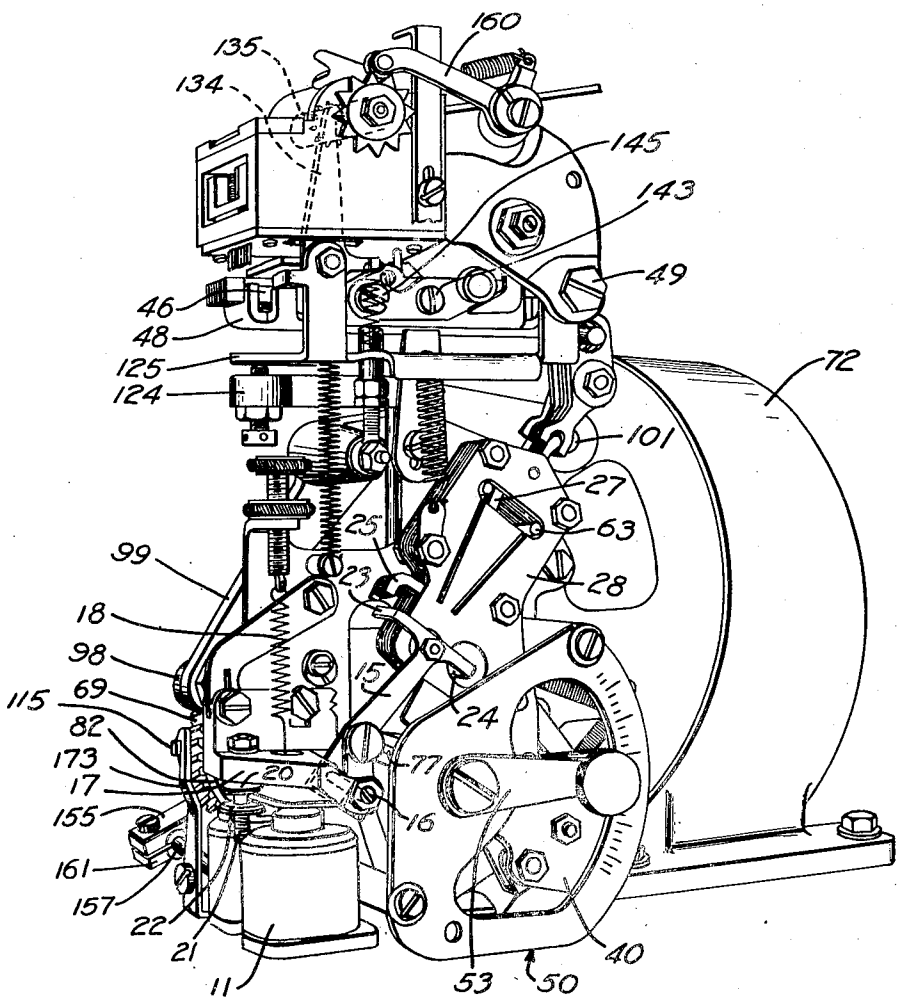
June 25, 1935. E. S. LARSON 2,005,748

TAPE PERFORATOR

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FIG. 1



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TAPE PERFORATOR

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FIG. 3

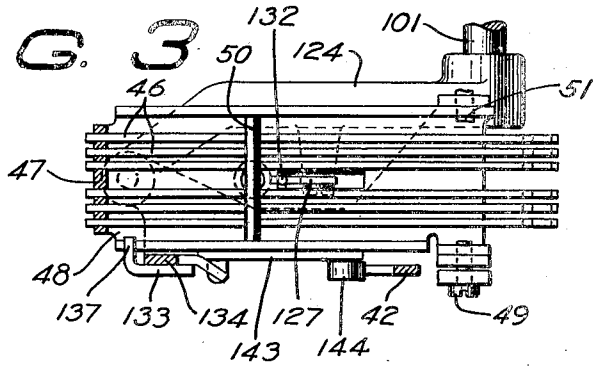


FIG. 4

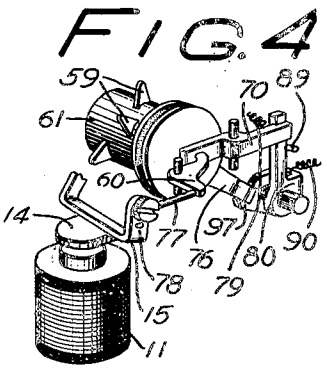
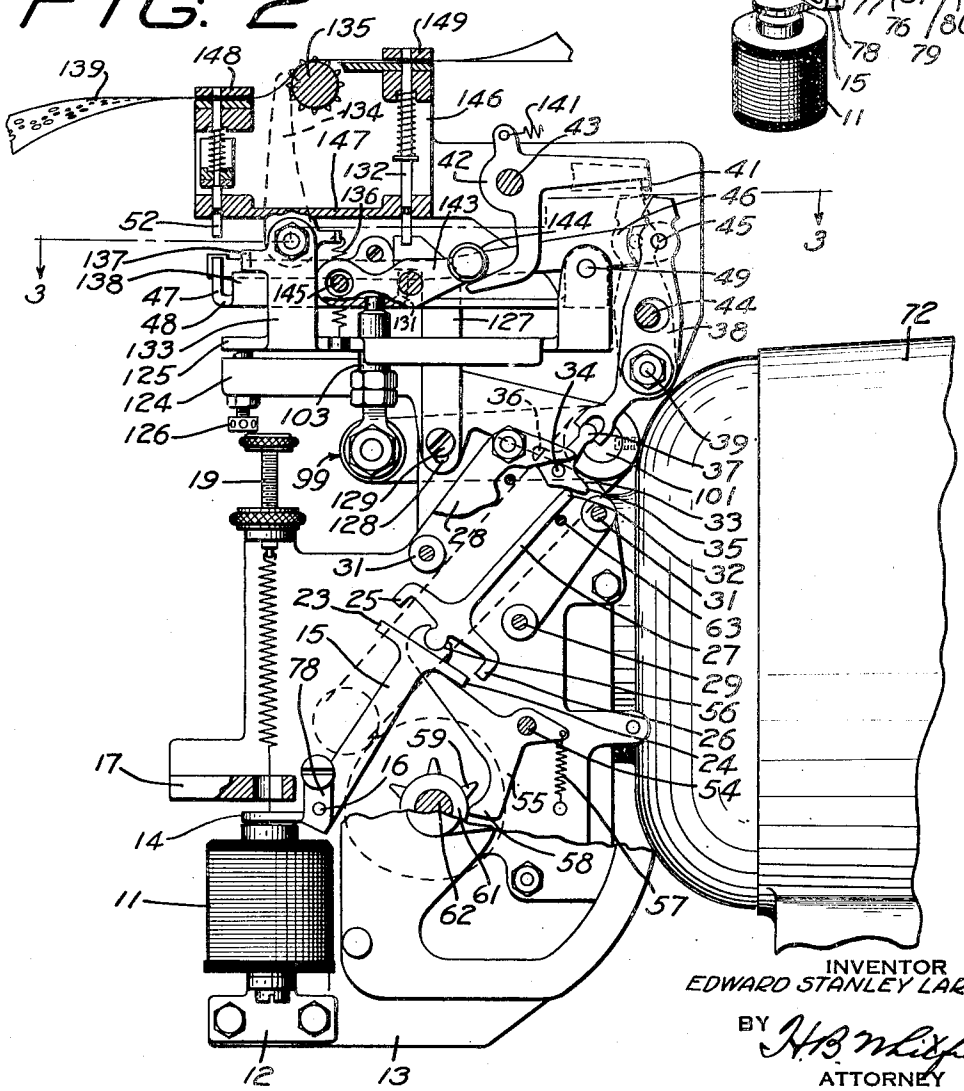


