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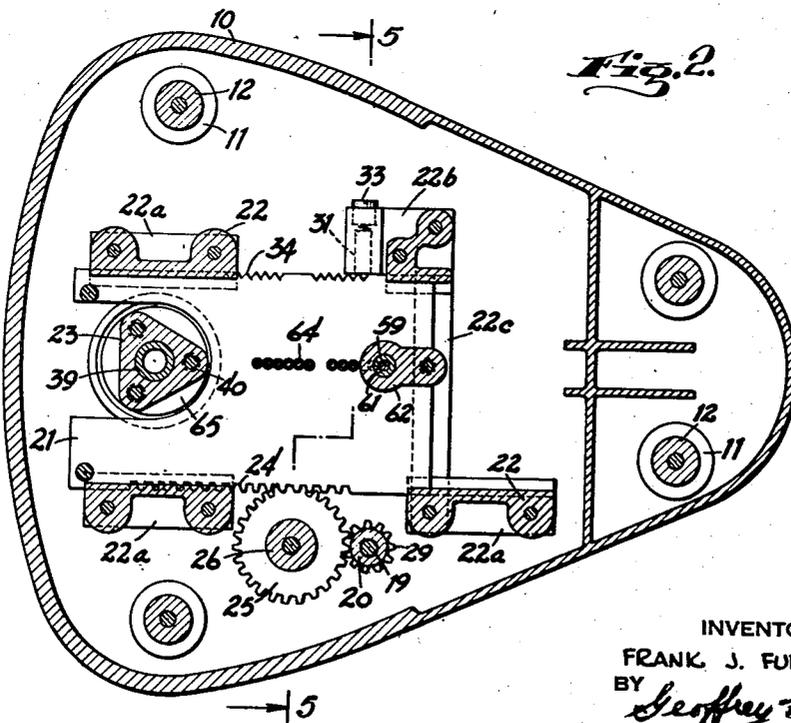
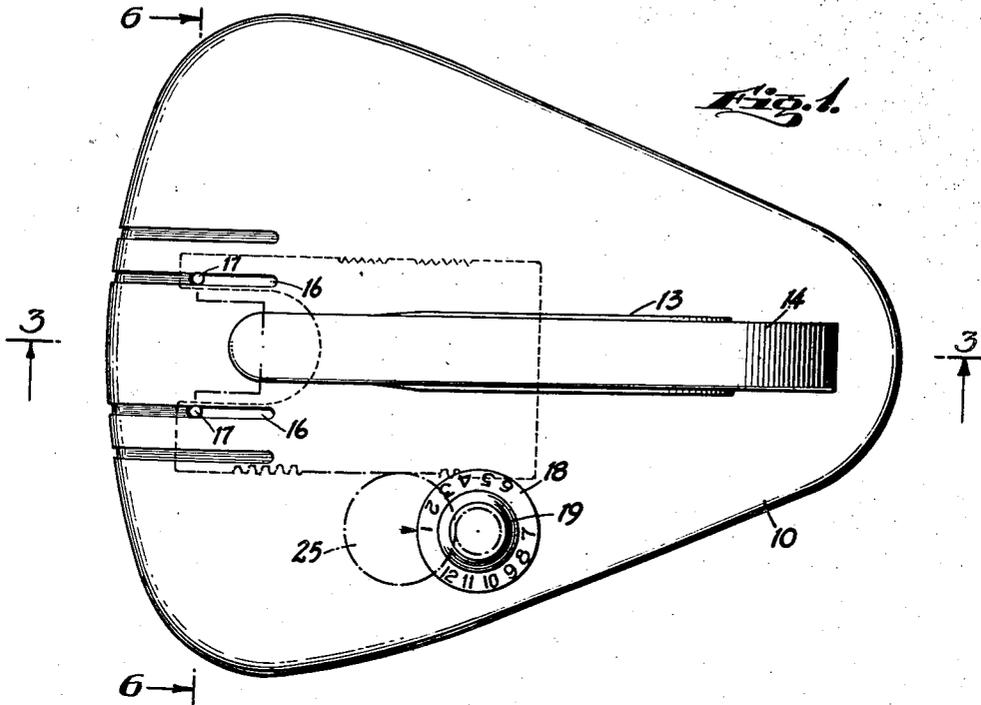
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2,580,756

