Sept. 26, 1961 R. C. SIMMERMAN ET AL 3,001,694

PUNCHING APPARATUS

Filed June 15, 1959 3 Sheets-Sheet 1

FIG. 11

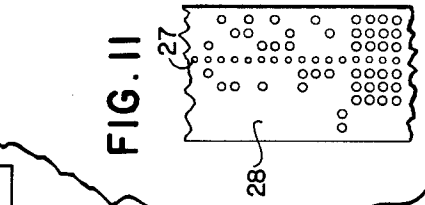


FIG. 1

FIG. 9

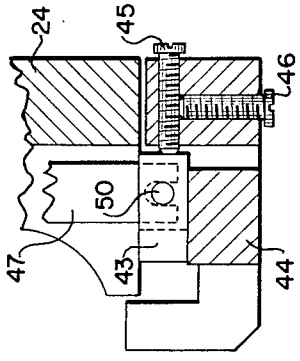
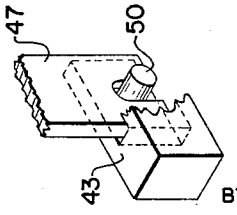


FIG. 10



INVENTORS
RICHARD C. SIMMERMAN
MELVIN T. ROUDEBUSH &
WILMER L. MOYER

BY

Louis A Kline

THEIR ATTORNEY

Sept. 26, 1961 R. C. SIMMERMAN ET AL 3,001,694

PUNCHING APPARATUS

Filed June 15, 1959 3 Sheets-Sheet 2

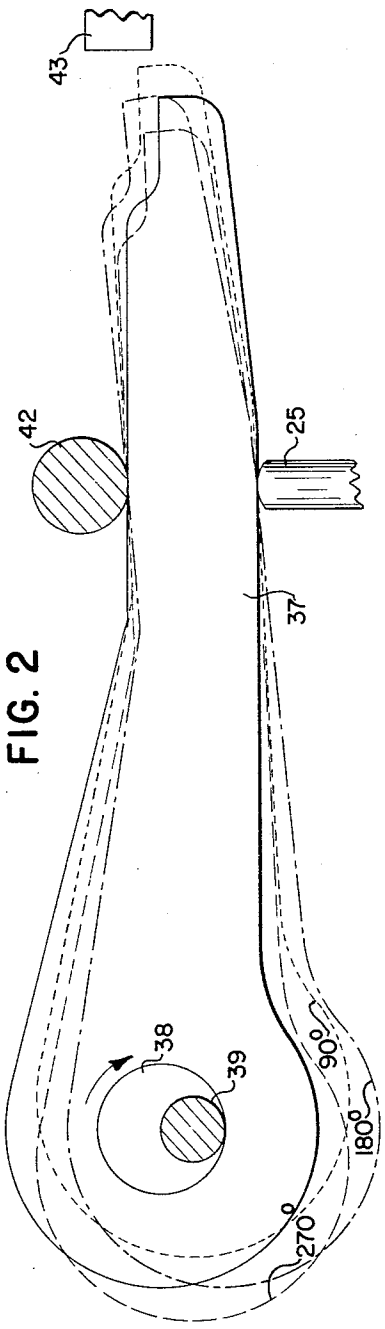


FIG. 2

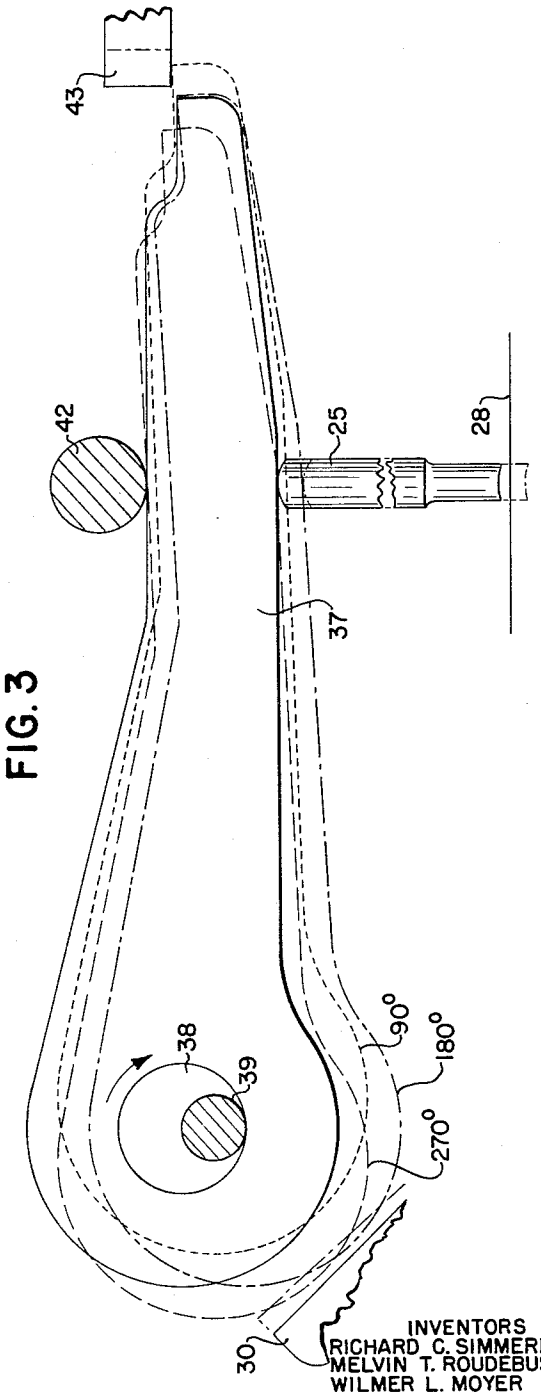


FIG. 3

INVENTORS
RICHARD C. SIMMERMAN
MELVIN T. ROUDEBUSH &
WILMER L. MOYER

BY Louis A Kline
THEIR ATTORNEY

Sept. 26, 1961 R. C. SIMMERMAN ET AL 3,001,694

PUNCHING APPARATUS

Filed June 15, 1959 3 Sheets-Sheet 3

FIG. 4

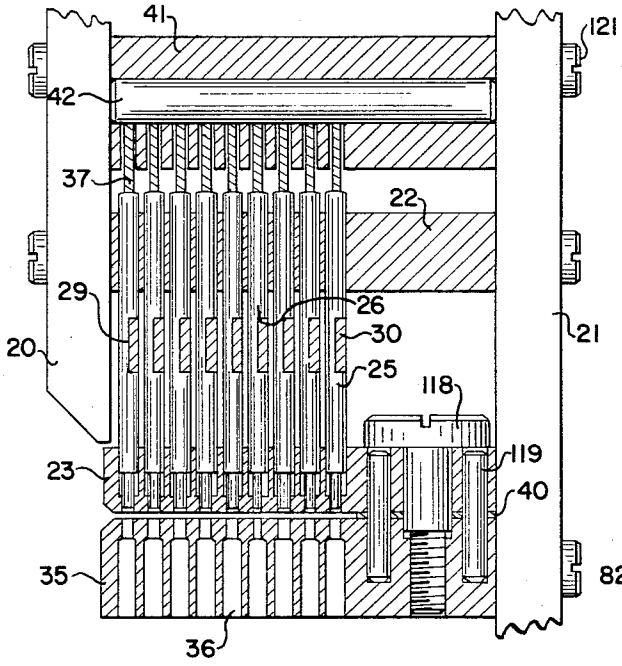


FIG. 5

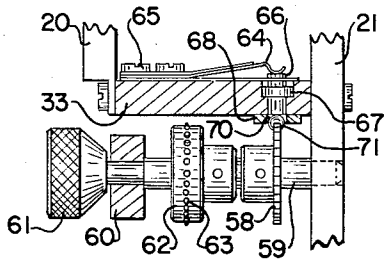


FIG. 6

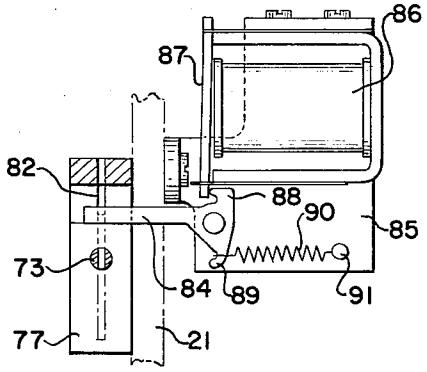


FIG. 8

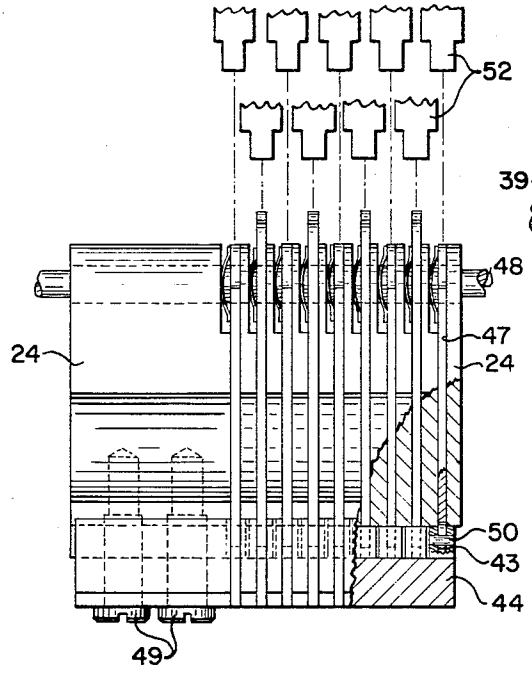
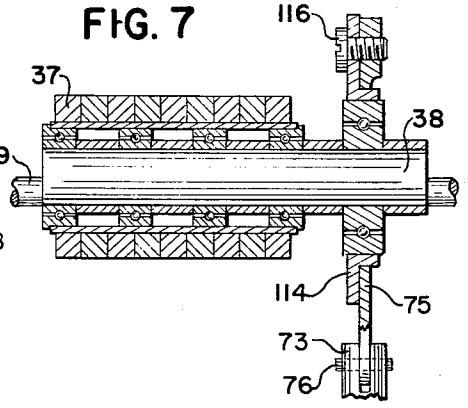


FIG. 7



INVENTORS
RICHARD C. SIMMERMAN
MELVIN T. ROUDEBUSH &
WILMER L. MOYER

BY

Louis A Kline

THEIR ATTORNEY

United States Patent Office 3,001,694 Patented Sept. 26, 1961

3,001,694

PUNCHING APPARATUS

Richard C. Simmerman, Melvin T. Roudebush, and Wilmer L. Moyer, Dayton, Ohio, assignors to The National Cash Register Company, Dayton, Ohio, a corporation of Maryland

Filed June 15, 1959, Ser. No. 820,539
9 Claims. (Cl. 234—110)

This invention relates to perforating means and more particularly to apparatus for perforating paper tape at a high rate of speed.

An object of this invention is to provide an improved perforating apparatus whereby the punching elements associated with the perforating apparatus are capable of being selectively activated for a continuous punching operation at extremely high speeds.

