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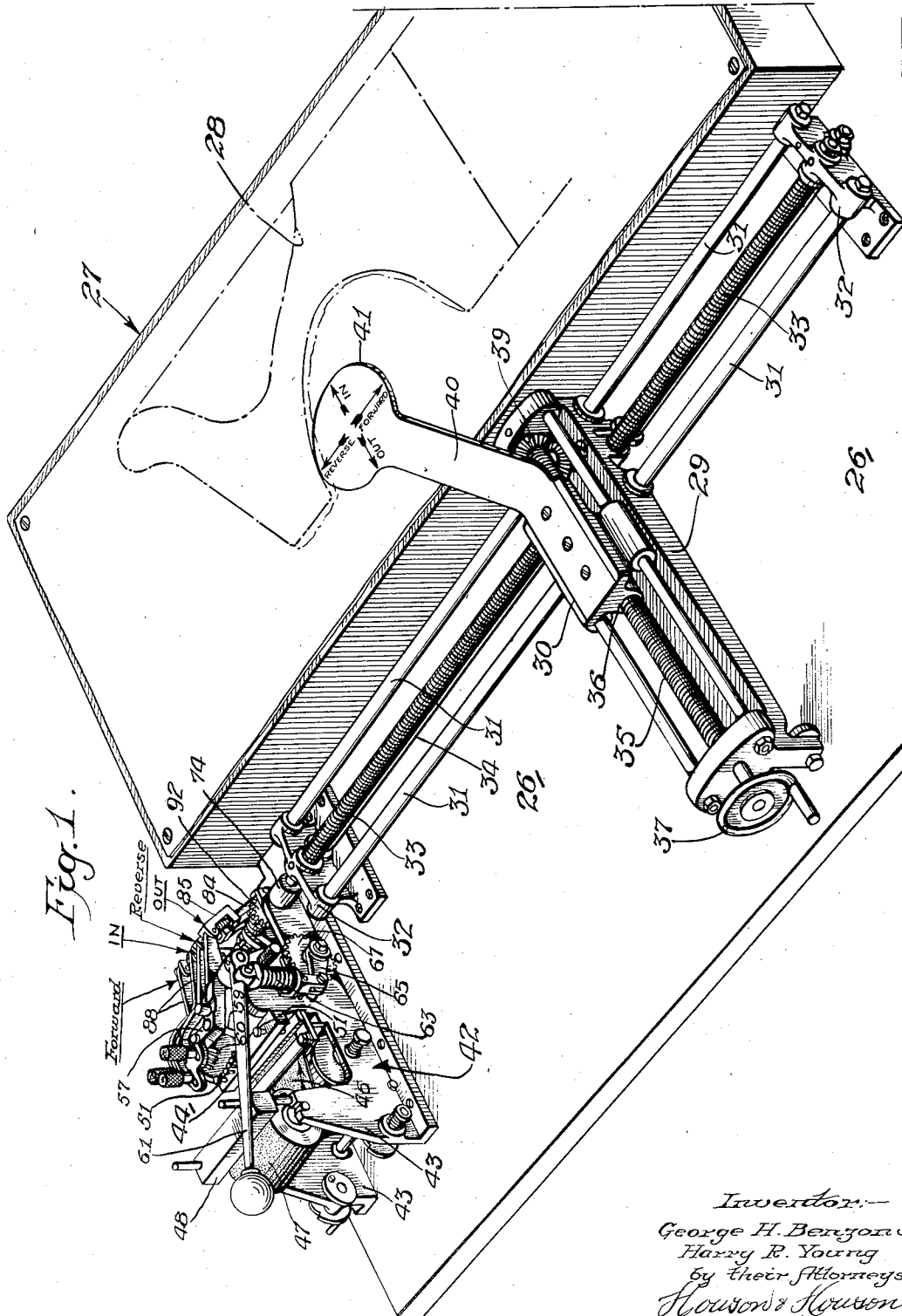
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2,174,457