FIG. 2



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TAPE PERFORATOR

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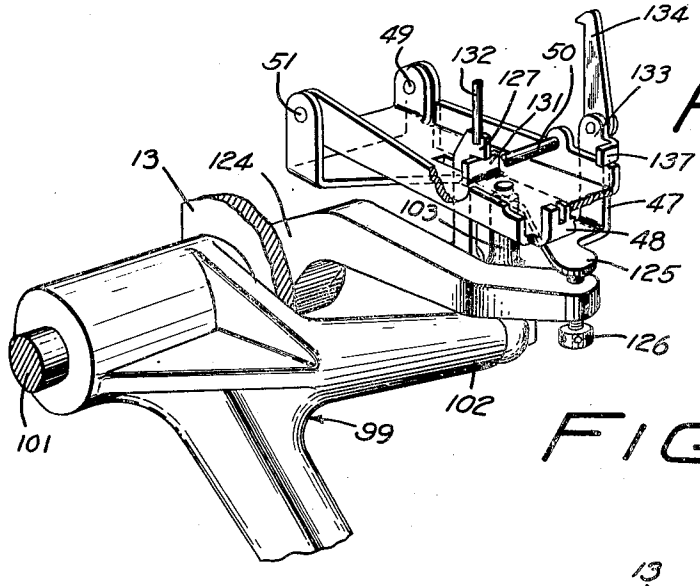