In its illustrated embodiment, the perforating apparatus comprises a plurality of punch elements and punch levers, each punch lever being pivotally supported by a punch element. Associated with the punch levers are a plurality of interposers, each capable of being selectively moved to a position to intercept and engage one end of a punch lever. A continuously-operable eccentric means is rotatably supported at the other end of each of said punch levers to oscillate the punch levers in an elliptical movement normally about the punch elements. Upon engagement with an activated interposer, the punch lever will pivot about the latched interposer to operate the punch element. Means are associated with the punch lever and the punch elements for positively restoring the punch elements to their normal position following a punching operation. In addition, continuously-operating cam means are provided to positively restore the interposers to their normal position, outside the path of the oscillating punch levers. Therefore, it is another object of the present invention to provide a plurality of punch elements each pivotally supporting an oscillating punch lever, which punch elements are operated whenever the associated punch lever is pivotally engaged with a related latching means.

A further object of the present invention is to provide means for positively resetting the punch elements to their original position after a punching operation has occurred.

Still another object of the invention is to provide continuously-operating means for positively restoring the interposers to their normal position after a punching operation.

With these and incidental objects in view, the invention includes certain novel features of construction and combinations of parts, a preferred form or embodiment of which will hereinafter be described with reference to the drawings which accompany and form a part of this specification.

In the drawings:

FIG. 1 is a side elevation of the novel perforating apparatus.

FIG. 2 is a diagrammatic showing of the oscillating movement of the punch lever in a normal position.

FIG. 3 is a diagrammatic showing of the oscillating movement of the punch lever during a punching operation.

FIG. 4 is a sectional view taken along the lines 4—4 of FIG. 1, showing the punching elements.

FIG. 5 is a sectional view taken along the lines 5—5 of FIG. 1, showing the tape-feeding means.

FIG. 6 is a top detail view of the interposer associated with the tape-feeding means.

FIG. 7 is a sectional view taken along the lines 7—7 of FIG. 1, showing the eccentric drive for the punch lever and the tape-feeding means.

FIG. 8 is a front view of the interposer and the interposer arms with the associated armatures.

FIG. 9 is an enlarged side view of the interposer and its adjusting means.

FIG. 10 is a cut-away view showing the connection between the interposer and its interposer arm.

FIG. 11 shows an example of the paper tape used with the perforating apparatus.

Referring now to FIGS. 1, 2, 3, 4, and 8, two side frames 20 and 21 (FIG. 4) form the main supporting means for the novel punching mechanism of the instant invention. The frames 20 and 21 are held in a fixed spaced-apart relationship by a number of cross members, including a punch guide block 22 (FIG. 1), a punch lever comb 41, and a punch interposer guide block 24.

