

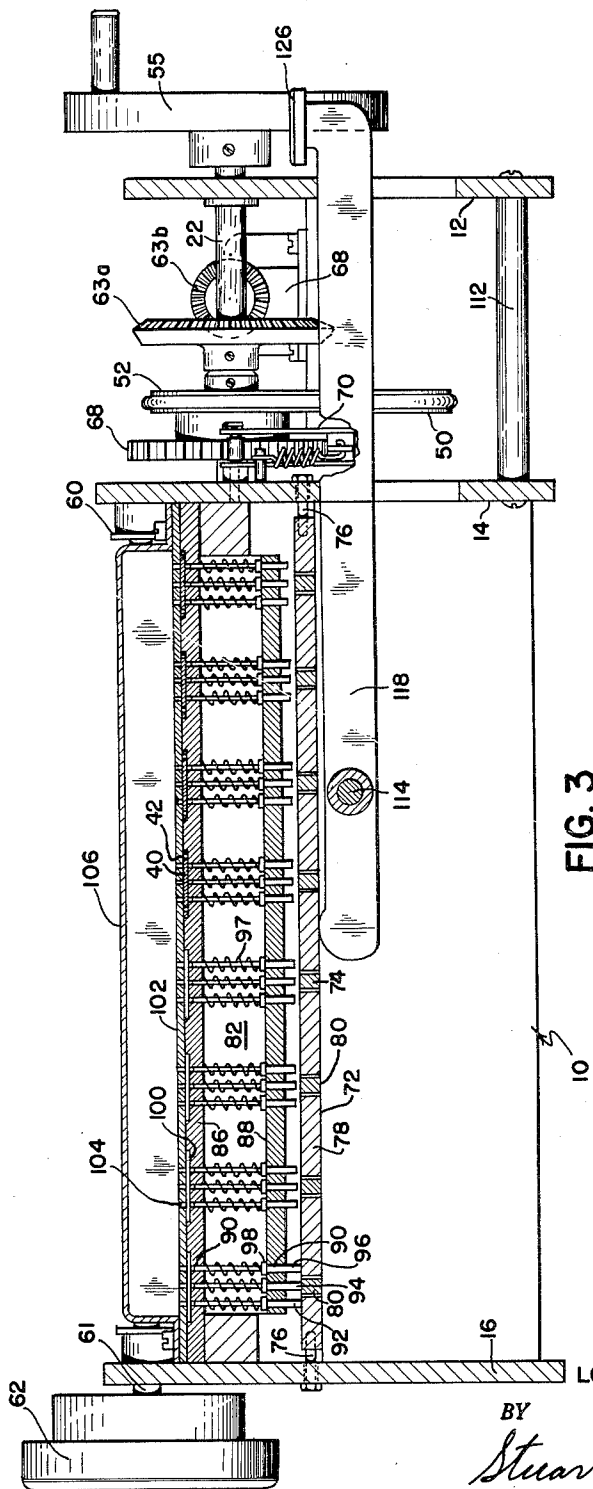
Jan. 16, 1962

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CODE PUNCHING DEVICE

3,016,781

Filed May 31, 1960

3 Sheets-Sheet 2



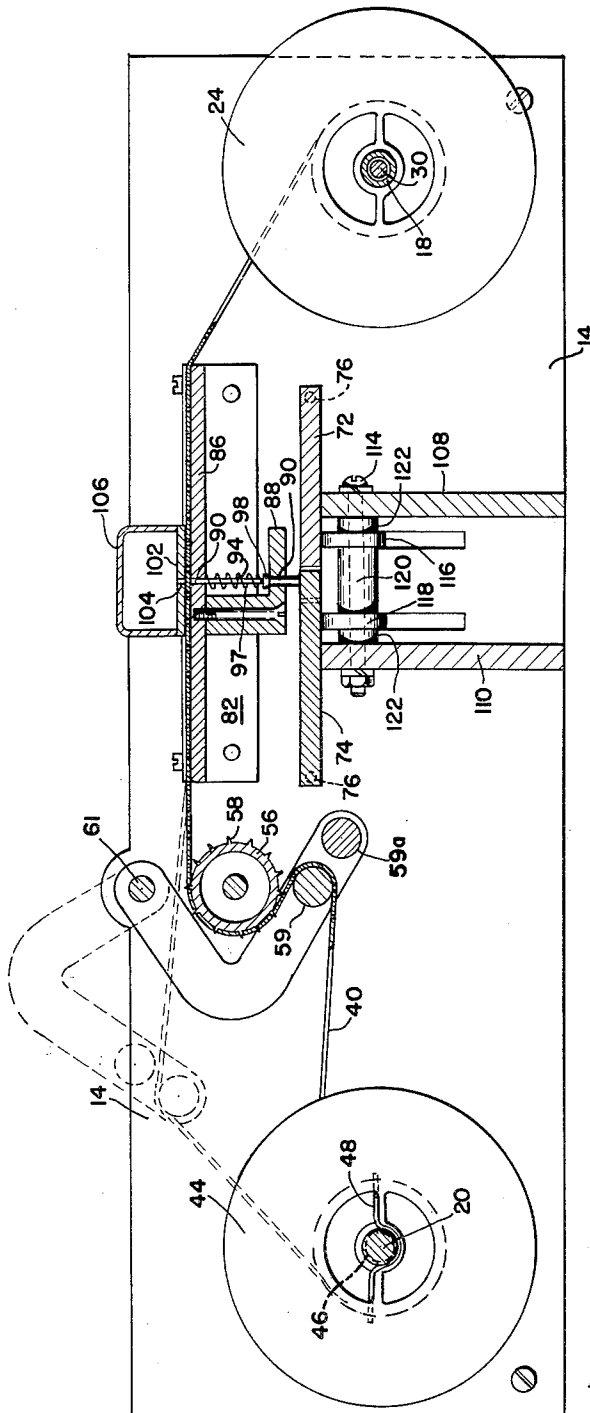
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CODE PUNCHING DEVICE

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9 Claims. (Cl. 83-633)

This invention relates generally to tape punching apparatus, and pertains more particularly to a device for punching holes in tapes in accordance with a desired code or program.

One object of this invention is to provide a code punching device that is capable of providing a particular hole pattern in a single tape or in a plurality of such tapes. In this way, if only one tape is needed for subsequent playback in the recorded control of dispensing, blending, mixing and other automated operations, such a tape can be readily produced. Yet, on the other hand, if it is known that duplicate tapes will be required for a plurality of individually controlled operations of an identical nature, these additional tapes can be punched simultaneously with no more effort and expense than in the punching of a single tape.

Another object is to provide a code punching device that is quite simple in its construction, such simplicity making the device easily used by inexperienced personnel. Also, it is an aim of the invention to provide a tape punching device of the envisaged character which is rugged and long lasting.

Another object of the invention is to provide a tape punching device that is light in weight and which can be easily transported from place to place. Also, a feature of the invention lies in the fact that the device is manually operated, requiring no source of electric power.