FIG. 6

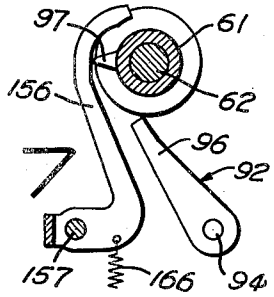


FIG. 7

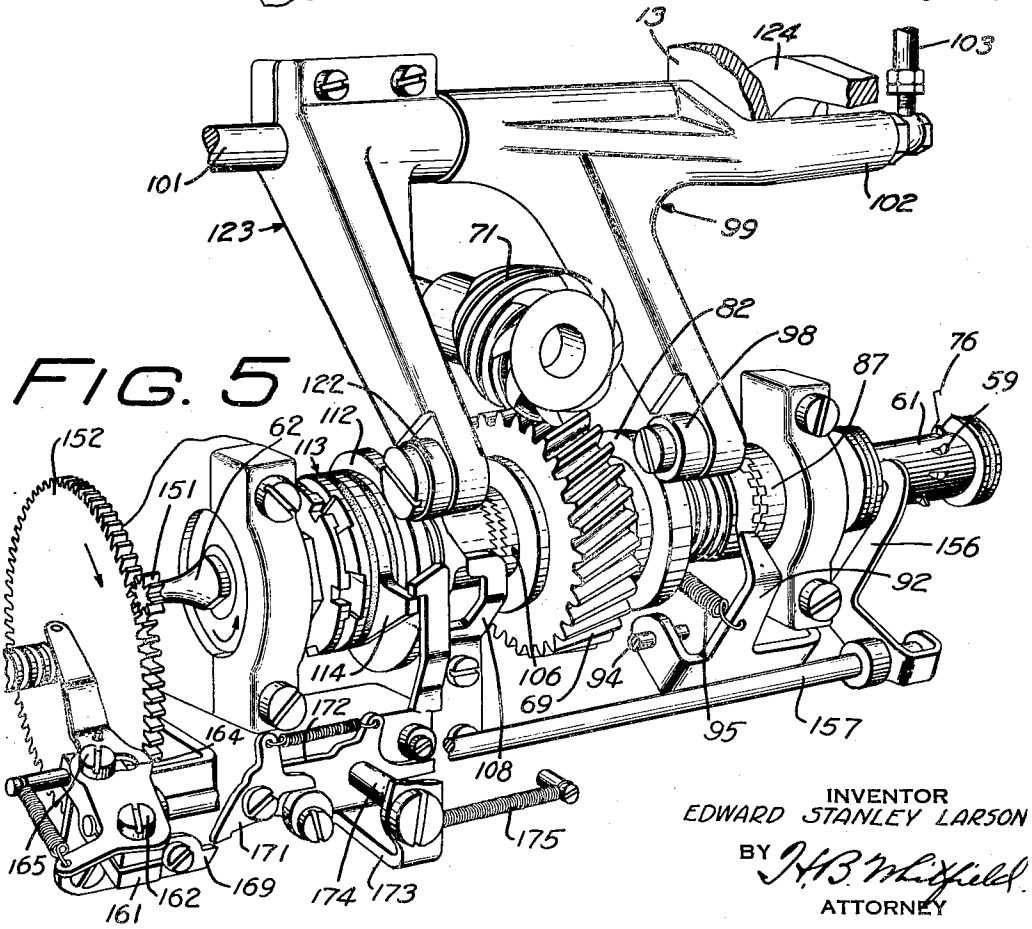


FIG. 5

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TAPE PERFORATOR

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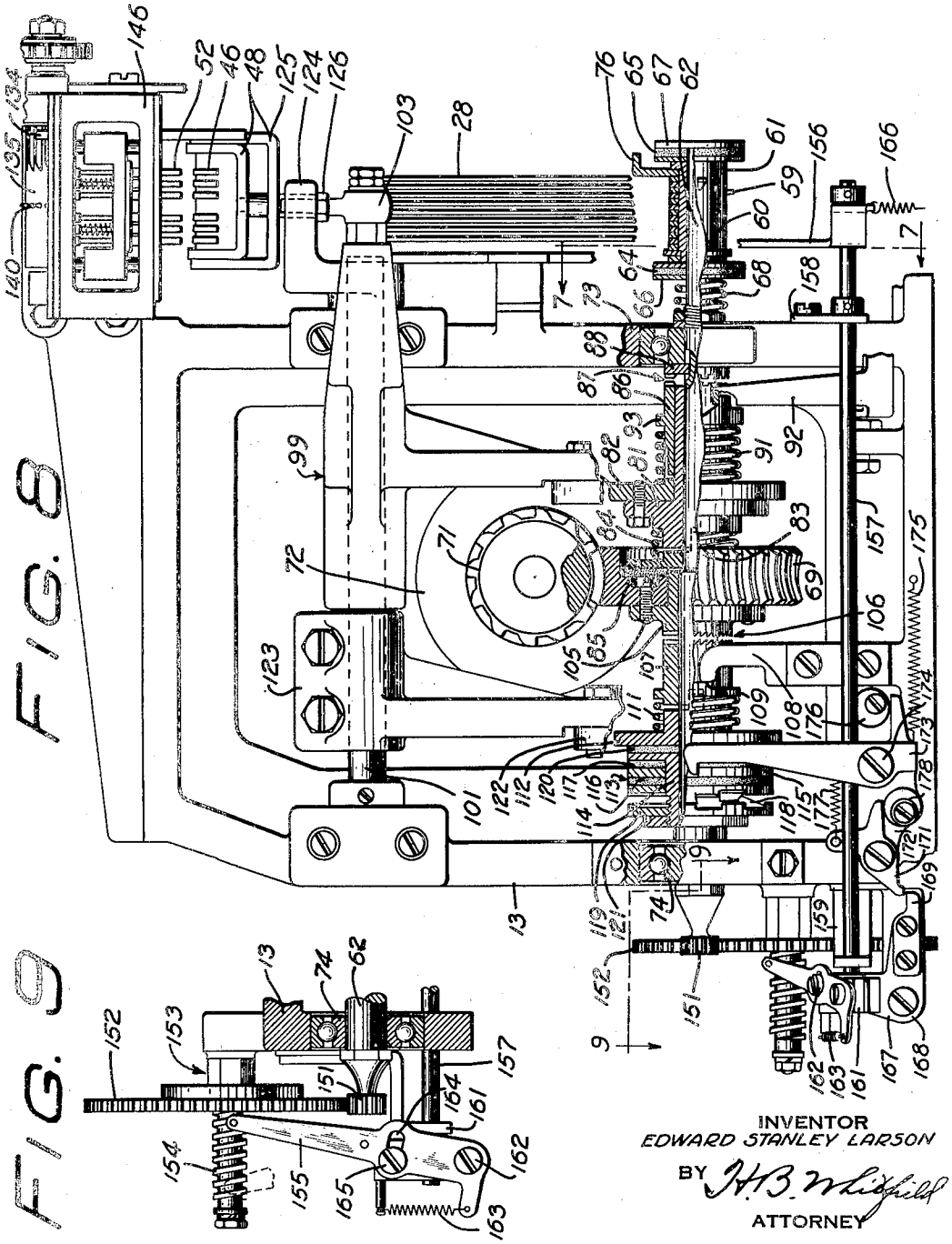


FIG. 8

FIG. 9

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Patented June 25, 1935 2,005,748

UNITED STATES PATENT OFFICE

2,005,748

TAPE PERFORATOR

Edward Stanley Larson, Chicago, Ill., assignor to Teletype Corporation, Chicago, Ill., a corporation of Delaware

Application July 1, 1933, Serial No. 678,587

15 Claims. (Cl. 178—92)

The present invention relates to signalling apparatus and especially to printing telegraph signal controlled mechanisms for producing perforated tape.

The salient object of the present invention is to provide a perforating mechanism arranged with groups of punches which may be operated either independently of or conjointly with each other.

Another object of the invention is the provision of a perforating mechanism including feed and signal punches whereby under predetermined conditions the feed punch will be operated and the signal punches will be ineffective to perforate the tape.

According to a feature of the invention, the perforating mechanism which includes feed and signal punches operative in response to selective conditions is arranged with means responsive to a cessation of selective conditions for advancing the tape a predetermined amount, during which the signal punches are not operated, regardless of the previous selective conditions.

To achieve the foregoing objects, the present invention contemplates the embodiment in a signal controlled perforating apparatus of the type disclosed in United States Patent No. 1,884,743, issued October 25, 1932 to E. E. Kleinschmidt, of a power driven mechanism responsive upon a cessation of code signals for operating an auxiliary mechanism to advance automatically through the perforating apparatus a predetermined length of tape which allows immediately thereafter, the transmission of impulses represented by the code perforations therein, and simultaneously to operate, during this procedure, the feed-hole punch independently of the signal-hole punches. Briefly, the apparatus embodying the present invention includes a single magnet selector mechanism responsive to received code combinations of signal impulses and adapted to control permutably a plurality of punch interference members of a perforating mechanism, and a mechanism including a worm and follower lever cooperatively related therewith responsive upon the cessation of reception of code signal impulses to control a secondary or auxiliary mechanism for spacing out a predetermined length of tape so as to preclude a condition wherein the portion of the message recorded in the tape between the punch block of the perforator and the pin block or sensing apparatus of a transmitter will be suppressed while awaiting the reception of a succeeding message, thus insuring the complete retransmission of a message without delay.

According to the present invention the punch operating members of the perforating device are so designed as to render the feed-hole punch operating mechanism operable under certain predetermined conditions independently of the code signal-hole punches; and under normal conditions the feed-hole punch is operative conjointly with the signal-hole punches.

