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MULTIPLE PUNCHING MACHINE FOR PAPER TAPE, CARDS, ETC.

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Fig. 1.

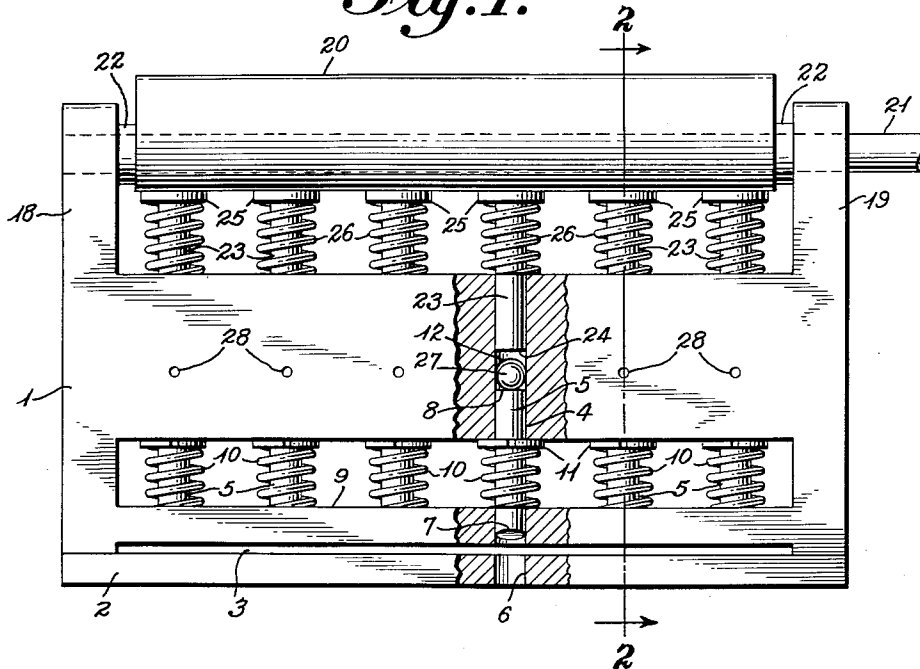


Fig. 2.

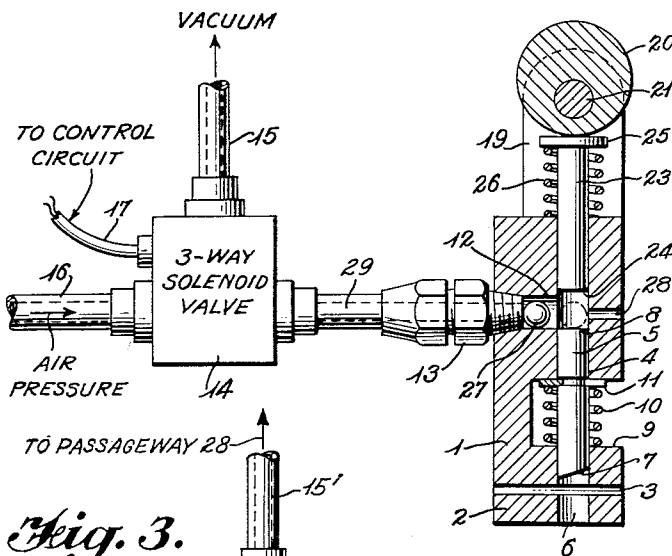
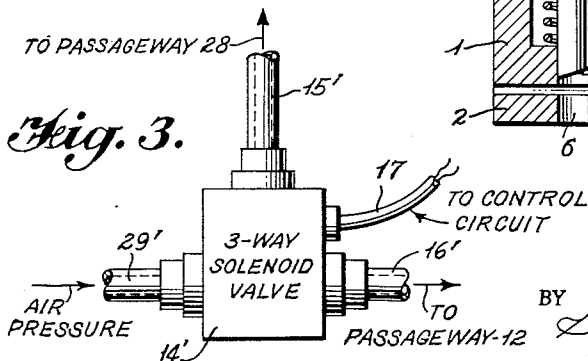


Fig. 3.



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MULTIPLE PUNCHING MACHINE FOR PAPER TAPE, CARDS, ETC.

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4 Claims. (Cl. 234-114)

This invention relates to a machine of the type adapted to store information on paper tape, cards or the like by punching holes in the same in accordance with information supplied to the machine. More particularly, this invention relates to the punching mechanism, per se.

The feature of storing information on paper tape, or cards, by punching various numbers of holes in various positions is well known. Also, machines for punching such tape or cards are also well known. Heretofore, the mechanisms employed for the purpose of punching the holes have been complicated and, for this reason, are generally expensive to construct and expensive to maintain.

Therefore, it is a principal object of this invention to provide an improved punching mechanism for use in machines of the type referred to above.

Other and further objects of this invention will hereinafter more fully appear from a detailed description of the drawings in which:

FIGURE 1 represents a view in front elevation, partly in section, of a mechanism embodying the features of this invention.