STRIP PUNCHING MECHANISM

Filed April 2, 1938

7 Sheets-Sheet 1



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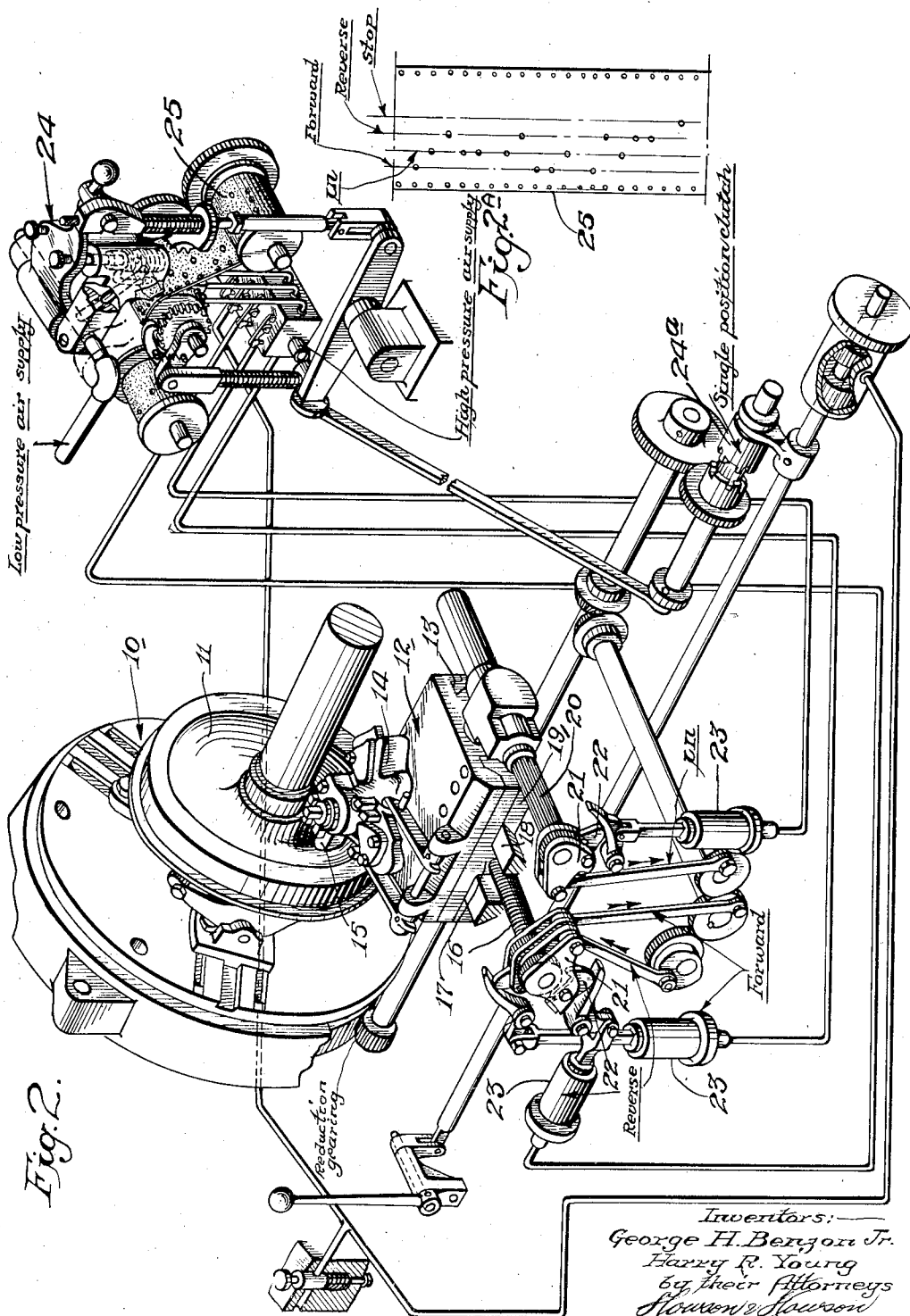
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STRIP PUNCHING MECHANISM

