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ARRANGEMENT FOR CONTROLLING AN ARBITRARY NUMBER OF PUNCHES

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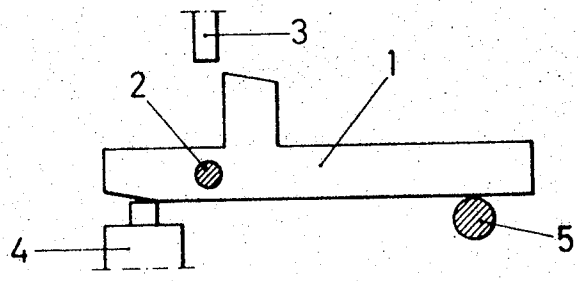

Fig. 1

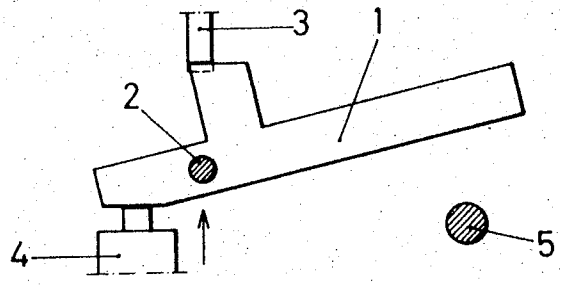

Fig. 2

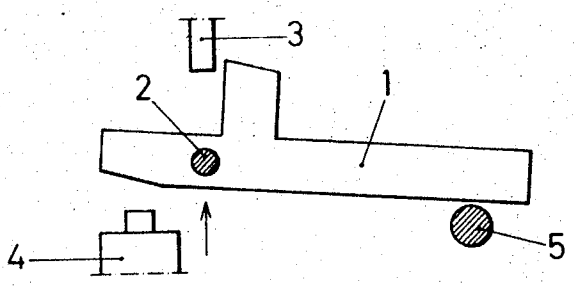

Fig. 3

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ARRANGEMENT FOR CONTROLLING AN ARBITRARY NUMBER OF PUNCHES

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U.S. Cl. 234—114 2 Claims

ABSTRACT OF THE DISCLOSURE

An arrangement for selectively driving punching mandrels or punches of a tape or like punching mechanism, which mandrels are operated by T-shaped levers or catches pivotally mounted on a shaft which is reciprocated for each step of movement of the tape, the levers being pivoted at one side of their centers of gravity so that a small magnetic force applied to that end of the lever at the opposite side of the pivot holds the end as the shaft reciprocates and thus moves the stem of the T into position to engage the corresponding punch mandrel as the shaft reciprocation continues.

This invention relates to an arrangement for the control of an arbitrary number of punches in punching devices for punched tapes and cards.

In conventional punching devices a tape or the like is fed past a punching head by means of a step mechanism which displaces the tape by one hole division for every stroke of the punch. The punching head usually comprises a stationary punching die and a plurality of punching mandrels cooperating with the die and being actuated according to the selected punching code, for example by impulses from an office machine or the like.

A known arrangement for driving the mandrels comprises a yoke or the like which reciprocates continuously in the longitudinal direction of the mandrels and in the absence of impulses does not actuate the mandrels. When a mandrel is to punch a hole, an impulse switches in an electromagnet which inserts a catch member between the yoke and the mandrel in question. The said electromagnets hereby perform a certain mechanical work and, therefore, must be designed with relatively large dimensions. The magnets drive the catch members which transfer the yoke motions to the mandrel.

In a known punching mechanism the punching speed was increased substantially by positively controlling the catch members, in such a manner, that they are moved into their operative position at the beginning of the yoke stroke. The catch members are moved into the immediate vicinity of associated selector magnets, and at the same moment current is caused to flow through the magnets corresponding to the selected mandrels. The said catch members are retained in their operative position during the continued stroke of the yoke, for which stroke only a relatively small energy amount is required. For this reason, the magnets can be given small dimensions and be mounted in the immediate vicinity of the catch members. As a result thereof the masses are small. The catch members which were not selected return by spring action to their non-operative position while the punching stroke of the yoke is continued.

The mounting and adjusting of the said springs in the known arrangement is relatively complicated. Moreover, the spring force is constant and independent of the punching speed and thereby makes the re-setting at very high speeds problematic.

This invention has as its object to produce an arrangement effecting a cheaper and more reliable construction.

The invention relates to an arrangement for controlling an arbitrary number of punches in a punching device wherein the punches are mounted movably in the axial direction in a frame, and are adapted to cooperate with a corresponding number of actuating members which are in turn selected for punch actuation by energization of a corresponding number of electromagnets. The actuating members are two-armed levers which are mounted rotatably on a shaft in a common yoke adapted to move up and down, in such a manner, that at one extreme of the reciprocation of the yoke the actuating members are mechanically caused to abut against the cores of the electromagnets in question by action of a stop member rigidly mounted in the frame.

The actuating members are so designed, that the centre of gravity is located between their mounting hole and their contact surface for the stationary stop. Upon the motion of the shaft, when the circuit to the electromagnet is not closed, the ends of actuating members remain against the stationary stop because of the force of inertia and thereby turn into position in which they do not engage the punches and therefore no punching operation is carried out.

Upon a corresponding motion of the shaft, when the circuit to the corresponding electromagnet is closed, the opposite end of the actuating member remains against the corresponding magnet and the actuating member or lever is thereby turned into operative position engaging the punch. A punching operation is carried out. In order to cause rotation of the actuating member, the electromagnet must overcome only the force of inertia. Due to the very small size of said force, the power of the electromagnet need not be great. Accordingly, it is possible to utilize small electromagnets which do not require much space and are easier to place in direct contact with the actuating member.