Other objects will be in part obvious, and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth and the scope of the application which will be indicated in the appended claims.

In the drawings:

FIGURE 1 is a plan view of a code punching device exemplifying my invention;

FIG. 2 is a front elevational view corresponding to FIGURE 1;

FIG. 3 is a sectional view taken in the direction of line 3-3 of FIGURE 1;

FIG. 4 is a sectional view taken in the direction of line 4-4 of FIGURE 1.

Referring now in detail to the various views the device comprises a rectangular frame denoted generally by the reference numeral 10. This frame includes several vertically disposed plates 12, 14 and 16. The plates 12 and 14 serve as bearings for several rotatable shafts or spindles 18, 20 and 22, the spindles 18, 20 projecting in a cantilever fashion from the plate 14. The purpose of the spindle 18 is to carry a plurality of tape supply reels 24 and is of hollow tubular construction for a reason explained below. These reels 24 are loosely circumscribed about the spindle 18 so as to be rotatable with respect thereto. As shown in FIGURE 1, a spacer or washer 26 is interposed between adjacent reels 24. Another spacer or shoulder 28 maintains the assemblage of reels 24 in a preferred axial position on the spindle 18. For the purpose of retaining the various reels 24 in position on the spindle 18 and for loading the reels axially to render them locked on the shaft in the rewind operation, a recessed nut member 29 is provided for attachment to the threaded end 31 of a rod 30 extending completely through the tubular spindle. The nut mem-

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ber 29 is applied after the reels have been placed on the spindle 18.