Slidably mounted for vertical reciprocating movement in a punch support block 23 and the punch guide block 22 (FIG. 1) are a plurality of punches 25. In the illustrated embodiment, nine punches 25 (FIG. 4) are shown, with punch 26 being utilized for punching sprocket holes 27 in a recording tape 28 (FIG. 11), while the remaining eight punches are used to perforate the recording tape in the code associated with the perforating apparatus. It will, however, be obvious that any desired number of punches could be provided, according to the code and the width of the tape employed.

As may be seen from FIG. 4, each punch 25 has a recess portion 29, located midway its length, into which is placed one end of a punch-restoring lever 30 (FIG. 1). Each lever 30 is rotatably supported on a shaft 31, suitably secured by the side frames 20 and 21. A spring 117 engages the other end of each of the levers 30 for normally urging the levers counter-clockwise about the shaft 31, as viewed in FIG. 1, which, in turn, urge the punches 25 upwardly. Each spring 117 is secured to a bracket 32, which is attached to a support 33 by studs 34. As shown in FIG. 1, every other spring is located in a staggered position, thereby providing enough room to accommodate the number of springs required. Located below the punch support block 23 is a die block 35 (FIGS. 1 and 4), having a series of bores 36 therethrough. Each of the bores 36 is in line with one of the punches 25. A spacer 40 (FIG. 4) is inserted between the two blocks 23 and 35 to provide a clearance for the passage of the tape 28. Both of the blocks are joined by a stud 118. Aligning pins 119 are used to provide the proper alignment between the punches 25 and the bores 36. The chaff resulting from the perforation of the tape will pass through the bores 36 to a suitable receptacle (not shown).

Pivotally supported by each of the punches 25, as shown in FIG. 1, is one of a series of punch levers 37, each lever having one end containing a journaled eccentric 38 (FIG. 7) formed on a shaft 39. The shaft 39 is suitably journaled in the side frames 20 and 21. The punch lever comb 41, secured to the side frame 21 by screws 121 (FIGS. 1 and 4), is located midway the length of the punch levers 37 and houses a shaft 42, which constitutes a stop for each of the punch levers, as shown in FIG. 4. The punch levers 37 are normally urged against the shaft 42 by the upward movement of the punches 25, as described previously. Power means (not shown), connected to the shaft 39, drives the eccentric 38 continuously in a clockwise direction. As shown in FIG. 2, this clockwise rotation of the eccentric rotates the free end of the punch lever in an elliptical oscillating movement.

Referring now to FIG. 1, there is shown, located adjacent the free end of the punch lever 37, a series of interposers 43, one for each punch lever, slidably supported in a guide comb block 44. The rear portion of the comb block contains adjusting screws 45, 46 for each interposer to vary the extent of travel of the interposer

from its non-operating position (FIG. 2) to its operating position (FIG. 3). Each interposer **43** has an associated interposer arm **47**, one end of which is rotatably supported on a shaft **48** (FIGS. 1 and 8), contained within a slotted guide block **24**. The guide block is supported by the side frames **20**, **21** and acts as a support for the comb block **44**, which is attached to the guide block by means of studs **49** (FIG. 8).

Each interposer arm **47** has a forked end, which is inserted over a stud **50**, located within a slot in the interposer **43** (FIG. 10). The other end of the arm has an ear **51**, which is engaged by the armature **52** of a solenoid **53**. As seen in FIG. 1, every other interposer arm has its ear **51** in a horizontal plane, so as engage the armature **52** of those solenoids located in front of the arms. The arrangement of the armatures **52** of the solenoids **53** may be best seen in FIG. 8. The solenoids are supported on brackets **54**, attached to the side frames **20**, **21**.

During a punching operation, th solenoids **53** are selectively energized to rotate their armatures **52** counter-clockwise, as viewed in FIG. 1. The solenoid **53** which controls the sprocket-hole-punching means is so connected in circuit with the other solenoids **53**, which control data punching in the tape, that it will also be energized when any of the data punch solenoids are energized, thereby to insure that a sprocket hole will be punched in each punching operation. The movement of the armatures rotates the related interposer arms **47** clockwise to move their respective interposers **43** to a position which will engage the free end of the oscillating punch levers **37**, as shown in FIG. 3. This engagement takes place at **45** degrees of revolution of the eccentric. Upon engagement with the interposer **43**, the punch levers will pivot about the interposer instead of the punches **25**, thereby moving the punches **25** downwardly to perforate the tape **28**. At approximately 135 degrees of revolution of the eccentric, the free end of the punch lever is disengaged from the interposer, allowing the punches to return to their normal position under the urging of the springs **117**, acting through the levers **30**. To insure that the punches are resteored, one end of the punch-restoring lever **30** is engaged by the punch lever **37**, as shown in FIG. 3, and is thereby urged counter-clockwise to positively restore the punches **25** to their normal position. This restoring action occurs at approximately 180 degrees of revolution of the eccentric, and the punches are fully restored by 225 degrees of revolution of the eccentric.