A better understanding of the present invention will be had from the following description, taken in conjunction with the following drawings, wherein,

Fig. 1 is a perspective view of the apparatus according to the present invention;

Fig. 2 is a side elevational view, partly in section, of the mechanism illustrated in Fig. 1;

Fig. 3 is a section taken on line 3—3 of Fig. 2;

Fig. 4 is a perspective view of the release mechanism of the selector device;

Fig. 5 is a perspective view of the tape space-out mechanism;

Fig. 6 is a perspective view of part of the punch operating mechanism;

Fig. 7 is a view illustrating the cooperative relationship between the selecting cam drum and the operation initiating levers of the perforating and space-out mechanisms;

Fig. 8 is a front elevational view of the device illustrated in Fig. 1, and

Fig. 9 is a plan sectional view taken on line 9—9 of Fig. 8.

In the drawings wherein like reference characters indicate the same part throughout the several views, the present invention is shown in the specific embodiment herein described in connection with a single magnet reperforator substantially as disclosed in the aforementioned patent. As shown in Figs. 1 and 2, the mechanism is controlled by a single magnet 11 which may be of any well-known construction. As shown more clearly in Fig. 2, the magnet 11 is secured to a bracket 12 which in turn is secured to the frame 13 of the apparatus. The magnet 11 is provided with an armature 14 fixed to the U-shaped end of a selector lever 15 which is pivoted at 16 to a bracket 17 (more clearly shown in Fig. 1) adjustably carried on the frame 13. A spring 18 has one of its ends secured to the armature 14 and its other end to an adjusting screw 19, urging the armature 14 into engagement with a nut 20 on stop screw 21 (Fig. 1) mounted on bracket 17. When the magnet 11 is energized, the armature 14 is held against the flange of a nut 22, carried on screw 21, which with nut 20

provides an adjustable limiting means for the movement of armature 14.

The free end of the lever 15 is T-shaped and is provided with a pair of laterally extending arms or abutments 23 and 24, which cooperate with laterally projecting arms 25 and 26 of swords 27 to position the latter either in their right or left-hand position, as will presently appear.

The swords 27, of which there are six in the present instance, are flat members separated by thin guide plates 28 (Fig. 1), which serve to keep the swords 27 in alignment and are mounted on studs 29 fixed to the frame 13 and spaced from each other by washers 31. Each sword 27 is provided with a knife edge 32 which engages a rockable T-lever 33 pivoted on a shaft 34 and comprised of three arms 35, 36, and 37, the latter one of which is rounded (as shown in Fig. 2) and engages the bifurcated end of a lever 38, a corresponding series of which are pivoted on a shaft 39.

Each of the levers 38 is tapered at its extremity for cooperation with a knife edge 41 on a universal bail 42 which is pivoted at 43. The levers 38 are adapted to be locked in either their clockwise or counterclockwise positions, as indicated by dotted lines in Fig. 2, between the knife edge 41 and a limiting stop 44 operative in an enlarged hole in each of the levers 38. Pivotally connected to each lever 38 at 45 is a punch interference member 46, the extremity of each of which is slidably carried in slots provided in a comb member 47 integrally formed on a cradle 48 which is pivotally carried on a pair of studs 49 and 51. Each of the interference members 46 is provided with an enlargement at its extremity, the purpose of which is, as is commonly known, to cooperate with an associated punch 52, the enlarged portion being adapted to be slid into or out of cooperative engagement with its associated punch 52, depending upon the position of its associated lever 38. A rod 50 (Figs. 3 and 6) is disposed over the interference members 46 and is provided to guide the members 46 and to prevent independent upward movement thereof.

The reciprocation of punch interference members 46 to either their operative or non-operative positions is effected by the action of swords 27 upon the rockable T-levers 33 in the following manner. Referring to Fig. 2, the swords 27 are shown as pivotally articulated to associated selector members 55 by a ball and socket connection 56. Each selector member 55 normally tends to rotate in a clockwise direction about common pivot 54 under the influence of its individual spring 57, thus tending to move its associated sword 27 into engagement with either arm 35 or 36 of T-lever 33. Each selector member 55 is provided with a cam follower arm 58 which is adapted to coact with a cam projection 59 carried on a selecting cam member 61 which is rotatably mounted on a main operating shaft 62. The several cam projections 59 correspond in number to the selector members 55, and are arranged in a helical series about the selecting cam member 61 so that upon the cyclic rotation of the cam member the selector members 55 will be actuated successively. An additional cam projection 60 (Fig. 8) is provided to coact with a release lever 156, as will hereinafter appear. When the selector member 55 is moved in a counterclockwise direction by a cam 59 against the tension of spring 57, the sword 27 associated therewith will be carried downwardly (as viewed in Fig. 2) so that abutments 25 and 26 will cooperate with either one or the other of their respective companion abutments 23 and 24, depending upon whether the selector lever 15, due to the energization or deenergization of selector magnet 11, is in its clockwise or counterclockwise positon. For example, if the selector magnet 11 is energized, the selector lever 15 will assume its counterclockwise position, as shown in Fig. 2, against the normal tendency of spring 18, and when the sword 27 is thus reciprocated by the aforementioned coaction between cam 59 and follower 58 the abutment 25 will coact with abutment 23, thus causing the sword 27 to rotate slightly in a clockwise direction so that when cam 59 has passed the follower 58 the spring 57 will effect a slight clockwise rotation of lever 55 to carry in turn sword 27 upwardly so that its knife edge 32 cooperates with arm 35 of T-lever 33. On the other hand, if the selector magnet 11 is deenergized, selector lever 15 will be biased to its clockwise position so that upon actuation of lever 55, as previously described, abutment 26 will coact with abutment 24 to cause a slight counterclockwise rotation of sword 27, whereupon knife edge 32 will be brought into cooperation with arm 36 of T-lever 33. The degree of oscillating motion of swords 27 is limited by a pair of stops 63.

Having reference to Fig. 8, the selecting cam member 61 is shown freely mounted on shaft 62 and frictionally connected thereto by means of friction discs 64 and 65 disposed between flanges 66 and 67 and cooperating flanges integrally formed with the selecting cam member 61, the frictional connection being rendered effective by a helical spring 68. Constant rotation is imparted to shaft 62 through a worm gear 69 affixed thereto, and a pinion 71 secured to the shaft of a motor 72. Shaft 62 is carried in anti-friction bearings 73 and 74 mounted in the frame 13.