FIGURE 2 is a cross-sectional view in side elevation taken along section line 2-2 in FIGURE 1, including, in addition, a semi-diagrammatic representation of one of the valve units employed for each of the individual punches.

FIGURE 3 shows an alternate pneumatic connection to eliminate the necessity of using a vacuum system in conjunction with the punch.

Referring to the drawings in detail, the multiple punching mechanism of the instant invention comprises a substantially rectangular punch block 1 and a lower die block 2 which is attached to the lower surface of the punch block. A relatively narrow paper slot 3 is provided on the lower portion of the punch block to permit the passage of paper tape or cards (not shown) between the two blocks. In the interior of the punch block there are series of spaced holes 4 which are adapted to receive individual slidable punches 5, later to be described in greater detail. The die block 2 has a similar series of holes 6 which are of the same size as, and in alignment with the holes 4 of the punch block 1. As shown in the drawings, each punch 5 is a relatively short cylindrical rod (of substantially the same diameter as the holes 4) having a lower inclined cutting surface 7 at its lower end, and an upper end 8 which terminates within the hole 4 substantially midway of the vertical distance of the punch block.

The punch block is provided with a substantially rectangular recess 9 which extends rearwardly into the punch block, providing an open space around the mid portions of all of the punches 5. Surrounding each punch is a helical spring 10 whose lower end bears against the lower surface of the recess 9 and whose upper end bears against the underside of a "tru-arc" or similar ring 11 which is secured to the punch 5 in a conventional manner; thus, it should be apparent that each punch 5, by virtue of the spring 10 and ring 11, is urged vertically upward at all times. However, if, as it will appear later, a downward force is exerted on the upper end 8 of the punch 5 of sufficient magnitude to depress the spring 10, the punch 5 will pass through the slot 3 into the hole 6

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of the die block 2 so as to punch a resulting hole through any paper or sheet material that might be present within the slot 3 at that time.

Each hole 4 is provided with an interconnecting horizontal hole or passageway 12 which extends outwardly therefrom at a location substantially midway of the hole 4 adjacent the upper end 8 of the punch 5. At the rear of the punch block 1, each passageway 12 is provided with a suitable pneumatic connection 13 which leads to an individual 3-way solenoid valve, generally designated as 14. The latter valve may be alternately connected to a source of vacuum or air pressure through conduits 15 and 16, respectively. Electrical connection 17 leading into a control circuit (not shown) is used to operate each individual valve 14.

At the upper portion of the punch block 1, and at the opposite side ends thereof, a pair of flange portions 18 and 19 extend vertically upward; between the flange portions 18 and 19, a substantially cylindrical cam roller 20 is eccentrically mounted on a cam shaft 21, which is suitably journaled in the flanges 18 and 19. As shown in FIGURE 1, the right hand portion of the cam shaft 21 extends outwardly so as to provide a means of connection to a driving source (not shown). Suitable bushings or bearings 22 may be provided at the opposite ends of the roller 20, as desired.

In the upper ends of the holes 4, a plurality of cylindrically-shaped cam followers 23 extend from their lower ends 24 adjacent the passageways 12 to their upper flattened heads 25 which impinge against the lower surface of the cam roller 20. The cam followers are of the same diameter as the punches 5. Each cam follower is provided with a separate return spring 26, the lower end of which bears against the upper surface of the punch block and the upper end of which bears against the lower surface of the flattened head portion 25.

Within each passageway 12, adjacent the corresponding hole 4, is situated a ball, or ball bearing 27, which is slightly smaller in diameter (i.e. 10%) than the diameter of the punch or the cam follower. Each hole 4 is also provided with a relatively small vent hole 28 which extends from the hole 4 outwardly to the front surface of the punch block 1 opposite from the passageway 12. The ball 27 may be urged into the dotted line position shown in FIGURE 2 by applying a source of air pressure to the passageway 12 through the medium of the valve 14.

The operation of the punching mechanism will now be briefly described as follows:

As the cam 20 rotates continuously at a predetermined rate of speed, each complete revolution of the cam will produce a complete reciprocation of all of the cam followers 23. At the same time, a continuous strip of paper (not shown) or a continuous progression of cards (not shown) will be fed through the slot 3, also at a predetermined rate of speed. Preferably, although not necessarily, the cam-rotating means (not shown) and the paper-feeding means (not shown) will be driven by a common source of power so as to permit synchronization between the punching sequence and the paper feeding.

While the cam followers are reciprocating regularly, all or any combination of the punches 5 may also be forced into action by the interposition of the balls 27 between certain of the punches and their respective cam followers. At any given moment, each solenoid valve 14 will be pre-set to vacuum or air pressure depending upon the information supplied to the valve from the control circuit through lead 17. Thus, on each downward movement of the six cam followers shown, any combination of 1, 2, 3, 4, 5, or 6 (or none) of the punches may be forced downwardly to punch holes correspondingly in the paper or card passing through the slot 3.