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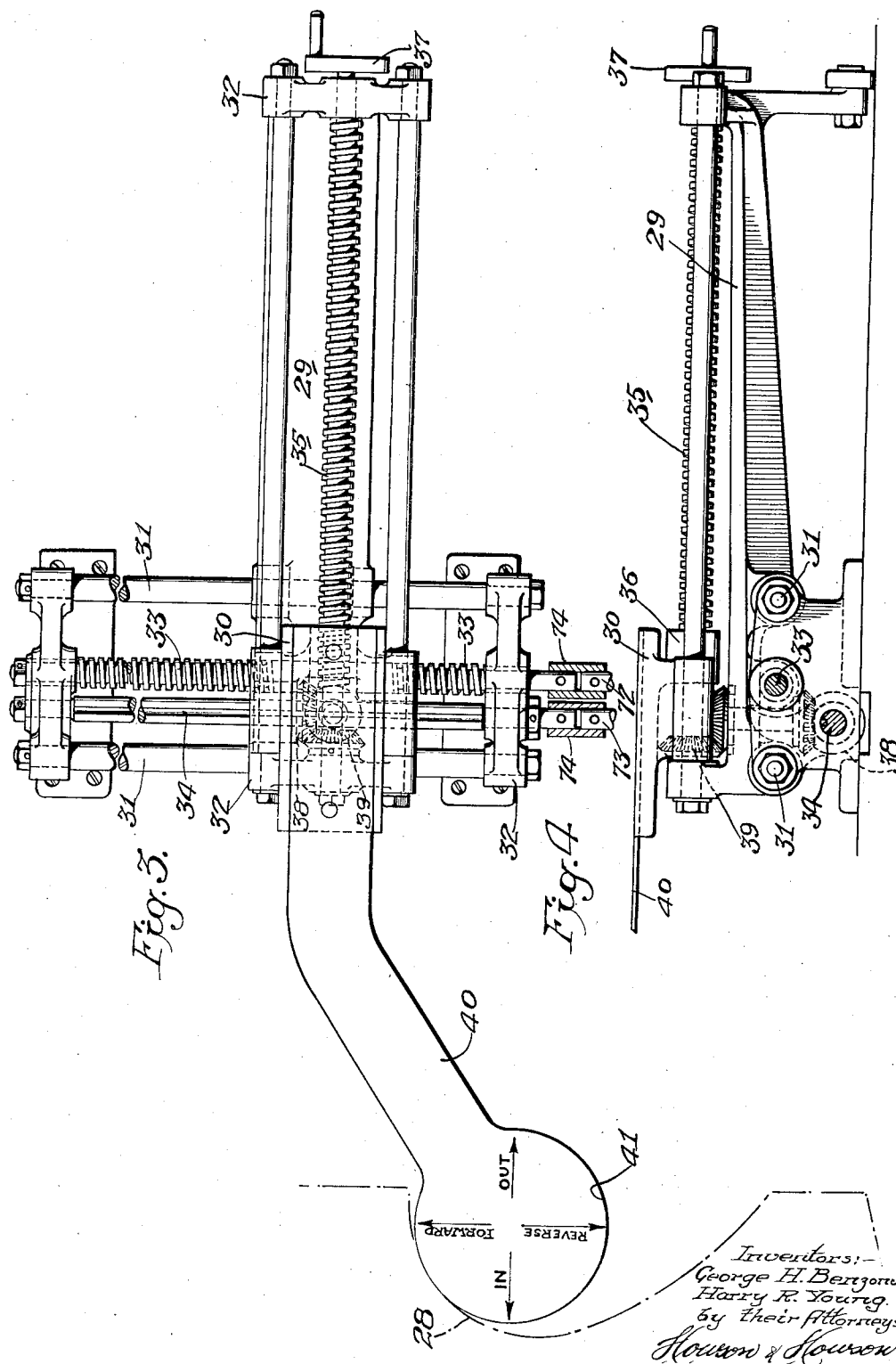
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7 Sheets-Sheet 3