PUNCH

Filed May 3, 1947

3 Sheets-Sheet 1



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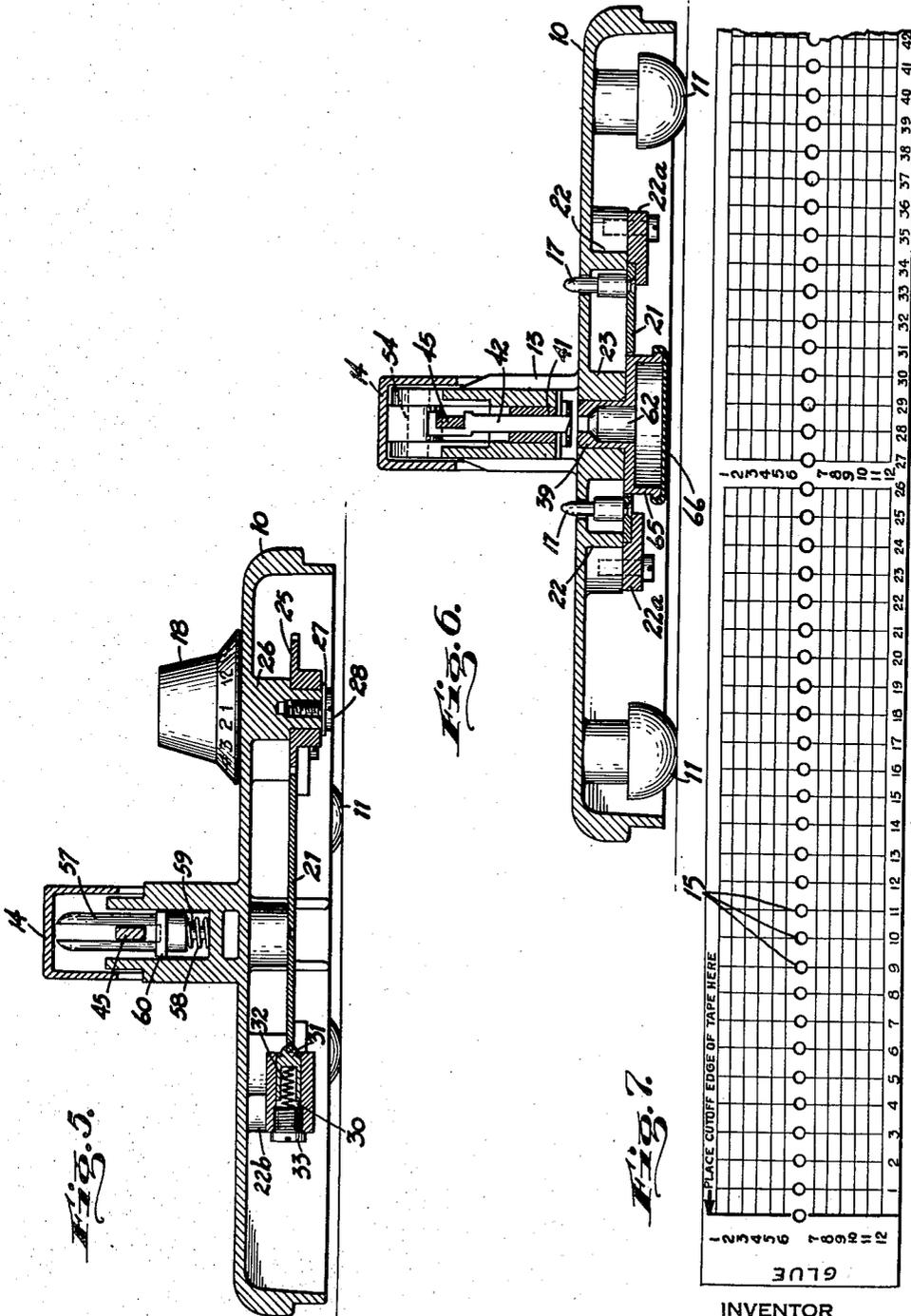
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# UNITED STATES PATENT OFFICE

2,580,756

PUNCH

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4 Claims. (Cl. 164—88)

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This invention relates to an apparatus for punching a record sheet with data or machine controlling codes.

The general object of the invention is to provide a punch of simple construction, which is capable of punching accurately located holes in sheet material.

A punch constructed in accordance with the invention is well suited for punching holes in tapes for tape controlled machines of the kind disclosed in the copending application of A. W. Mills, F. J. Furman, and E. J. Rabenda, Ser. No. 609,854, filed August 9, 1945, which has matured into patent No. 2,531,885 dated November 28, 1950. Since a tape of this kind, once punched, is used for a more or less extended time, the punch does not need to be capable of high speed operation, but it must punch the holes very accurately.

Accordingly, it is a particular object of the invention to provide a tape punch with mechanical means to insure correct relative positioning of the punch and the tape holding means and interlocking means to prevent operation of the punch if it is so far out of position that it cannot be accurately centered on its way toward the tape.