Switching means (not shown) associated with the eccentric drive shaft **39** times the energization of the solenoids to allow the solenoids to energize and position the interposers in the path of the free end of the punch levers **37** before the eccentric has reached its 45-degree position, as viewed in FIG. 3. At 135 degrees of revolution of the eccentric, the lever **37** has moved to the left far enough to be disengaged from the interposer, thus terminating the downward movement of the punch **25**.

Located adjacent to and in front of the interposer arms **47** is an interposer-restoring cam **55**, which rotates continuously in a clockwise direction, as viewed in FIG. 1. The cam **55** and the eccentric **38** are rotated on a a one-to-one ratio. The cam is so positioned relatively to the eccentric that the cam surface **56** engages, at 135 degrees of revolution of the eccentric, those interposer arms which have been rotated by their solenoids to a forward position to set the interposers in effective position, and restores each arm and its related armature and interposer to normal position. The restoration of these parts is completed by 225 degrees of revolution of the eccentric. Located adjacent to and in the rear of the guide comb block **44** is a magnet **57**, which, upon the restoration of the interposers to their normal position by the cam **55**, will hold each interposer and its related arm in ineffective position. The attraction between the magnet **57** and the interposer arms **47** is not sufficient to interfere with the shifting of the interposer arms by the armatures **52**

of the solenoids **53**. It may thus be seen that the punches and the interposer arms have completed their operating functions and have been restored to their initial position by 225 degrees of revolution of the eccentric. This allows sufficient time for the solenoids to be selectively energized and their associated interposers to be positioned for the next punching operation.

Means for advancing the taper tape **28** are provided, which means are operated from 258 degrees to 360 degrees of revolution of the eccentric. The paper tape **28** is intermittently fed from a suitable supply roll (not shown) to the punching station by means of a ratchet wheel **58** (FIGS. 1 and 5), pinned to a feed line **59**. As seen in FIG. 5, the feed line **59** is rotatably supported by the side frame **21** and a support frame **60**, which is attached to a bracket (not shown) supported by the side frame **21**. A knob **61** is attached to one end of the feed line to provide manual control of the feed line. Located intermediate the ends of the feed line is a sprocket wheel **62**, having a series of sprocket teeth **63** for engaging corresponding holes in the paper tape punched by the punch pin **25**, as previously explained.

The mechanism for advancing the ratchet wheel to provide a paper-feeding operation includes a pawl **72**, pivotally supported within a slot in a shaft **73** on a stud **74** (FIG. 1). The shaft **73** is itself pivotally supported at one end of a paper feed arm **75** (FIGS. 1 and 7) by the stud **76**. Referring to FIG. 7, the arm **75** is shown rotatably supported on the flange of an arm **114**, within which is journaled the eccentric **38**. The arm **114** has a slot **115**, within which is slidably located a screw **116**, secured to the arm **75**, for clamping both of the arms **75**, **114** together. Rotation of the eccentric will oscillate the arms about the shaft **39** in an elliptical movement.

As may be seen from FIG. 1, the shaft **73** is positioned for slidable movement within the support **33** and a guide **77**, located at the lower end of the shaft. An elliptical movement of the paper feed arm **75** will oscillate the shaft **73** in a vertical direction. This vertical oscillation of the shaft **73** will also oscillate the pawl **72** in a similar manner.

The pawl **72** has a finger **78**, which is engaged by a spring **79**, attached to a stud **80** in the side frame **21**. Another finger **81** of the pawl rides in a vertical slot **82** (FIG. 6), located within the guide **77** (FIGS 1 and 6). The guide **77** also contains a horizontal slot **83** (FIG. 1), within which is slidably located an interposer **84** (FIGS. 1 and 6). As may be seen from FIG. 6, the interposer **84** is pivotally supported on a support **85**. Also located on the support **85** is a solenoid **86**, having an armature **87**, one end of which engages a finger **88** of the interposer **84**. Another finger **89** of the interposer is engaged by a spring **90**, having its other end secured to a stud **91** on the support **85**. Energization of the solenoid **86** during a punching operation will cause the armature to rotate the interposer **84** clockwise, as viewed in FIG. 6, thereby positioning the end of the interposer out of the path of the finger **81** of the pawl **72** (FIG. 1) for reasons that are explained later.