The cam member 61 is held against rotation by the cooperation of a stop arm 76 with a latch mechanism, shown in Fig. 4, controlled by arm 78 of armature lever 15 through a plunger 77 (Figs. 1 and 4). Thus, upon the deenergization of magnet 11 selector lever 15 will be biased slightly clockwise by its spring 18 so that the eccentric screw on arm 78 will function to urge plunger 77 rightwardly to rotate bell crank 60 in a counterclockwise direction (as viewed in Fig. 4) whereby latch 70 is caused to rotate in an opposite direction against the tendency of a spring 79 to effect its disengagement from stop gate 80. Stop gate 80 is normally held against a stop pin 89 by a spring 90, but since the torque constantly applied to the cam member 61, and hence to stop arm 76, is of greater force than that exerted by spring 90, the holding effect of stop gate 80 on arm 76 is overcome and cam member 61 permitted to rotate; the action of arm 76 on gate 80 being to rotate gate 80 a certain angular amount against the action of its spring 90 until the disengagement of arm 76 from gate 80 occurs, whereupon gate 80 will be returned to its position against stop 89 by spring 90.

During the last portion of the revolution of arm 76, the selector magnet 11 becomes energized by the stop impulse of a received code combination of impulses under which condition latch 70 will be engaged with gate 80 to prevent the rotation of said gate when arm 76 strikes arm 97 thereof. The abeyance of arm 76, and hence cam member 61, will prevail until a start or no-current impulse is received to effect the deenergization of magnet 11 and the consequent operation of plunger 77, as just described. The magnet 11 is normally energized during the stop or

idle period of the perforating apparatus so that, when a start impulse is received, the cam member 61 will be thus released for one cyclic operation. The stop gate 60 and latch 70 are mounted on a plate 40 (Fig. 1) of an orientation device 50, said plate 40 being attached to an adjustment arm 53 which can be rotated about the axis of shaft 62 to change the stop position of arm 76, as set forth in the aforementioned patent.

Also mounted on the shaft 62 (Figs. 5 and 8) is a flanged sleeve member 81 to which is secured the operating cam 82 for the signal-hole punches 52. Sleeve 81 has a slidable connection with a flanged member 83, a helical spring 84 being interposed between members 81 and 83. The tension of spring 84 tends to create through a disc of friction material 85 a frictional connection between member 83 and gear 69. Slidably carried on sleeve member 81 is a bushing 86 which forms the driven member of a grab clutch 87, the driving member 88 of which is keyed to the shaft 62. By this construction a combination friction and grab clutch is provided whereby the cam 82 is actuated during the initial and final periods of its rotation by the friction means 85 and during its effective or intermediate period of operation by the grab or tooth clutch 87. The driven portion of the grab clutch is urged, during its operative period, into mesh with the driving portion 88 by a helical compression spring 91. This tendency, however, is counteracted by a stop lever 92 (Figs. 5 and 8) which coacts with a cam formed on the side of flange 93 integral with bushing 86 of clutch 87. Lever 92, which is pivoted at 94, is normally urged into cooperative relation with the cam formed on the flange 93 by its spring 95. Lever 92 is provided with an arm 96 (Fig. 7) which cooperates with one of the helical series of cams on the selecting cam member 61 in such manner that, at a predetermined point in the cycle of rotation or operation of the selector cam member 61, the cam portion 97 will coact with arm 96 to rotate lever 92 against the action of its spring 95 to disengage lever 92 from the clutch member 86, permitting the cooperative engagement of members 86 and 88 of clutch 87 and the ensuing single cyclic rotation of said clutch in the following manner. When lever 92 is disengaged from bushing 86, the member 86 is actuated toward the right into mesh with the driving member 88. However, immediately upon the disengagement of lever 92 the rotation of bushing 88 is initiated through the instrumentality of friction means 85 to move the cam portion on flange 93 out of range of the follower portion of lever 92. Simultaneously with this movement the meshing of members 86 and 88 will be effected due to the distending action of spring 91 to render the positive clutch 87 effective. During the single cycle of rotation of clutch 87, the lever 92 will be restored to its operative position with respect to member 86 by spring 95 preparatory to coacting again with the cam portion on flange 93, which occurs during the final period of rotation of clutch 87, at which time the power communicated through friction clutch means 85 will effect through the camming action of the cam on flange 93 and the follower on lever 92 the disengagement of members 86 and 88.

Cam 82 coacts with a follower roller 98 (Fig. 5), carried at the extremity of one arm of a punch operating bell crank lever 99 which is freely mounted on a shaft 101 suitably carried in the frame 13 (Figs. 5 and 8). As clearly shown in Figs. 5 and 6, the lever 99 is provided with an arm 102 at the extremity of which is pivotally articulated an adjustable strut 103 which functions to actuate the cradle 48 pivotally about pivots 49 and 51 (Fig. 2).

Referring again to Figs. 5 and 8, it is noted that the gear 69 is carried on a flanged sleeve 105, affixed to shaft 62, which forms the driving portion of a grab clutch 106, the driven portion 107 of which is normally held out of mesh with the driving portion 105 by a fixed cam follower 108 adapted to coact with a cam portion formed on the side of flange 109 integral with clutch portion 107. The clutch portion 107 is maintained out of meshing engagement with driving portion 105 by the cam follower 108 against the action of a compression spring 111 and has a slidable connection with a cam member 112 so that cam 112 rotates with the clutch member 107. Frictionally associated with cam 112 is a friction clutch assembly 113 comprising a flanged sleeve member 114 on which is carried a stop disc 115 interposed between a pair of washers 116 and 117 of friction material. A slit annular spring member 118 is provided to impart a compressive action to the friction clutch, the pressure of which is adjusted by means of a nut 119 and a locknut 121. A washer or disc 120 of friction material is interposed between the clutch assembly 113 and cam 112 and by virtue of the pressure exerted by spring 111, cam 112 is thus frictionally connected to drive shaft 62, whereby, together with positive clutch 106, cam 112 is, during a cyclic operation, initially and finally controlled by the friction clutch and intermediately controlled by the positive clutch 106 in a manner similar to that set forth in connection with aforementioned cam 82.