As best viewed in FIG. 2 it will be discerned that the hollow spindle 18 has affixed thereto a ratchet labelled 32, this ratchet being engaged by a spring pawl 34 so that the spindle is normally prevented from being turned or rotated in a clockwise direction as viewed in this particular figure. However, a knob 36 is provided at the end of the spindle 18 opposite from the member 29 for rotating the spindle 18 in a counter-clockwise direction when it is desired to take-up or rewind the various tapes presently to be referred to. Inasmuch as the reels normally are free to rotate with respect to the spindle 18, when paying out their tapes it becomes desirable to provide a clamping action during the rewinding function in order to cause the various reels 24 to rotate in unison with the spindle 18 during any tape rewinding. To accomplish this, the spindle 18 is threaded at 37. A nut member 38 is threaded on the section 37 and normally bears against the knob 36. Through the agency of a head 39 on the rod 30, it will be appreciated that when the nut member 38 is backed away from the knob 36 it forces the head 37 and the rod 30 in a direction so as to draw the nut member 29 against the reel 24 adjacent thereto, thereby clamping all of the other reels therebetween due to the presence of the shoulder 28.

Inasmuch as the reels 24 have been denoted as supply reels, it can now be stated that these reels each carry a supply of tape designated by the reference numeral 40. Each tape 40 may be of plastic material and is formed with a series of sprocket engaging holes 42 along its marginal edges, resembling the holes usually found in a conventional motion picture film.

A number of take-up reels 44 is carried on the spindle 20. The number of take-up reels 44 corresponds of course to the number of supply reels 24. However, while they may be of identical construction, the manner in which they are retained on the spindle 20 is somewhat different. It will be observed that the spindle 20 is formed with a series of axially spaced circumferential grooves 46 which serve to position each of the reels 44 longitudinally on the spindle 20. The specific manner in which this is accomplished is not of the utmost importance, but a glance at FIG. 4 will show that a diametrically stretched wire 48 on each reel 44 is designed to engage an arcuate portion of each groove 46 when the various reels 44 are placed on the spindle 20. These wires 48 not only aid in locating the reels 44 along the spindle 20 but also provide frictional engagement so that the reels 44 are free to slip during the take-up of the various tapes 40, as will become clearer as the description progresses.

The manner in which the spindle 20 is driven will now be explained. In this regard, it is to be observed that a pulley 50 is affixed to the spindle 20 so as to be rotatable therewith. A second pulley 52 is affixed to the spindle 22. A coil spring tape or belt 54 is entrained about both of these pulleys 50, 52. Hence, by means of a knob 55, it will be understood that the spindle 20 is driven when the spindle 22 is caused to rotate by the mere turning of the knob 55.

While the spindle 22 serves to rotate the spindle 20, it will now be pointed out that this spindle 22 also performs another important function. Accordingly, it will be observed that the spindle 22 carries a sprocket drum 56 provided with a plurality of cogs or teeth 58. These cogs 58 are spaced along the surface of the drum 56 so as to be engageable with the various holes 42. The tapes 40 are normally maintained in engagement with the drum 56 through the agency of a roller 59 rotatably carried between a pair of rocker arms 60. The arms 60 are secured at one end to a rock shaft 61 actuatable by a knob 62 for swinging the roller 59 from the solid line position in

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which it appears in FIG. 4 to the raised phantom position there shown, a second roller 59a then lifting the tapes 40 out of engagement with the sprocket teeth 58, thereby facilitating rewinding of the tapes 40.

Although the need therefor will not be completely understood at this moment, it will be explained nonetheless that the spindle 22 additionally supports a beveled gear 63a which meshes with another beveled gear 63b connected to a dial counter indicated generally by the reference numeral 64. This dial counter 64 is of conventional construction and has a knob 66 by which the various number wheels contained therein may be initially set for proper viewing through a rectangular window 68. Owing to the fixed drive between the spindle 22 and the counter 64, coupled with the direct engagement of the various cogs 58 on the drum 56 with the tape holes 42, any registration of the counter 64 will be indicative of the distance through which the tapes 40 have been moved. Stated somewhat differently, the counter 64 is driven in a direct relation with the linear distance through which the tapes 40 are moved during the coding operation which has not yet been described. To assure a true digital registration of the counter 64, the spindle 22 additionally carries a notched wheel 68 which is engaged by a spring pressed detent mechanism 70. Thus, rotation of the spindle 22 will normally be made in discrete incremental steps governed by the engagement of the detent mechanism 70 and the various notches formed in the wheel 68, and the registration in the window 68 of the counter 64 will be in whole numbers.