The pawl **72** has an extension **92**, one side of which has a tooth portion which coacts with the ratchet wheel **58**. The other side of the extension has a cam surface, which engages a cam **93** as the pawl moves toward its upper position, shown in FIG. 1. The cam **93** is rotatably supported between the side frame **21** and the frame support **60** and is manually adjusted so that its highest cam surface will engage the pawl extension **92** and wedge said extension toward the ratchet wheel, thus providing a positive engagement between the pawl **72** and the ratchet wheel **58**, as shown in FIG. 1.

During a punching operation, the solenoid **86** will be energized to rotate the interposer **84** out of the path of the feed pawl **72** (FIG. 1). Upon rotation of the eccentric **38** from 0 degree to 180 degrees of revolution, the shaft **73** will move downwardly, thereby withdraw-

ing the tooth portion of the pawl from the ratchet wheel. As the pawl continues its downward movement, the spring **79**, attached to the finger **78**, will pivot the pawl counter-clockwise, as viewed in FIG. 1. This pivotal movement will position the tooth portion of the pawl beneath the next lower ratchet tooth. On the upstroke of the shaft **73**, which occurs from 180 degrees to 360 degrees of revolution of the eccentric **38**, the ratchet wheel will be rotated, due to the engagement of the tooth portion of the pawl **72** with the next lower ratchet tooth, and the paper tape will be advanced. The actual advancing of the paper tape occurs from 257 degrees to 360 degrees of revolution of the eccentric. As described previously, the pawl is wedged into engagement with the ratchet feed by the cam **93**, thus assuring a proper feeding operation.

In the event that there is no punching operation, the solenoid **86** will not be energized, and the interposer **84** will remain in the path of the pawl, due to the urging of the spring **90**, as shown in FIG. 6. On the downstroke of the shaft **73**, the finger **81** of the pawl **72** will engage the interposer **84** and pivot the pawl clockwise about the stud **74**. This pivotal movement rotates the pawl out of engagement with the ratchet wheel. On the return stroke of the shaft **73**, the pawl will be pivoted back to its original engagement with the ratchet wheel, thus preventing the advancement of the paper tape. To vary the feeding stroke of the pawl **72**, the position of the arms **75**, **114** (FIG. 1) of the eccentric may be adjusted with respect to each other by locating the screw **116** within the slot **115** to the desired position. By this means, the uppermost position reached by the pawl **72** in its paper feed stroke may be varied.

Means are provided for engaging and positioning the ratchet wheel **58** so as to prevent any movement during a punching operation. Included in this means is a spring arm **64** (FIG. 5), one end of which is attached to the support **33** by a pair of studs **65**. The free end of the spring arm **64** bears against the top of a detent damper **66**, positioned within a counterbore **67** in the support **33**. An adjusting bracket **68**, attached to the support **33** by a stud **69** (FIG. 1), contains a bore **70**, which is aligned with the counterbore **67** of the support **33**. Contained within the bore **70** is a ball **71**, freely rotatable and, as can be seen in FIG. 5, riding between the ratchet wheel **58** and the bottom of the damper **66**. Counter-clockwise rotation of the ratchet wheel **58**, as viewed in FIG. 1, will force the ball against the damper, which is restrained by the spring arm **64**, thus preventing the ratchet wheel from moving except during a paper-feeding operation, where the rotation of the ratchet wheel is sufficient to overcome the force of the spring arm **64**.

To advance the paper tape by manual means, the cam **93** is manually adjusted, so that the lowest surface is adjacent the pawl. This provides sufficient clearance for the pawl **72** to slip over the ratchet teeth as the ratchet wheel is rotated by the knob **61** (FIG. 5) to advance the paper tape any desired length.

Referring to FIG. 1, there is shown, located adjacent the punching station, a paper tape guide **94**, secured to the side frame **21**. The guide **94** has a flange **95**, extending the width of the paper tape, with a slot **96** intermediate its ends, into which there is normally positioned one end **97** of an arm **98**, which is rotatably supported on a stud **99** in the side frame **21**. The end **97** of the arm **98** comprises an overhang **100**, which, when the arm **98** is in the position shown in FIG. 1, is supported by the paper tape **28**. In loading the paper tape in the punching mechanism, the tape is inserted under the overhang **100** and then over the sprocket wheel **62** (FIG. 5) and the rollers **101** and **102** to a take-up spool (not shown). The rollers **101** and **102** are rotatably supported on shafts **103** and **104**, respectively, which shafts are secured to the side frame **21**.