A principal embodiment of the arrangement according to the invention is shown in the accompanying drawings wherein,

FIG. 1 is a fragmentary cross-sectional view showing an actuating member in its lowest position wherein it is brought to a definite position abutting a stationary stop and the core of the corresponding electromagnet.

FIG. 2 is a view similar to FIG. 1 showing how the electromagnet retains the actuating member which thereby swings into position to operate the punch, and,

FIG. 3 shows how the actuating member, when it is not actuated by the electromagnet, swings so that no contact is made with the punch.

Referring now to the drawings, it will be seen that the structure comprises a plurality of transfer membes **1** (only one illustrated in the drawing) pivotally supported on an axle **2**, common to all members **1**. This axle **2** is supported in a non-illustrated yoke member to which a reciprocating vertical motion is imparted by a non-illustrated power-driven crank mechanism of a kind well known in itself. The axle **2** thus is arranged to move alternately towards and away from a plurality of vertically disposed punches **3**, the punches **3** being represented in the drawing only by the bottom end of a punch **3** interacting with the illustrated member **1**. The axle **2** arranged for motion in the longitudinal sense of the punches **3** is shown in FIG. 1 in its lowest position, in which one end of T-shaped transfer member **1** engages the armature of an electromagnet **4**, and the opposite end abuts against a stationary stop member **5**. In the said lowest position of the axle **2** the stem of the transfer member **1** is disposed with its top end laterally spaced from the actuated end of the punch **3** and at some distance below the latter.

If an upward motion is imparted to the axle 2 by the action of the non-illustrated yoke member, as denoted by arrows in FIGS. 2 and 3, the transfer member 1 may assume either of two different operative positions, dependent on whether the electromagnet 4 has been energized, or not. If the magnet is energized, the transfer member 1 will rock counterclockwise as illustrated in FIG. 2, since the end portion of the transfer member engaging the armature of the electromagnet is retained during the upward motion of axle 2 by the electromagnet, whereby the stem of the transfer member is swung in below the corresponding punch 3, the abutment surface of said stem striking against the punch and assuming the position illustrated in FIG. 2 during continued upward motion of axle 2, in which position the punch will have punched a hole in a non-illustrated tape or like recording medium, disposed above the punches. On the return motion of axle 2 to its lowermost position illustrated in FIG. 1 the transfer member 1 will be swung clockwise by the action of its end portion abutting the electromagnet 4.

Since the transfer member 1 is made from a sheet metal punching, it will be understood from the drawing figures that its center of gravity will be to the right of the supporting axle 2. This is an important feature for the proper functioning of the mechanism, as will be seen from the continued description.

If the axle 2 is moved upward, as illustrated in FIG. 3, while the electromagnet 4 is not activated, the end portion of the transfer member 1 initially engaging the electromagnet will not be retained by the latter, and consequently the counterclockwise rocking motion of the transfer member as illustrated in FIG. 2 will not take place. Since on its upward motion the axle 2 engages the transfer member 1 to the left of its center of gravity, the inertia of the transfer member will give rise to a couple tending to swing the transfer member clockwise. Hereby, as illustrated in FIG. 1, the end portion of the transfer member initially abutting the stationary stop member 5 will remain substantially in this position whereas the opposite end portion of the transfer member is swung upwards from the electromagnet 4, the stem of the transfer member being swung away from the bottom end of the punch 3.

When the axle 2 returns to its lowermost position illustrated in FIG. 1 the transfer member 1 is submitted to a counterclockwise swing motion by its interaction with the stationary stop member 5, the transfer member thereby being moved back into the initial position illustrated in FIG. 1.

As will readily be understood from the above description, no spring means or other additional elements for controlling the different positions of the transfer member 1 are needed. The functioning of the mechanism is based solely on the weight difference between the portions of the transfer member 1 disposed to the right and to the left of the supporting axle, respectively. The smaller the transfer member is made, the less this difference can be, and the less the inertia to resist its rocking between the two active positions will be. This will make it possible to attain very high punching frequencies, using relatively very small electromagnets. The mechanism thus can be made compact, at the same time as its extremely simple design makes it inexpensive to manufacture and reliable in operation.

While I have described a preferred form of my invention, it will be understood that various embodiments are possible without departing from the scope of the invention and I therefore wish not to be limited by the foregoing description, but on the contrary, solely by the claims granted to me.

What I claim is:

1. In a punching device of the type in which the punches are mounted for axial displacement and are adapted to be actuated by a corresponding number of actuating members which are positioned to actuate the hole punches by a corresponding number of electromagnets, the improvement which comprises, rotatably mounting the actuating members on a common shaft reciprocating in a plane perpendicular to the shaft, each said actuating member being of substantially T-shape and having its center of gravity located between its shaft mounting and one end of said member, a stationary stop adjacent said one end of each said member, an electromagnet adjacent the opposite end of said member, the stem of the T of said member being positioned to engage a corresponding one of the punches when the associated magnet operates to retain said opposite end and to pass by said punch when said electromagnet remains de-energized during reciprocatory movement of said shaft in the punch-operating direction.

2. A punching device according to claim 1 wherein each operating member is returned to initial position with said one end against said stationary abutment due to rotation about said shaft resulting from the location of the center of gravity between said shaft and said one end.

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