A control tape of the kind described, which is used for controlling line spacing, skipping, and over-flow feed of an automatic carriage, has holes punched at various multiples of the line space distance, along the tape. It is another object of the invention to provide a punch which can be operated to punch holes at an exact distance apart along the tape, which may be any multiple of the line space distance.

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 example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is a plan view of the punching device showing the casting, tape guide pins, punch handle, and column shift dial.

Fig. 2 is a cross-sectional plan view, on the line 2—2 of Fig. 3.

Fig. 3 is a section taken on line 3—3 of Fig. 1 showing the punch in the normal position.

Fig. 4 is a cross-sectional view similar to Fig. 3 only showing the punch in the operated position.

Fig. 5 is a section taken on line 5—5 of Fig. 2.

Fig. 6 is a section taken on line 6—6 of Fig. 1.

Fig. 7 is a view of the record tape.

The invention will now be described in detail

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by reference to an illustrative embodiment shown in the drawing, which is designed particularly for punching a control tape.

The device consists of a metal casting or body portion 10 which serves both as a cover and as a hollow base since the underside of the casting is open to receive a plurality of parts which, in combination, perform certain functions hereafter described. The casting is mounted on four rubber caps 11 which are inserted over four bosses 12. A rib section 13, which is an integral part of the casting, is formed to support portions of the punch and interlock mechanisms hereafter described, and in addition receives a handle 14 for actuating said punch and interlock mechanisms. Two slots 16 in the casting receive two paper positioning pins 17. A dial 18 with the numbers 1 through 12 printed thereon is fixed on a shaft 19, which is rotatably mounted in the casting through boss 20.

The dial is used by the operator to move the tape transversely underneath the punch mechanism in order to select any one of 12 punching positions across the width of the tape. Fig. 7 shows the tape with 12 columnar punching positions. The series of pre-punched holes 15 down the middle of the tape are for locating the tape on the two pins 17 and eventually serve as feed holes for the tape.

Referring to Figs. 2 and 5, the mechanism provided for transversely positioning the tape consists of a plate 21 slidably mounted on a plurality of bosses 22 and retained thereon by three plates 22a, a detent block 22b, and a strip 22c all of which are bolted to bosses 22 and have grooves to allow plate 21 to slide freely. A U shaped notch is cut in one end of plate 21 to allow the plate to slide past a triangular boss 23. The purpose of this boss will be described later. Teeth 24 are cut along one edge of plate 21 and mesh with a gear 25 which is retained upon a boss 26 by a washer 27 and screw 28. Gear 25 meshes with a gear 29 which is fixed to the shaft 19 previously mentioned as being fixed to dial 18. Turning dial 18 will cause gear 29 to turn gear 25 which in turn will cause plate 21 to slide back and forth and thus pins 17 which are attached to plate 21 will move the tape transversely.

In order for plate 21 to establish a punching position the following mechanism is provided. Referring to Figs. 2 and 5, the detent block 22b has a chamber 30 which contains a free sliding detent 31. A spring 32 is inserted in the chamber and compressed between the detent and a screw 33, thereby urging the detent against a

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series of 12 notches 34 cut along the edge of plate 21. Hence when the dial is turned one position, plate 21 will cam the detent in until the next notch is in position to allow the detent to seat itself and position the plate.

Referring to Figs. 3, 4, 5 and 6, a die 39 is secured in a socket of the triangular boss 23 by screws 40. On a forwardly extending arm 13a of the rib section 13 is a vertical punch guide 41 in which slides a punch 42, for coaction with the die. A stripper 43 has a forked end embracing the punch and is secured to a part 13b of the overhanging arm 13a by a screw 44. The upper end of the punch hangs upon one end of a lever 45, the opposite end of which is swiveled in a seat formed by a portion 46 of the casting, a washer 47, and a screw 48. The lever is embraced by the forked end of a lug 49 extending downward from the handle 14 and is held thereto by a pin 50. A spring 51 held in a socket 52 on the arm 13a bears against the lower side of lever 45 and holds the punch normally in its upper position.

The handle 14 is pivoted at 54 on a bearing fork 55 of the arm 13a and is curved downward at its opposite end to extend through an opening 56 in the casting. A plunger 57 has its upper end slotted to straddle the lever 45 and bears against the bottom side of the handle, under the force of a spring 58 surrounding its reduced lower end 59.

The upper end of the plunger 57 is guided by a stationary bracket 60, while its lower end 59 is guided by a bushing 61 in a boss 62. The plunger normally holds the handle 14 up in the position shown in Fig. 3, with a lip 63 on its right end against the bottom of the casting. The reduced lower end 59 of the plunger coacts with a series of index holes 64 in the plate 21. These holes have a beveled countersink on the side toward the plunger, which serves to center the plate 21 at the chosen columnar position.