Cam 112 cooperates with a follower roller 122 (Figs. 5 and 8) carried at the extremity of a lever 123 which is clamped tightly on shaft 101. In this manner shaft 101 is constrained to rock in accordance with the movement of lever 123. At the right-hand extremity of shaft 101, as viewed in Fig. 6, is secured a lever 124 which cooperates with a member 125 (Figs. 2 and 6) which is also pivotally carried on the studs 49 and 51. The lever 124 is provided at its extremity with an adjusting screw 126 which serves to provide an adjustable relation between lever 124 and member 125. Also pivotally carried on lever 124 substantially intermediate the adjusting screw 126 and the shaft 101 is a feed punch carrier 127 which is provided with a slotted hole 128 which engages the pivot stud 129 carried on the lever 124. The purpose of the slotted hole 128 is to permit the operation of carrier 127 and hence feed punch 132 either with the cradle 48 and associated punches 52 or independently. The carrier 127 is provided at its upper extremity with a shouldered portion which cooperates with a vertical projection 131 integrally formed on the cradle 48. As viewed in Figs. 2 and 6, the carrier 127 is also notched to provide a seat for a feed punch 132. It is clearly apparent from Fig. 2 that the feed punch is operable either independently of or conjointly with the signal-hole punches 52 in the following manner. Upon reciprocation of strut 103 by means of the punch operating lever 99 (the lever 124, at this time, remaining unoperated due to the inaction of cam 112, Fig. 5), the cradle 48 will be oscillated about pivots 49 and 51, thus likewise causing interference members 46 to oscillate about their common pivot 45 to actuate the punches 52 in accordance with the relative positions of the en-

larged ends of the interference members 46. Simultaneously, punch carrier 127 will be carried upwardly by the cooperation of projection 131 and the shoulder on carrier 127 to actuate feed punch 132, the purpose of slotted hole 128 being to permit the actuation of carrier 127 by cradle 48 independently of lever 124 during the normal reception of code signal impulses. Thus, it is seen that the actuation of cradle 48 through the instrumentality of the punch operating member 99 causes the actuation of punches 52 and feed punch 132 conjointly.

Provision is made for the independent operation of the feed hole punch 132 thus, when a rocking motion is imparted to shaft 101 by the cooperation of cam 112 and follower 122, as will presently appear, a corresponding rocking motion or oscillation will be imparted to lever 124 which, since it carries the feed punch carrier 127, will cause a corresponding reciprocal motion of carrier 127 independently of cradle 48, which at this time remains at rest due to a cessation of reception of code signal impulses, and the consequent inaction of cam 82. Member 125, which is interposed between cradle 48 and lever 124, is controlled by either the cradle 48 or the lever 124 to effect the stepping or advancement of the tape. Member 125 is provided with a vertical portion 133 at the upper end of which is pivotally carried a feed pawl 134 which is normally urged into cooperative engagement with the ratchet portion of cylinder 135 by a spring 136 distended between the pawl member 134 and member 125. Portion 133 of member 125 is provided with a projection 137 which is adapted to cooperate with a vertical projection 138 on cradle 48 so that, when cradle 48 is oscillated about its pivots 49 and 51, member 125 will be reciprocated correspondingly through the cooperation of projections 137 and 138 to effect the stepping of the tape 139 through the actuation of cylinder 135 by pawl 134 in a manner well known in the art, the cylinder 135 being provided also with a circumferential series of tape-feed pins 140 (Fig. 8). Also, when cradle 48 remains at rest and lever 124 alone is oscillated, member 125 will respond to the movement of lever 124 through its cooperation with adjusting screw 126 to effect, through pawl 134 and pins 140 of cylinder 135, the stepping of the tape 139.

The oscillation of cradle 48 also effects, during each oscillation thereof, the actuation of locking bail 41 because, as cradle 48 is swung upwardly the member 42 is allowed to rotate about its pivot 43 by the pull of a spring 141. The proper timing of the motion imparted to member 42 is governed by an adjustable member 143 pivotally carried on the side wall of the cradle 48 (Figs. 1 and 2). As shown in Fig. 2, one end of member 143 carries a roller 144 which coacts with the bent portion of a depending arm on member 42. The other end of lever 143 is provided with an enlarged hole through which extends a clamping screw 145 of considerably smaller diameter. In this manner lever 143 can be rotated slightly in either direction about its pivot to determine by proper adjustment the timing of the engagement of bail 41 with levers 38.

Incidentally, the punches 52 and 132, which are spring returned, are operatively carried in a punch block 146, as indicated in Fig. 2, and are adapted to be movable through a guide plate 147 and coact with die plates 148 and 149 to perforate a tape. In the specific embodiment herein shown and described, the feed punch die plate 149 is indicated as lying in a plane elevated above that of die plate 148, the particular advantages of this construction residing in the fact that the tape can thereby engage two or more feed pins 150 in the feed roller or cylinder 135, thus greatly reducing the liability of tearing the tape material between feed holes. As shown in Fig. 1, the cylinder 135 carries on its end a star wheel which cooperates with a spring actuated jockey or detent lever 160, the purpose of which, as is commonly known, is to maintain the cylinder 135 in its successively stepped positions.

The left end of shaft 62 (as viewed in Figs. 5 and 8) is formed with a pinion 151 which meshes with a gear 152 loosely carried on a stud shaft 153 mounted on the frame 13. Integrally formed with the gear 152 is a square-threaded worm or screw 154 which cooperates with a follower or traveling member 155 to effect, upon the cessation of reception of code signals, the stepping out or spacing out of a predetermined length of tape, as will presently appear.

The cam projection 97 (Fig. 7) not only coacts with lever 92, but also cooperates cyclically with a lever arm 156 fixed to a rock shaft 157 (Figs. 5 and 8) suitably carried in brackets 158 and 159 affixed to the frame 13. At the left extremity of the rock shaft 157 (Figs. 5, 8 and 9) there is clamped an adjustably positionable member 161 on which is pivotally carried at 162 the follower lever or traveling arm 155. Having particular reference to Fig. 9, it is seen that the arm 155 is normally urged in a clockwise direction about pivot 162 by a spring 163. The movement of arm 155 is limited by a slot 164 therein and a shoulder screw 165. Upon each cyclic operation of the selecting cam member 61, the lever arm 156 is actuated against the action of its spring 166 (Fig. 7) to rock the shaft 157 slightly, thus raising the arm 155 out of operative engagement with the constantly rotating screw 154. In the event that no signals are received; that is, upon a cessation of reception of code signals, during which period the rotation of selecting cam member 61 is arrested, the arm 155 remains in cooperative engagement with the screw 154, and hence will be caused to travel longitudinally with respect to the axis of the screw until it either reaches the end of the series of screw threads thereon or is raised out of operative engagement with the screw upon the initiation of rotation of the selecting cam member 61 upon resumption of code signal reception; thus, whenever the arm 155 has traveled any distance, however slight, along the screw 154 and is again raised out of operative enagement with the screw, it is actuated in a clockwise direction by its spring 163 to the starting position.