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7 Sheets-Sheet 4

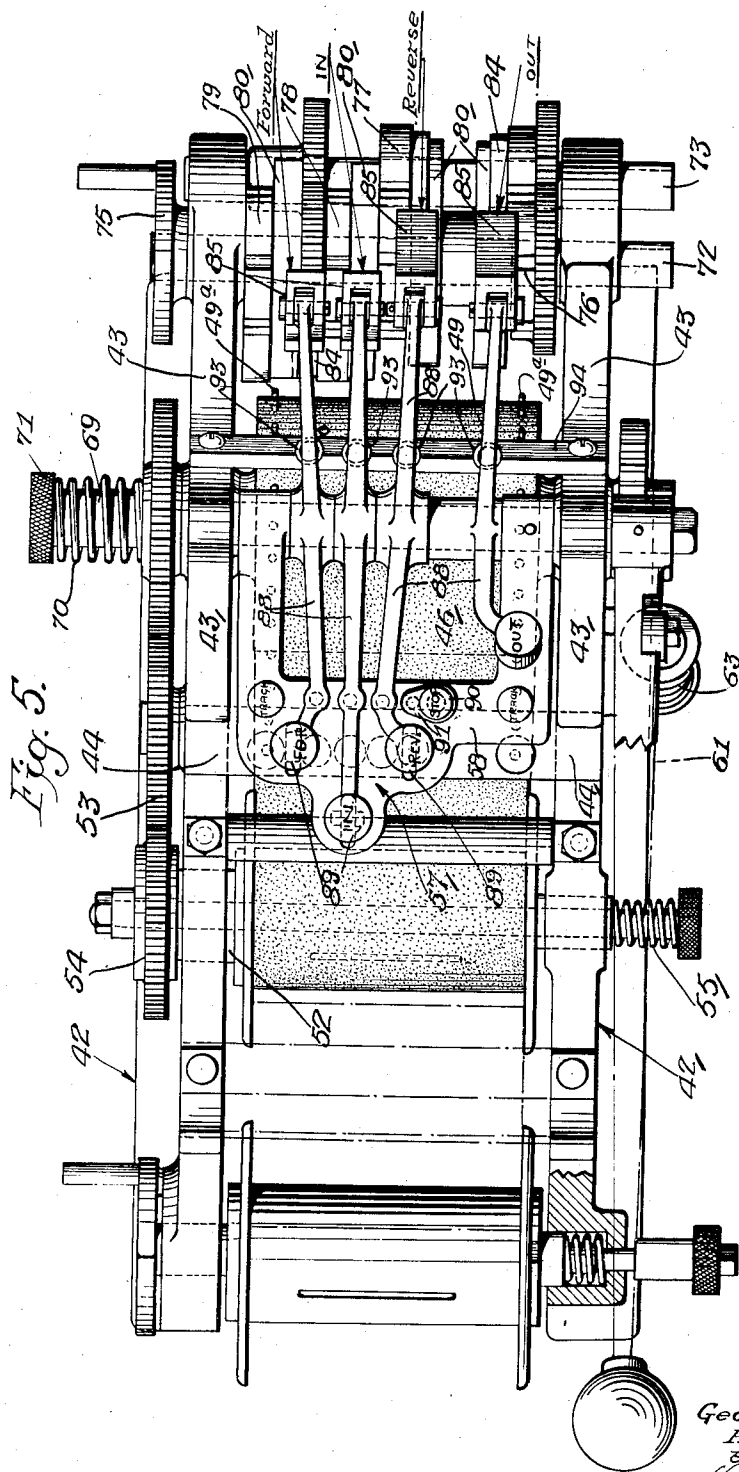


Fig. 5.

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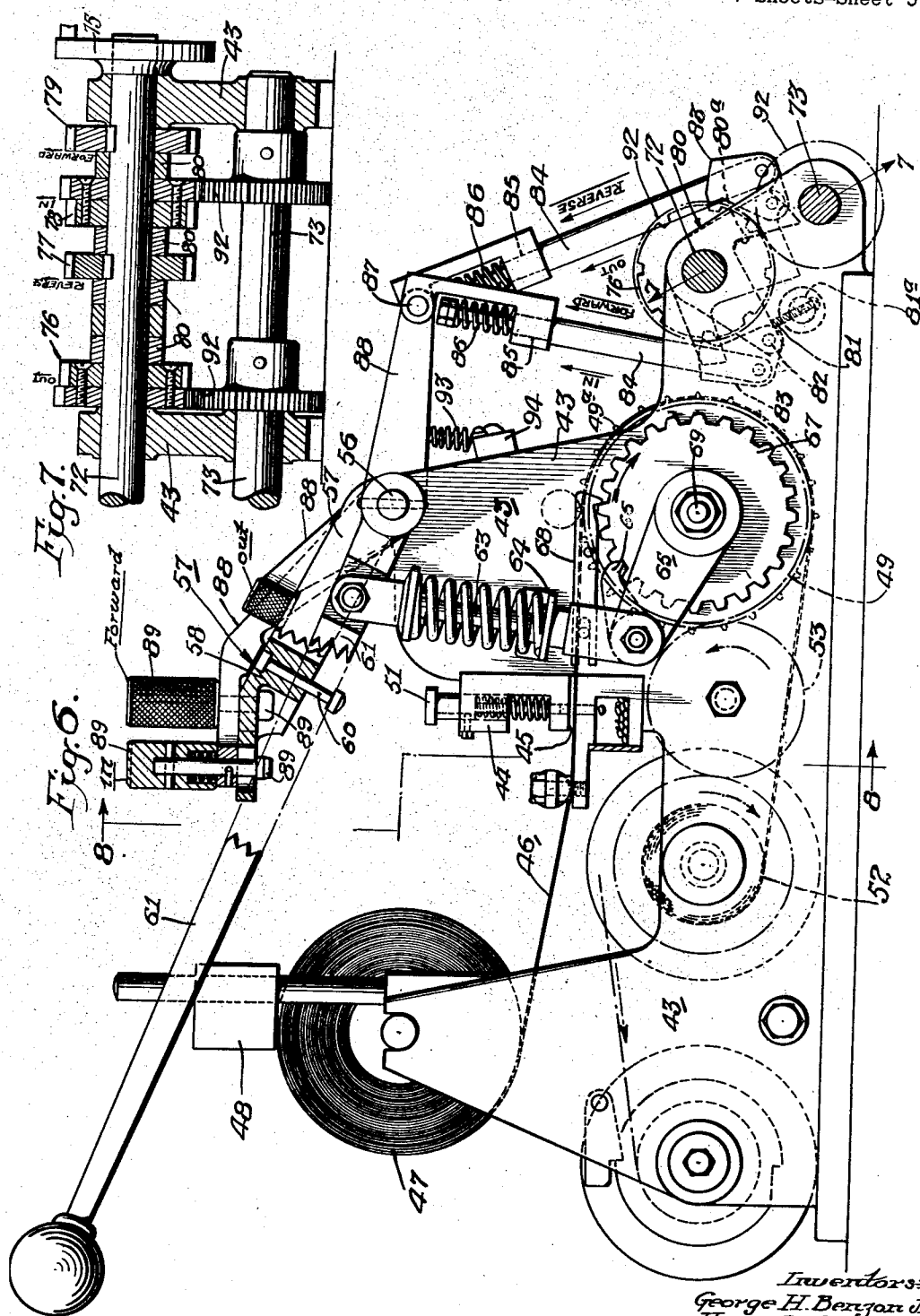
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7 Sheets-Sheet 5