Associated with the sprocket wheel **62** is a pressure pad **105** (FIG. 1), secured to an arm **106**, rotatably supported on the shaft **104**. A link **107** has one end pivotally secured to the arm **106**, while the other end is attached to one end of a lever **108**, secured to the side frame **21**. The other end of the lever **108** comprises a cam surface, to which is attached a spring **109**, normally urging said lever counter-clockwise, as viewed in FIG. 1. It will be seen that the counter-clockwise movement of the lever **108** will rotate the pressure pad **105** into engagement with the tape to hold the tape against the sprocket wheel **62**. A handle **110**, located on the pressure pad, facilitates the manual rotation of the pressure pad to the withdrawn position, shown in FIG. 1, so that the paper tape **28** may be loaded into the punching mechanism. It will be seen that the rotation of the pressure pad to its withdrawn position will rock the lever **108** clockwise, whereby the cam surface of the lever will rotate the arm **98** counter-clockwise, positioning the overhang **100** for the loading operation.

In the event the paper tape breaks during a punching operation, a micro-switch **120** (FIG. 1) is opened, interrupting an energizing circuit to the eccentric drive motor (not shown). The switch **120** has a spring arm **111**, having a roller **112** rotatably supported at one end. The roller engages one end of the arm **98**, as shown in FIG. 1. When the paper tape **28** breaks, the arm **98** is rotated clockwise by a spring **113**, allowing the spring arm **111** to move away from the micro-switch **120**, thereby opening the micro-switch. Moving the arm to the position shown in FIG. 1 closes the switch to allow for further punching operations.

While the form of mechanism shown and described herein is admirably adapted to fulfill the objects primarily stated, it is to be understood that it is not intended to confine the invention to the one form or embodiment disclosed herein, for it is susceptible of embodiment in various other forms.

What is claimed is:

1. Perforating apparatus comprising a plurality of punch elements; a plurality of punch levers, one for each punch element, each punch lever being pivotally supported intermediate its ends by its associated punch element; a stop engaging each of said punch levers opposite the punch elements; a continuously-operating actuating means located at one end of each said punch levers and operable to oscillate said punch levers normally about the punch elements and the stop in a first and second non-linear movement; a plurality of pivoted interposer arms, one for each punch lever, each arm having an associated interposer normally positioned in close proximity to, but out of the path of, the free end of a punch lever; means selectively operable for rotating said interposer arms to move their associated interposers to a position engageable by the free end of the oscillating punch levers during their first non-linear movement, thereby pivoting said punch levers about the interposer to operate the punch elements; continuously-operable cam means disposed adjacent the interposer arms and engaging those interposer arms activated for a punching operation to restore said arms to their normal position; and means pivotally connected to each of the punch elements for normally urging the punch elements towards the punch levers and engageable by the punch levers during the second part of their non-linear oscillating movement for restoring the actuated punch elements to their original position.

2. Perforating apparatus comprising a plurality of punch elements; a plurality of punch levers, one for each punch element; each punch lever being pivotally supported intermediate its ends by its associated punch element; a stop engaging each of said punch levers opposite the punch elements; a rotatable eccentric disposed within one end of each of said punch levers for actuating the punch levers through a non-linear oscillating movement; a plurality of movable interposers, one for each punch lever,

each interposer normally positioned in close proximity to, but out of the path of, the free end of its related punch lever; means selectively operable to position any of said interposers for engagement with the free end of its associated punch lever, thereby pivoting the punch lever about the interposer to operate the related punch element; and means pivotally connected to each of said punch elements and engaging the punch lever during a portion of its oscillating movement for restoring the actuated punch elements to their normal position.

3. Perforating apparatus comprising a punch; a lever pivotally supported intermediate its ends by said punch and having means located at one end for oscillating said lever about the punch to move the free end through an elliptical path; engaging means located adjacent the free end of said oscillating lever; means for moving said engaging means to a position engageable by the free end of said lever such that further elliptical movement of the free end of said lever will be prevented and the lever will pivot about said engaging means, thereby operating the punch; and means pivotally connected to said punch for normally urging said punch towards said lever and engageable with the lever for restoring the punch to its original position.

4. In combination, in a perforating machine, a plurality of punch elements; a plurality of punch levers, one for each punch element; each punch lever being pivotally supported intermediate its ends by its associated punch element; a stop engaging each of said punch levers opposite the punch elements; a continuously-operating eccentric means located at one end of said punch levers and operable to oscillate said punch levers normally about the punch elements in a first and a second non-linear oscillating movement; a plurality of pivoted interposer arms, one for each punch lever, each arm having an attached interposer normally positioned in close proximity to, but out of the path of, the free end of its related punch lever; means associated with said interposer arm to position the interposers for engagement with the free end of the punch levers during their first non-linear oscillating movement, thereby pivoting said punch levers about the interposers to operate the punch elements; continuously-operating cam means associated with said interposer arms for restoring each engaged interposer to its original position during the punch lever's second non-linear oscillating movement; and other means engaged by the punch lever during its second non-linear movement for restoring all actuated punch elements to their normal position.