Pivotally articulated to the traveling arm 155 is the extremity of the vertical arm of a bell crank 167 pivotally supported at 168 to a bracket mounted on frame 13. Through this interconnection with traveling arm 155, the bell crank 167 is caused to rotate in a counterclockwise direction whenever the traveling arm is actuated leftwardly along the screw 154. The extremity of the horizontal arm of the bell crank 167 is provided with a longitudinally adjustable member 169 adapted to coact with a member 171 adjustably carried on arm 172 of a release lever 173 mounted on a stud shaft 174 secured to frame 13. Release lever 173 is normally biased in a counterclockwise direction by a spring 175 against an eccentric adjusting screw 176. Member 171 is normally actuated in a clockwise direction by a spring 177 against an eccentric adjusting screw

178 carried on arm 172 of release lever 173. By means of their respective adjustments, the timed engagement or bite between members 169 and 171 can be accurately controlled.

Upon a cessation of code signals, the rock shaft 157 remaining quiescent due to the arrested motion of cam member 61, the follower 155 will thereupon travel along the screw 154 and in so doing, portion 169 of bell crank 167 will, at a predetermined moment, engage member 171 of release lever 173. Upon the continued movement of driving arm 155, bell crank 167 will be actuated counterclockwise, to rotate in turn release lever 173 in a clockwise direction out of engagement with stop disc 114. Release lever 173 will remain out of positive engagement with the stop disc 114 upon the further continuance of the travel of the arm 155 along the screw 154 until the bell crank 167 has been rotated a sufficient amount so that the portion 169 has become disengaged from the portion 171. As has been noted, the period of engagement between portions 169 and 171 has been predetermined by their respective adjustments, so that the stop disc 114, and hence cam 112, have been permitted to rotate a predetermined number of times, the ultimate effect of which is to permit a series of oscillations of lever 123 to rock correspondingly shaft 101 to oscillate lever 124 in turn to actuate the feed punch 132 and to oscillate member 125 to effect the feeding of the tape. In this manner the continued rotation of stop disc 114 and cam 112 for a predetermined length of time will cause the feeding or spacing out of the tape a definite predetermined length or distance.

When the portions 169 and 171 have become disengaged by the continued travel of arm 155 along screw 154, the release lever 173 will respond to the tension of its spring 175 and will be rotated into arresting engagement with stop disc 114, effecting simultaneously the arrest of cam 112 and the discontinuance of the spacing-out operation. The follower arm 155, however, will continue to travel along the screw 154 until it has reached the end of the series of threads where it will remain until code signals are again received, at which time lever 156 will again be actuated to rock the shaft 157 to raise in turn the follower arm 155 out of coaction with the screw 154, whereupon the follower arm 155 will be restored to its right-hand position by its spring 163, and the cycle of operation described will be repeated.

General operation

A further understanding of the structure constituting the present invention can, it is thought, be obtained from the following detailed description of its operation.

It will be assumed that the motor is running and that the various parts of the machine are stopped in their normal positions. In this condition the selector magnet 11 is normally energized due to the fact that the current on the line is of marking nature. Since the start impulse of a code combination of signal impulses is of spacing nature, the reception thereof preceding a signal code causes the deenergization of selector magnet 11, whereupon selector lever 15 is actuated by its spring 18 in a clockwise direction to effect, through plunger 77 and the latch mechanism shown in Fig. 4, the rotation of the selecting cam member 61. The cooperative effect of the member 61 (which is rotated in synchronism with incoming signals) and selector lever 15 (which is actuated in either of two positions by the signal impulses) will be to set the swords 27 by means of levers 55 into either of their two positions according to the nature of the signal impulses received, as previously described. Levers 38 will be set through T-levers 33 to correspond with the setting of swords 27, thereby establishing the positions of the interference members 46 preparatory to perforating the signal code in the tape. After the cam member 61 has rotated a predetermined angular amount, the cam projection 97 (Fig. 7) thereon cooperates with lever 92 to effect the operation of clutch 87 to cause in turn the operation of lever 99 by cam 82, which operation functions through strut 103 and cradle 48 to actuate punches 52 and 132 simultaneously, the latter being effective by reason of the cooperative relation between cradle 48 and punch carrier 127 through projection 131, thereby producing in the tape a series of code signals in one position and a feed punch hole in another position, the feed hole in relation to its associated signal holes being thereby pre-punched. When, during the perforating operation the cradle 48 is oscillated, lock bail 41 is operated in proper timed relation with the perforating operation to maintain levers 38, and hence interference bars 46 in their selected positions. Such is the operation of the perforator during the normal reception of signal code combinations of impulses.

However, in the event that the reception of code signals ceases, the present invention contemplates the provision of mechanism responsive to the cessation of code signals, the purpose of which is not only to space out a sufficient amount of tape to insure the complete transmission of the message recorded therein, but also to perforate such spaced-out tape with only feed holes to produce what is commonly known in the art as blank tape, instead of, as heretofore, to repeat during the spacing-out operation the last signal received and set up. The mechanism shown in Fig. 5 is accordingly provided, which, as previously mentioned, comprises essentially a constantly rotating screw or worm and a follower arm coacting therewith, the coaction of which is controlled through the rock shaft 157 by the lever 156. The lever 156 is actuated once during each cyclic operation of cam member 61 to lift lever 155 out of cooperative engagement with screw 154 to permit its return by spring 163 to the start position. But, when the reception of code signals ceases, the arm 155 remains in cooperative engagement with screw 154 and travels along the threads thereof to effect the rotation of bell crank 167, and through members 169 and 171, a counter-rotation in release arm 173, whereupon the clutches 106 and 113 are rendered effective for rotation for a predetermined length of time, depending upon the adjusted engagement or bite established between members 169 and 171. The ensuing continued rotation of cam 112, which is controlled by clutches 113 and 106, causes, through lever 123, shaft 101 to rock continuously, thus oscillating arm 124 secured to the end thereof to operate through punch carrier 127 the feed punch 132. Attention is directed to the slotted interconnection between carrier 127 and lever 124, by means of which the punch carrier 127 and hence the feed punch 132 may be operated either independently of or conjointly with the signal punches 52. The conjoint operation of punches 52 and 132, as already set forth, is accomplished through the instrumentality of the slotted hole 128, which permits the actuation of carrier 127 by cradle 48 independently of lever 124 during the normal re-

ception of code signal impulses, at which time the lever 124 remains at rest due to the inaction of cam 112. Now, when the cam 112 is caused to operate continuously for a predetermined period upon the cessation of reception of code signal impulses, the lever 124 is correspondingly operated to actuate in turn carrier 127, the cradle 48 at this time remaining unoperated due to the inaction of cam 82 which, as previously mentioned, is operated only during the normal reception of code signal impulses.