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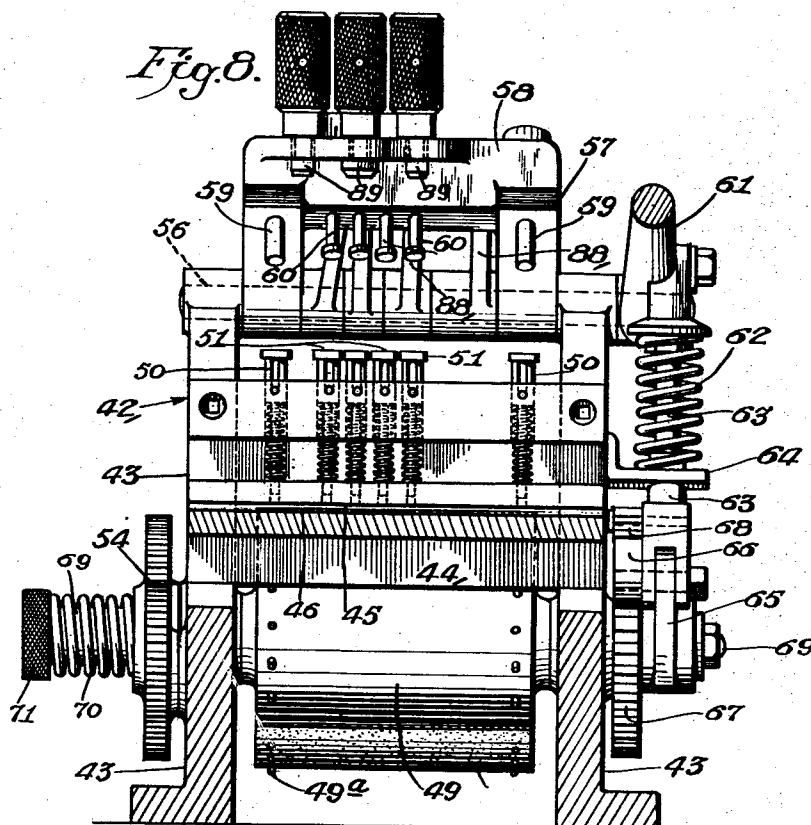
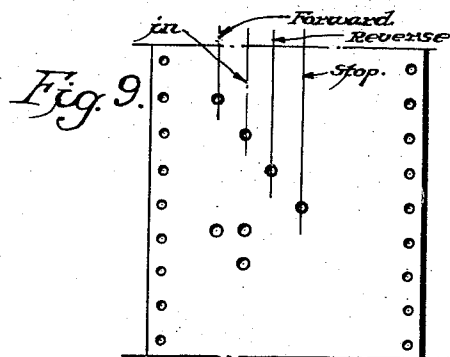
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