Turning now to the specific mechanism by which the punched code is effected, attention is drawn to the employment of a pair of rocker plates 72 and 74. These rocker plates 72 and 74 are pivotally or hingedly supported by two pair of pivot pins 76, the pivot pins 76 being situated near the remote edges of these plates and carried by the vertical plates 14, 16 as best viewed in FIGURE 1. The adjacent edges of the plates 72, 74 are formed with inter-fitting projections 78, 80. It will be readily discerned that the projections 78 are considerably wider than the projections 80. The reason for the differences in projection widths will soon be clearly understood.

Superimposed above the rocker plates 72, 74 is a punch and die assembly indicated generally by the reference numeral 82. The assembly 82, it will be noted, includes upper and lower guide plates 86, 88. As can be most readily seen from FIG. 3, these guide plates 86, 88 have a series of spaced apertures 90 extending therethrough and arranged in groups of three. Each aperture 90 accommodates a vertically reciprocable punch element 92, 94 or 96. These punch elements 92—96 are normally urged downwardly in the direction of the rocker plates 72, 74. A coil spring 97 encircling each punch element reacts against the underside of the upper die plate 86 and a flange 98 integral with the punch element itself in achieving the downward bias. From FIG. 3, it will be seen that the punch elements 92 and 96 bear against the wider projections 78 whereas the centrally disposed punch element 94 of each group bears against the narrower projections 80. Although not as yet described, it is believed evident at this time that the rocker plates 72, 74 are responsible for urging the punch elements 92—96 upwardly to overcome the biasing action of their springs 97. Because of the reduced scale of FIG. 3, it cannot be ascertained that the lengths of the various punch elements 92—96 are preferably staggered so that these punch elements are not actuated in unison but instead in a progressive manner thereby requiring a lesser degree of force than if they were all acted upon simultaneously.

Since it is planned that the various tapes 40 pass over the upper die plate 86, this die plate 86 is formed with a plurality of channels or grooves 100, these grooves being approximately the same width as the tapes 40. Also, the punch and die assembly includes a die plate 102 posi-

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tioned immediately above the guide plate 86. FIG. 3 shows quite clearly that the guide plate 102 is formed with apertures 104 which are located in registry with the apertures 90. It is through the agency of these apertures 104 that the upper ends of the various punch elements 92—96 are received after passage through the tapes 40. In other words, the holes that are desired to be punched in the tapes will be produced through the restraint imposed by the die plate 102. The removed portions of the tapes 40 are merely pushed upwardly and remain within the confines of a transparent shield 106. Periodically the punched out wafers can be removed.

From FIG. 4 it can be seen that a pair of transverse plates 108, 110 is employed. It is through the agency of these plates that the rocker plates 72, 74 are normally maintained in a horizontal plane, the plates 72, 74 merely resting upon the upper edges of the transverse plates 108, 110. The opposite ends of transverse plates 108, 110 are welded or otherwise secured to the previously mentioned plates 14, 16; hence, the plates 108, 110 impart rigidity and unity to the overall frame 10. Stated somewhat differently, the plates 108, 110 maintain a fixed relationship between the plate 16 and the plate 12 and the plate 14. Suitable struts such as those labelled 112 function to maintain the plates 12 and 14 in a fixed relationship with each other. A further and very important function of the transverse plates 108, 110 is for the support of a pin 114. This pin serves as a pivot for a pair of actuating levers 116, 118. Suitable spacers such as those denoted by the reference numeral 120 and 122 maintain the levers 116 and 118 in the proper locations beneath the rocker plates 72, 74 respectively. The levers 116 and 118 are equipped with keys 124 and 126, respectively, by which these levers may be manually actuated. It will be understood, it is believed, that depressing either key 124, 126 will cause its associated lever 116, 118 to be pivoted about the pin 114 so as to cause the lever end underlying the rocker plate 72 or 74, as the case may be, to be forced upwardly with an accompanying upward swinging or pivoting of said plates 72, 74.