The oscillation of arm 124 also effects, through member 125 and pawl 134, the stepping of the tape. The amount of tape to be stepped or spaced out is determined by the distance between the pin block or sensing apparatus of the transmitter and the punch block of the perforator, and the amount of tape actually spaced out is accordingly obtained by the adjustment established between members 169 and 171. As previously described, the lever 155 continues to travel along the screw 154 even after the member 169 has become disengaged from member 171, until lever 155 has reached the end of the screw, to insure the positive operation of the spacing-out mechanism. The mechanism remains in this condition; that is, with the follower 155 at the left end of the screw 154, as viewed in Fig. 9, until the resumption of reception of code signals, whereupon lever 156 will again be actuated by cam projection 97 to raise or lift, through shaft 157, arm 155 out of engagement with screw 154, whereupon arm 155 will be returned to its rightward position by its spring 163.

Although the present invention has been disclosed and described with reference to tape perforators, it is, of course, understood that the invention is capable of embodiment in many and varied forms other than that specifically disclosed, without departing from the spirit and scope of the present invention.

What is claimed is:

1. In a tape perforator, a perforating mechanism including a plurality of punches, a selecting device responsive to code signals for controlling the operation of said mechanism comprising selectable elements having no normal position, means for advancing a tape for each operation of said mechanism, and means effective independently of said selecting device and without altering the setting of the selectable elements for perforating single perforations and causing the advancement of the tape upon a cessation of code signals.

2. Tape perforating apparatus comprising a feed member for advancing a tape, feed-forming means for said tape, tape-marking means comprising selector means therefor having no normal non-selecting condition, and means to render said feed-forming means operable either conjointly with or independently of said tape-marking means.

3. In a tape perforator, signal-hole perforating means comprising selector means therefor having no normal non-selecting condition, feed-hole perforating means, mechanism normally operative upon the reception of code combinations of signal impulses for operating simultaneously both said means, and mechanism operative solely upon the cessation of code signal reception to operate, irrespective of the condition of said first recited means, said second recited means independently for a predetermined length of time.

4. In an apparatus for preparing a perforated record, permutation selector mechanism arranged to remain in its selected position, perforating mechanism, means controlled by said selector mechanism to operate the perforating mechanism in accordance with the selective conditioning of the selector mechanism, and means effective upon a cessation of the operation of the selector mechanism and without altering its selected position for operating said perforating mechanism differently.

5. In a signal-controlled apparatus, the combination of punches for perforating signals in a tape, a punch for perforating feed holes in said tape, means operated by received signals for actuating said punches, and means constantly tending to function effective only upon a cessation of code signals reception for controlling the perforation of a predetermined length of blank tape by the feed-hole punch without affecting said first mentioned means.

6. In a signal-controlled tape perforator, a perforating device comprising a plurality of signal punches, and a feed punch adapted to be operated either conjointly with or independently of said signal punches, means constantly tending to function to operate said feed punch solely, and means effective during signal reception to disaffect said means whereby said first recited means is adapted upon a cessation of code signal reception to operate said feed-hole punch a predetermined number of times.

7. In combination in a signal-controlled apparatus, a selector mechanism, signal controlling means including a first component and a second component, auxiliary means, means controlled by said selector mechanism for rendering said components effective conjointly, and means effective upon the inactivity of said selector mechanism to render said auxiliary means effective to operate said second component solely.

8. In a tape perforator, signal-hole perforating means, means having no normal non-selecting condition for selectively controlling said means, feed-hole-perforating means, means to render said feed-hole-perforating means operable without altering the selective condition of said second recited means either conjointly with or independently of said signal-hole perforating means, and tape-advancing means operable with either of said perforating means.

9. In combination in a signal-controlled apparatus, a selector mechanism having no normal non-selecting condition, signal controlling means including a first component and a second component, auxiliary means, means controlled by said selector mechanism for rendering said components effective conjointly, means effective upon the inactivity of said selector mechanism to render said auxiliary means effective to operate said second component solely without altering the condition of said selector mechanism, and spacing mechanism operated by either of said components.

10. In a tape perforator, signal-hole perforating means, feed-hole-perforating means, mechanism normally operative upon the reception of code combinations of signal impulses for operating both of said means simultaneously, and means comprising a first element and a second element adapted to be adjustably cooperative with each other operative solely upon the cessation of code signal reception to operate said feed-hole-perforating means independently for a predetermined length of time.

11. In a tape perforator, permutation selector mechanism having no normal non-selecting con-

dition, perforating mechanism, means controlled by said selector mechanism to operate the perforating mechanism in accordance with the selective conditioning of the selector mechanism, and means effective upon a cessation of the operation of the selector mechanism and without altering the selective condition thereof for operating said perforating mechanism differently.

12. In a signal-controlled apparatus, a selector mechanism having no normal non-selecting condition, signal controlling means including a first component and a second component, auxiliary means, means controlled by said selector mechanism for rendering said components effective conjointly, and means effective upon the inactivity of said selector mechanism and without altering the selective condition thereof to render said auxiliary means effective to operate said second component solely.

13. In a tape perforator, means having no normal non-selecting condition for perforating code signal holes, means for perforating feed holes, means to render said feed-hole-perforating means operable without altering the condition of said first recited means either conjointly with or independently of said signal-hole perforating means.

14. In a signal-controlled apparatus, a selector mechanism, signal controlling means including a first component and a second component, auxiliary means, means controlled by said selector mechanism for rendering said components effective conjointly, means effective upon the inactivity of said selector mechanism to render said auxiliary means effective without altering the selective condition of said signal controlling means to operate said second component solely, and spacing mechanism operated by either of said components.

15. In a signal-controlled apparatus, a selector mechanism, a signal controlling means including a first member and a second member, auxiliary means, means controlled by said selector mechanism for rendering said members effective conjointly, and means comprising a first element and a second element adapted to be adjustably cooperative with each other operative solely upon a cessation of code signal reception to operate said second member independently for a predetermined period.

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