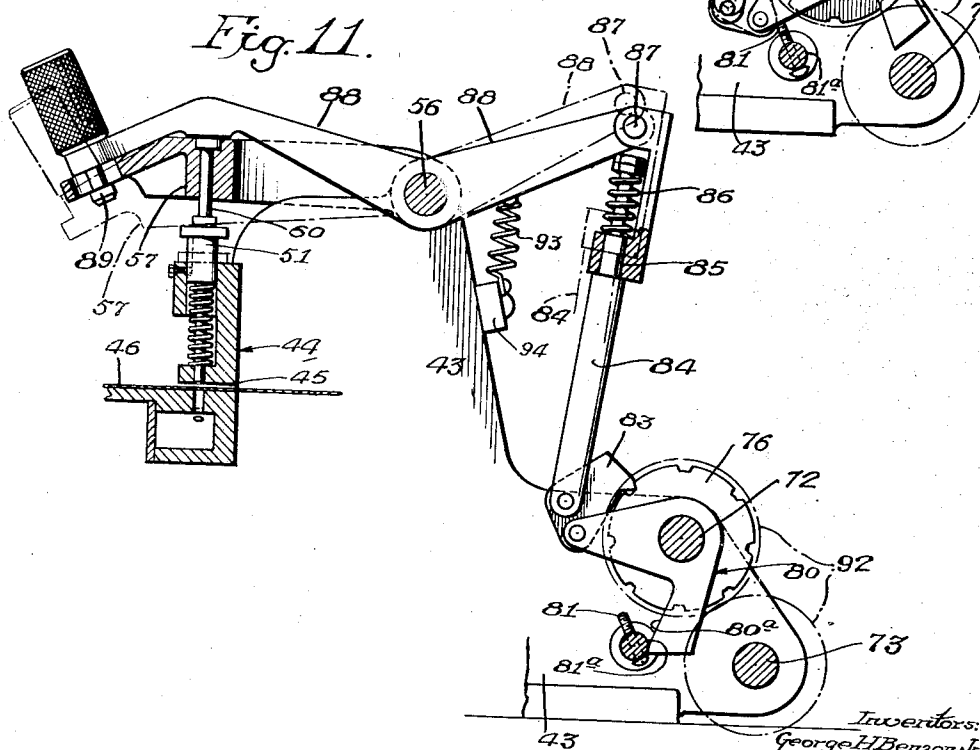
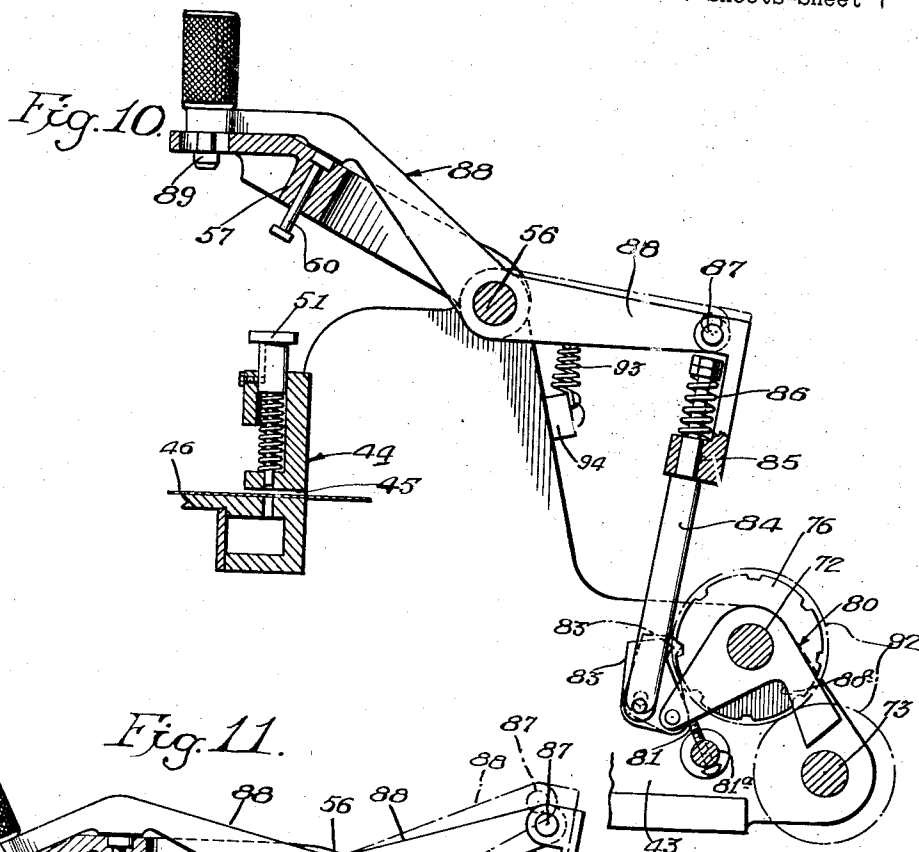
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STRIP PUNCHING MECHANISM