As a refinement to the invention, attention is now directed to the employment of a dial counter 128 which is similar to the dial counter 64. The dial counter 128 is directly associated with the lever 116, there being an arm 130 which underlies the lever 116 so that when its key 124 is depressed a registration will occur on the counter 128. The counter 128 is provided with a viewing window 132 via which the registration can be observed. A reset knob 134 permits the counter to be returned to a preferred initial setting. A similar counter can be employed in conjunction with the lever 118. However, for the sake of drafting simplicity, only one counter 128 has been pictured. The role played by the counter 128, as is believed evident, is to count the number of times that the key 124 is depressed. In this way, when a particular code demands that a certain number of holes be punched in the tapes 40, an accurate check can be made as to the number of times the lever 116 is actuated to form these holes. By the same token, any counter coupled to the lever 118 will show the number of times this lever has been actuated to form the holes that it makes when actuated. Having presented the foregoing description, the operation of my code punching device should be readily apparent. However, a brief operational sequence will undoubtedly be of assistance in appreciating all of the benefits that are derivable from the invention. Accordingly, it will be presumed that the various reels 24 have been properly positioned on the spindle 18. Further, the tapes 40 stored on these supply reels 24 are "threaded" through the punch and die assembly 82, then between the rollers 59, 59a and finally attached to the take-up reels 44 which are assumed to have been positioned on the spindle 20. In "threading" the various tapes 40 through the punch and die assembly 82, it will be appreciated that this action brings the tapes 40 into the various grooves 100. In this way, they pass above

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the upper ends of the various punch elements 92, 94 and 96. It is important at this time to note that a trio of punch elements is included in each of the eight groups, there being eight tapes 40 illustrated. The plates 72 are responsible through the agency of their projections 78 for raising the punch elements 92, 96. On the other hand, the other rocker plates 74 are similarly responsible via their various projections 80 for lifting the centrally disposed punch elements 94.

Consequently, when the key 124 is depressed, the lever 116 will be pivoted about the pin 114 so as to cause the plate 72 to rock upwardly, thereby forcing the punch elements 92, 96 of each group upwardly through that portion of the tape 40 then immediately above these punch elements. Owing to this happening, it can be appreciated that a pair of laterally spaced holes 140 is punched in the tape. If the tape remains stationary and only the key 126 is punched, a single centrally disposed hole 142 is formed. However, when both keys 124 and 126 are depressed at a given station or tape location, the three abreast holes 140, 142 are punched. After this, the user can turn the knob 55 so as to move the tape forwardly until he is ready to punch additional holes. The counter 64 will always inform the user as to the distance through which the tapes 40 are moved. In this way, one hole, two holes or three holes can be punched at spaced intervals along the tapes 40, thereby permanently incorporating into the tapes themselves a desired code or program.

Recognition is made of the fact that a starting point is usually desired on any given tape. To accomplished this aim so that the tapes 40 will be punched in a completely duplicated manner, a reference mark 144 can be placed across the plate 102, or if preferred, the edge of this plate may be utilized. In any event, it will be recognized that the leading ends of tapes 40 which are wrapped around the reels 44 will not necessarily present the same relative sections of tape to the punch and die assembly 82. Accordingly, some reference mark should be normally used. As shown, one hole 142 on each tape 40 has been brought into registry with the mark 144, and in the illustrated situation the leading hole 142 functions as the reference holes, on the subsequent holes then all being in a predetermined relationship along each tape 40.

After the user has punched the various holes 140, 142 in a selected manner to form the desired code, the tape 40 may be rewound onto their supply reels 24, if desired. This action is facilitated by means of the rocker arms 60 which carry the roller 59a therebetween. The rocker arms 60 can be swung upwardly into their dotted line positions about their supporting shaft 61 (see FIG. 4). This will lift the tape off the cogs of drum 56. When in their phantom relationship, it will be appreciated that the tapes 40 can be quickly rewound on the reels 24.