An alternate connection of the three way valve 14

may be used to eliminate the need for a vacuum system for connection to the punch. This alternate connection is shown in FIGURE 3. In this arrangement, the input line 16 now becomes an output line 16' and is connected to the passageway 12; the line 29 becomes the air pressure input line 29', and the vacuum line 15 becomes a second output line 15' connected to the passageway 28 which, for this embodiment, must be adapted to receive a suitable pneumatic connection similar to the connection 13. With the pneumatic connections just described and with a slight modification of the valve such that solenoid valve 14' opens one of the output lines, either 15' or 16', to the atmosphere whenever the other output line is connected to the air pressure input line 29' by the valve, the ball elements 27 may be positioned to disengage, as well as to engage, their respective punches by the air under pressure. The necessity for a vacuum system connected to the valve and punch to disengage the punches is thus eliminated.

Whereas the instant mechanism has been described in relation to six separate punches and six associated cam followers, it should be understood that the invention might equally be applied where more or less than six punches were employed. Other and further modifications of this invention apart from those shown or suggested herein may be made within the spirit of the invention.

What is claimed is:

1. A multiple punching mechanism comprising a punch block and die block arranged in a substantially adjacent and cooperating relationship so as to define therebetween a paper slot through which paper tape or cards may be fed, said punch block having a plurality of punch holes extending therethrough in open communication with said slot, said die block also having a like plurality of holes in alignment with the punch holes in said punch block and communicating with said slot, a slidable punch within each punch hole extending from one end adjacent said slot to an opposite end substantially midway between the ends of said punch hole, means for resiliently urging each of said punches away from said slot, a slidable cam follower situated in the end of said hole opposite from said paper slot and extending outwardly from said punch block, means for urging each of said cam followers resiliently outward from said punch block, a rotatable cylindrical cam roller mounted on a substantially horizontal and eccentric axis with its outer surface bearing against the outer ends of all of said cam followers, said roller being adapted by its rotation to cause reciprocation of all of said cam followers, said punch block having a plurality of right-angled passageways communicating separately with said punch holes, a substantially spherical solid member situated within each right-angled passageway, each solid member being movable into its corresponding punch hole between its cam follower and punch, and pneumatic means connected with each right-angled passageway for urging said spherical member into and out of the space between its corresponding cam follower and punch.

2. A multiple punching mechanism comprising a punch block and die block arranged in a substantially adjacent and cooperating relationship so as to define therebetween a paper slot through which paper tape or cards may be fed, said punch block having therein a plurality of punch holes extending therethrough in open communication with said slot, said die block also having a plurality of holes in alignment with the punch holes in said punch block, each hole in said die block being of the same size and cross-sectional shape as the corresponding hole in said punch block, an elongated and slidable punch within each punch hole extending from a location adjacent said slot to a location substantially midway between the ends of said punch hole, means for resiliently urging each of

said punches away from said slot, an elongated and slidable cam follower situated in each of said holes in the end opposite from said paper slot and extending outwardly from said punch block, each punch and its corresponding cam follower being of substantially the same cross-sectional size and shape so as to fill substantially the cross-section of their corresponding hole in said punch block, cam means for urging each of said cam followers resiliently outward, means for reciprocating all of said cam followers, right-angled passageways within said punch block each communicating with one of said punch holes, a substantially spherical member situated within each right-angled passageway and adapted to be forced into said one of said punch holes between its corresponding cam follower and punch, and pneumatic means connected with each right-angled passageway for urging each spherical member into and out of the space between its corresponding cam follower and punch.

3. A multiple punching mechanism comprising a punch block, a die block, said punch block and said die block defining a slot therebetween to permit the passage therethrough of a material to be punched, a plurality of aligned holes extending through said punch block and said die block, a punching member slidably received in each hole of said punch block extending from adjacent said slot and terminating within said hole, resilient means urging each said punching member away from said slot, a cam follower slidably received in each said hole in said punch block extending from a point external of said punch block on the side opposite said slot and terminating spaced from said punching member in that hole, cam means reciprocating said cam followers in unison, free-moving unattached elements, and means for applying fluid pressure to interpose said free-moving unattached elements between selected ones of said punching members and their associated cam followers to cause said selected ones of said punching members to reciprocate with their associated cam followers.

4. A punching mechanism comprising a punch block, a die block, said punch block and said die block defining a slot therebetween to permit the passage therethrough of a material to be punched, a first hole defined by and extending through said punch block, a second hole defined by and extending through said die block and aligned with said first hole, a punching member slidably received in said first hole extending from adjacent said slot and terminating within said first hole, resilient means urging said punching member away from said slot, a cam follower slidably received in said first hole extending from a point external of said punch block on the side opposite said slot and terminating spaced from said punching member, cam means reciprocating said cam follower, a free-moving unattached element disposed within said punch block, and means for applying fluid pressure to interpose said element between said punching member and said cam follower.

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