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7 Sheets-Sheet 7



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2,174,457

STRIP PUNCHING MECHANISM

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Application April 2, 1938, Serial No. 199,709

12 Claims. (Cl. 164—114)

This invention relates to strip punching machines, and more particularly to a punch for use in forming control strips for use in the paper towers of automatic contouring lathes and the like such as those shown in our copending application, Serial No. 199,708, filed of even date herewith.

An important object of the invention is the provision in a machine of this character of a construction permitting a given predetermined tool shape to follow closely a contour lay-out for a given piece of work, and which construction will permit the ready correction of any errors made in selection of the movement of the tool pattern.

A further object of the invention is the provision in a construction of this character of an arrangement such that the movement of the tool pattern is completed prior to any actual punching operation so that the position of the pattern may be corrected prior to such punching operation.

A further object of the invention is the provision of a construction of this character which is extremely simple in its operation and may be readily manipulated by an ordinary workman with but little instruction.

These and other objects we attain by the construction shown in the accompanying drawings, wherein, for the purpose of illustration, we have shown a preferred embodiment of our invention and wherein:

Fig. 1 is a perspective view of a punching apparatus constructed in accordance with our invention;

Fig. 2 is a perspective diagram of the type of control mechanism which is to be operated by the strips produced in the punching machine;

Fig. 2a is a fragmentary detail of the control strip employed in a machine of the character diagrammed in Fig. 2;

Fig. 3 is a plan view of the table and slide;

Fig. 4 is a side elevation thereof;

Fig. 5 is a plan view of the table control mechanism and strip punching means;

Fig. 6 is a side elevation partially in section of the punch;

Fig. 7 is a sectional view showing the control shafts and the gearing associated therewith;

Fig. 8 is a section on line 8—8 of Fig. 6;

Fig. 9 is a detail strip produced showing the relative positions of the various punched openings produceable with the machine;

Fig. 10 is a semi-diagrammatic section showing in solid lines the normal position of the parts,

and in dotted lines the positions assumed by a selected operating element and the actuating yoke after initial movement of the yoke; and

Fig. 11 is a view similar to that of Fig. 10 with the parts shown in solid lines in the positions they have upon completion of the primary yoke movement, and in dotted lines after completion of the secondary or punch-operating yoke movement.

As hereinbefore noted, the machine with which the strips to be produced by the present invention are to be employed is shown in our above-noted copending application for contouring wheel lathe. This lathe and its controls are diagrammatically illustrated in Figs. 2 and 2a.

Referring now more particularly to these figures, the numeral 10 generally designates a suitably driven rotating chuck in which the work piece 11, at present shown as a car wheel, is mounted for the contouring operation. This chuck may have its axis at any desired angle, in the present illustration being horizontally disposed, and associated with the chuck is a turret assembly 12 comprising a slide 13 and the turret proper, indicated at 14, the latter carrying the cutting tool 15. The turret proper is movable both perpendicularly and longitudinally to the axis of the chuck, the perpendicular movement at present being illustrated as provided through a worm drive 16 engaging in a nut 17 on the slide 13, which slide is mounted in suitable guides 18 extending transversely of the lathe bed 19. A second worm, not shown, operated through the medium of a spline shaft 20 serves to shift the turret head 14 upon the slide in a direction longitudinal to the chuck axis. These movements of the turret are all conventional and well known, and need no further description or illustration than that here given. Operation of the worms is obtained through continuously operating ratchets 21 associated therewith, these ratchets including normally disengaged pawls 22, engagement of which is effected through air cylinders 23. A device 24, generally termed a paper tower, has a perforated strip 25 fed therethrough, the perforations of this strip controlling not only the action of the cylinders 23, but likewise a disengaging clutch 24a to stop operation of the machine.

The strip 25 is produced in the machine forming the subject matter of the present application. This machine comprises a suitable support 26 having associated therewith an easel 27 to support a lay-out 28 of the contour of which it is desired to have the contouring machine or lathe

reproduce. In the present instance this contour is shown as that of the car wheel 11. Upon the support 26 there is disposed a carriage 29 (Figs. 1, 3 and 4) somewhat similar in function to the traveling carriage of the lathe and carrying a slide 30 corresponding to the slide 12 of the lathe. Extending longitudinally of the support 26 are guide bars 31 upon which the carriage 29 is longitudinally shiftable. These guide bars are secured at their ends in supports 32 which rotatably mount a worm 33 and a spline shaft 34 corresponding to the worm 16 and spline shaft 20 of the lathe. Extending longitudinally of the carriage is a worm 35 extending through a nut 36 on the slide 30. This worm may be either rotated by hand through a hand-wheel 37 or may be driven from spline shaft 34 through a gear 38 mounted on the spline shaft and having driving connection with a gear 39 secured to worm 35. Detachably secured to the slide for interchange with similar devices is a template 40, the outer end 41 of which is constructed to have the same form as the tool 15 which is to be employed in the contouring machine. For convenience, the upper face of the outer end of the template is marked with directions corresponding to those in which the slide can be moved through the control mechanism about to be described.