The device operates in the following manner. The operator places the tape under the stripper 43, and positions it longitudinally so that the two pins 17 will project through a particular pair of pre-punched feed holes to locate a certain transverse line of the tape over the die. The operator will then move the tape transversely to any one of the twelve columnar positions, by turning dial 18 until the corresponding number comes opposite the index mark. With the tape now placed in the desired punching position, the operator presses the handle 14 down, said handle pivoting clockwise about bolt 54, thereby forcing plunger end 59 down and through one of the holes 64 in plate 21.

If the plate was positioned accurately enough by the dial and detent block, the plunger will enter the hole freely. If plate 21 is slightly out of position for accurate punching, the plunger will strike the counter-sunk portion of the hole and move plate 21 into an accurate position. If plate 21 is out of position enough, the plunger will not hit the hole but will be stopped by plate 21 which acts as an obstructing surface and no punching can be effected. This arrangement thus serves as an interlock to guarantee accurate punching.

Pressing on the handle will also force lever arm 45 to pivot counterclockwise on the seat 46, driving the punch through the tape to punch the hole. When pressure on the handle is released, spring 58 will restore the plunger and handle to their normal position and spring 51 will restore lever

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arm 45 to its normal position, thereby withdrawing the punch from the tape.

The lower part of the die 39 is expanded into a cup 65 having a bead over which fits a stiff rubber cap 66, to catch the punchings.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a single modification, 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 device for punching a sheet having a series of pre-punched locating holes therein, a die, a punch coacting therewith, operating means for said punch, sheet positioning means comprising a plate having a plurality of aligned prongs to engage selected ones of said locating holes for holding the sheet between the die and punch, said plate being provided with a series of teeth on a first edge, means meshed with said teeth for shifting said positioning means transversely to the line of said prongs, and centering means for said sheet wherein said plate is provided with notches on a second edge and a series of centering holes spaced apart along the line of movement, a detent, means for forcing said detent into a selected one of said notches and a plunger positively actuated by said punch operating means to enter a selected one of said centering holes upon operation of said punch and to prevent movement of the punch operating means when the movable plate is not in position to allow said plunger to enter a centering hole.

2. In a device for punching a sheet having a series of prepunched locating holes therein, a body portion, a die, a punch coacting therewith, a punch actuating handle mounted to said body portion, a punch operating lever from which said punch depends, a connection between said handle and said lever whereby actuation of the handle causes the lever to operate said punch, and sheet positioning means comprising a plate having a plurality of aligned prongs to engage selected ones of said locating holes for holding the sheet between the die and punch, said plate being movably mounted and having a series of centering holes spaced apart along the line of movement, means locating said plate so as to operatively and selectively position one of said centering holes, a plunger operatively and positively moved by said punch actuating handle to enter the selected one of said centering holes upon operation of said punch thereby accurately positioning the sheet, said plunger preventing movement of the punch actuating handle when the movable plate is not in position to allow the plunger to enter a centering hole.

3. In a device for punching a sheet having a series of prepunched locating holes therein, a body portion having a hole therein, a die, a punch coacting therewith, a punch actuating handle pivotally mounted on one end thereof to said body portion and movable at its free end through said hole in the body portion, a punch operating lever pivoted at one end thereof to said body portion, said punch depending from the free end of the punch operating lever, a pivotal connection between said actuating handle and said punch operating lever whereby actuation of the handle

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causes the lever to operate said punch, and sheet positioning means comprising a plate having a plurality of aligned prongs to engage selected ones of said locating holes for holding the sheet between the die and punch, said plate being movably mounted and having a series of centering holes spaced apart along the line of movement, means locating said plate so as to operatively and selectively position one of said centering holes, a plunger operatively and positively moved by said punch actuating handle to enter the selected one of said centering holes upon operation of said punch thereby accurately positioning the sheet, said plunger preventing movement of the punch actuating handle when the movable plate is not in position to allow the plunger to enter a centering hole.

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4. The device of claim 2 in which spring means are provided between said plunger and said body portion to positively restore said actuating handle after each punching operation.

FRANK J. FURMAN.

## REFERENCES CITED

The following references are of record in the file of this patent:

## UNITED STATES PATENTS

Number	Name	Date
487,737	Hollerith .....	Dec. 13, 1892
524,623	Walsh .....	Aug. 14, 1894
641,333	Saltzkorn et al. ....	Jan. 16, 1900
748,823	Weaning .....	Jan. 5, 1904
1,289,636	Brown .....	Dec. 31, 1918