5. Perforating apparatus comprising a plurality of punch elements supported for individual movement to an operating position; a plurality of levers, one for each punch element, each lever being supported intermediate its ends by its associated punch element; stop means engaging each of said levers in its normal position opposite the punch elements; eccentric operating means acting on one end of each of said punch levers to normally oscillate said levers in a non-linear movement about their pivoted engagement with the punch elements and the stop; individual engaging members for said levers, each engaging member being normally disengaged therefrom but capable of being moved to a position engaging the free end of the oscillating punch lever during the first half of its non-linear movement and being disengaged during the second half of said movement; means for selectively moving said engaging members to an operating position with the free end of the punch levers to pivot the levers about the engaging members, thereby moving the punch elements to an operating position; and means engaging the punch levers and the punch elements for restoring all of the operated punch elements to their non-operating position.

6. In combination in a perforating machine, a punch supported for movement to an operating position; a lever pivotally supported intermediate its ends by said punch and having eccentric means located at one end for continuously oscillating said lever about the punch in a first and second non-linear movement; a stop engaging said lever opposite the punch; engaging means located adjacent the free end of said lever and capable of being moved to a position to intercept the free end of said lever during its first non-linear movement; means for moving said engaging means to an engageable position with said lever such that further movement of the lever will pivot said lever about the engaging means to operate the punch; continuously-operating cam means associated with said engaging means for restoring the engaging means to its original position during the second non-linear movement of said lever; and other means connected to said punch for normally urging said punch towards said stop and engageable with the lever during its second non-linear movement for restoring the punch to its original position.

7. Perforating apparatus comprising a plurality of punch elements; a plurality of punch levers, one for each punch element, each punch lever being pivotally supported intermediate its ends by its associated punch element; a stationary stop engaging each of said punch levers opposite the punch elements; a continuously-operating eccentric located at one end of each of said punch levers and operable to oscillate said punch levers normally about the punch elements and the stop in a first and a second non-linear movement; a plurality of pivoted interposer arms, one for each punch lever, each arm having an interposer pivotally attached to one of its ends and normally positioned in close proximity to, but out of the path of, the free end of an oscillating punch lever; means selectively operable for rotating said interposer arms to move their associated interposers to a position engageable by the free end of the oscillating punch levers during their first non-linear movement, thereby pivoting said punch levers about the interposers to move the punch elements to an operative position; continuously-operable cam means associated with the interposer arms for restoring all activated interposer arms to their normal position during the second non-linear movement of the punch levers; and a plurality of levers, each having one of its ends pivotally connected to a punch element, the other end of which lever is spring urged to normally move said punch element towards its associated punch lever and which is engaged by the punch lever during the second part of the punch lever's non-linear movement for restoring all operated punch elements to their original position.

8. Perforating apparatus comprising a plurality of punch elements supported for individual movement to an operating position; a plurality of levers, one for each punch element, each lever being supported intermediate its ends by its associated punch element; stop means engaging each of said levers in its normal position opposite the punch element; eccentric operating means acting on one end of each of said punch levers to normally oscillate the free end of said levers in a movement having horizontal and vertical components; individual interposer members for said levers, each interposer member normally positioned out of the path of movement of the free end of the levers but movable to an effective position where the horizontal component of the movement of the free end of said levers will move the free end into and out of engaging relation with its related interposer and where the vertical component of said movement will be effective when the free end of the levers is engaged with said interposer to cause the punch lever to pivot about the interposer to operate the punch element; and means simultaneously engaging the punch levers and the punch elements for restoring all of the operated punch elements to their non-operating position.

9. Perforating apparatus comprising a plurality of punch elements supported for individual movement to an operating position; a plurality of levers, one for each punch element, each lever being supported intermediate

its ends by its associated punch element; stop means engaging each of said levers in its normal position opposite the punch element; eccentric operating means acting on one end of each of said punch levers to normally oscillate the free end of said levers in a movement having horizontal and vertical components; and individual interposer members for said levers, each interposer member normally positioned out of the path of movement of the free end of the levers but movable to an effective position where the horizontal component of the movement of the free end of said levers will move the free end into

and out of engaging relation with its related interposer and where the vertical component of said movement will be effective when the free end of the levers is engaged with said interposer to cause the punch lever to pivot about the interposer to operate the punch element.

References Cited in the file of this patent

UNITED STATES PATENTS

2,346,267	Mills et al.	Apr. 11, 1944
2,398,014	Lake	Apr. 9, 1946
2,436,126	Tholstrup	Feb. 17, 1948