Mention has already been made of the threaded end 37 on the spindle 18. As previously pointed out, rotation of the nut member 38 in a clockwise direction, the threads 37 being preferably lefthanded, will cause a clamping of the various reels 24 on the spindle 18, this coming about by reason of the threaded action drawing the member 29 against the particular reel 24 lying adjacent thereto. All the other reels are then moved toward the spacer or shoulder 28 to effect the desired clamping action. It will be understood, though, that when the tapes are originally withdrawn or payed from these reels 24 the reels are free to rotate upon the spindle 18; it is only when the tapes 40 are to be rewound that they are caused to be rotated with the spindle 18.

Owing to the need for providing a linear measurement of the amount of tape movement when performing the punching operation, the counter 64 is driven in a direct relationship with the number of revolutions made by the spindle 22. Inasmuch as the diameter of the tape taken up by the reels 44 will be constantly increasing during a coding operation, it should be noted that a certain amount of slippage of the reels 44 will occur on the

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spindle 20 as the tape diameter gets progressively greater. The wires 48 usually permit such slippage, because they only frictionally bear against the bottoms of the circumferential grooves 46, and additional slippage can occur between the belt 44 and the pulleys 50, 52. All that is necessary is that the tape be maintained in a relatively taut condition between the take-up reels 44 and the sprocket drum 56. Of course, any slippage that occurs beyond the location of the drum 56 will not adversely affect the accuracy of any counter registration that results. Consequently, it is believed manifest that the linear measurement previously alluded to will always be made. Therefore, if one is to have a one-half inch spacing between the various holes 140, say such spacing can be accurately derived. On the other hand any modification of the spacing can be made between succeeding holes, that is, different stations, so that the code can be predicated upon linear distance as well as to the number of holes 140, 142 punched at each station.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

What is claimed:

1. A coding device comprising means for holding a record medium that is to have formed thereon a desired code, a pair of flat rocker plates mounted for pivotal movement about their opposite edges and having substantially parallel adjacent edges, a first coding means actuatable by one of said plates for forming one portion of said code on the record medium, a second coding means actuatable by the other of said plates for forming a second portion of said code on the record medium, and a pair of pivotal levers each engageable with a rocker plate for causing pivoting thereof and consequent actuation of the particular coding means associated therewith.

2. A coding device in accordance with claim 1 in which said code constitutes a plurality of holes to be formed in said record medium, and said first and second coding means each includes at least one punch element.

3. A coding device comprising means for holding a record medium that is to have a desired code punched therein, a pair of rocker plates having interfitting projections on their adjacent edges residing in the general plane of its particular plate, hinge means at the remote edges of said plates for mounting said plates for individual pivotal movement from a common plane to inclined intersecting planes, a first punch element located so as to be actuated by the projection on one plate, and a second punch element located so as to be actuated by the projection on the other plate.

4. A coding device comprising means for holding a record tape that is to have a desired code punched therein, a trio of punch elements disposed in a substantially straight line, a pair of hinged mounted rocker plates normally residing in a generally common plane, one of said plates having a projection engageable with the centrally disposed punch element and the other of said plates having a projection located at each side of said first-mentioned projection and in transverse alignment with said first-mentioned projection, whereby when said one plate is rocked, said centrally disposed punch element will be actuated, and when said other plate is rocked, the other punch elements will be actuated.

5. A coding device in accordance with claim 4 includ-

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ing a pivotal lever associated with each plate for causing rocking thereof.

6. A coding device in accordance with claim 5 including spring means for biasing said punch elements toward said plates.

7. A coding device comprising means for holding a plurality of tape supply reels, means for holding a plurality of tape take-up reels, a trio of punch elements for each supply reel, said punch elements all being arranged in a row, a pair of rocker plates, one of said plates having a plurality of relatively narrow projections engageable with the middle punch element of each trio and the other of said rocker plates having a plurality of relatively wide projections interfitting with said relatively narrow projections and engageable with the nearer punch elements of adjacent trios, and a manually actuatable lever for each rocker plate for individually operating same to cause holes to be punched in tapes extending between said supply and take-up reels.

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8. A coding device in accordance with claim 7 including means for measuring the linear distance through which said tapes are moved.

9. A coding device in accordance with claim 7 in which said means for holding a plurality of tape supply reels includes a tubular spindle rotatably supported at one end, a rod extending through said spindle, a detachable enlarged member normally carried on the projecting end of said rod and a threaded mechanism situated at said one end of the spindle for drawing said rod and its detachable member in a direction to clamp said supply reels.

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