plurality of interposers, means for selectively moving said interposers into said slots adjacent to the ends of said rocker arms, the dimension of the end of the interposers and of the second end of the rocker arms being such as to substantially fill each slot in the direction of motion of the oscillating member.

5. The invention according to claim 4 in which said last-mentioned means are a plurality of solenoids.

6. A selective multiple punch comprising a plurality of punches, a plurality of rocker arms, said punches and rocker arms being arranged in a pattern of closely spaced rows and columns, the rows of rocker arms being pyramided to define columnar groups of rows corresponding to each column of punches one end of each of said rocker arms being positioned to contact one end of a separate one of said punches, a continuously oscillating plate having a plurality of slots, a second end of each of said rocker arms being positioned in a separate one of said slots, the dimension of said slots in the direction of the oscillatory motion being larger than the corresponding dimension of said rocker arm by an amount at least as great as the motion of said plate, a plurality of interposers arranged to be movable in two directions, one perpendicular to said plate and one parallel to said plate, means for selectively moving said interposers into said slots adjacent to the ends of said rocker arms, the dimension of the end of the interposers and of the second end of the rocker arms being such as to substantially fill each slot in the direction of motion of the plate.

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