It will be obvious that by suitable operations of worms 33 and 35 the tool-simulating inner end of the template 40 may be caused to follow the contour of the lay-out pattern 28 at present shown as a drawing. For example, assuming that the tool is to be fed only into the work, from its position shown in Fig. 1, the contour would be followed by a simultaneous "in" and "forward" movement while from its position shown in Fig. 3 the contour would be best followed by alternate "reverse" and "in" motions.

The punch proper, indicated generally at 42 is located at one end of the support 26 and comprises spaced side frames 43 connected through transverse structure 44, affording a slot 45 for the passage of the strip 46 from which the control strip 25 is to be formed. At one side of this slot a supply roll 47 of the strip material is rotatably supported, a suitable means, such as friction block 48, being employed to retard rotation thereof.

At the opposite side of the slot the frames 43 support a draw roll 49 over which the strip 25 passes after punching. Above the slot, the cross member 44 supports a plurality of spring-elevated punches which may be generally classified as track punches 50 and operation control punches 51, four of the latter being shown in the present instance. From the paper draw roll the punched strip is passed to a winding roll 52 which is driven from the draw roll 49 through step-up gearing 53 and a friction driving clutch 54 permitting relative slip between the roll and drive. The friction of this clutch may be regulated through an adjustable tension device such as indicated generally at 55.

Mounted in the side members 43 adjacent the top thereof is a shaft 56 which, between the side members bears a yoke frame 57 including a transverse cross bar 58 overlying the track punches and the operation punches. This cross arm bears fixed operating pins 59 for engagement with the track punches 50 and loosely mounted pins 60 for cooperation with the operation control punches 51, means being provided, as hereinafter more fully set forth, for selectively locking these

slidably mounted pins against movement with relation to the cross arm.

At its outer end the shaft 56 has secured thereto an operating arm 61 through which the shaft may be oscillated and the cross arm of the yoke, accordingly, elevated or depressed to bring the pins into engagement with the punches. This arm is normally kept in its elevated position through a spring 62 surrounding a rod 63 which, at its upper end, is pivoted to arm 61, and adjacent its lower end passes through a guide 64. At its lower end, the rod 63 is pivoted to an arm 65 pivoted upon the shaft of draw roll 49. The connection between this arm and the rod mounts a pawl 66 cooperating with the gear 67 secured to the shaft of the draw roll. This pawl is so constructed that during downward movement of arm 61 it rides over the teeth of the gear and during upward movement thereof it rotates the same, thereby advancing the paper strip through one step, pawl 68 preventing return movement of the gear. To assist in preventing this return movement and any possible movement of the draw roll through slack in pawl connections, or the like, the shaft 69 of this draw roll is equipped with a tension spring 70 and an adjusting device 71 therefor whereby the roll may be drawn firmly against its bearings.

At their inner ends, the side frames 43 support shafts 72 and 73 aligning respectively with the worm shaft 33 and the spline shaft 34, and connected thereto by collars 74, shaft 72 having an operating handle 75 through which the worm shaft 33 may be manually rotated.

Shaft 72 has mounted thereon ratchet discs 76, 77, 78 and 79, and adjacent each of these ratchet discs mounts a lever 80 for each disc. Each lever 80 is in the form of a bell crank, the arms of which are alternately adapted to engage against stops 81 and 81a, the stops 81a at present shown as in the form of a transversely-extending shaft and the stops 81 in the form of screws adjustably directed through these shafts. The arm of each lever which is adapted to engage the stop 81 has pivoted thereto at 82 a pawl 83 for engagement with the associated ratchet and to this pawl, in turn, is pivoted the lower end of a link 84. Links 84 are each formed in two sections which are slidably engaged with one another at 85 and are held in a normally collapsed condition through springs 86. The upper end of the upper section of each link is pivoted at 87 to the tail of a lever 88 loosely pivoted upon the shaft 56 and having its forward end overlying the yoke. These levers will hereinafter be referred to, for the purpose of identification, as the "forward," "in," "reverse," and "out" levers, corresponding to the various operation control movements of slide 30.

The "forward," "in," and "reverse" levers adjacent their forward ends overlie the upper ends of the three left-hand pins 60 for coaction therewith and their forward extremities are provided with rotatable buttons 89 by means of which they may be locked to the yoke. When the forward end of a given lever is locked to the yoke, its corresponding pin 60 is held against upward movement and, accordingly, will actuate the associated punch when it comes in contact therewith. The "out" lever does not coact with a pin 60 and merely has its end closely overlying the yoke so that it cannot be moved downwardly unless the yoke is in lowered position, and this lever is not equipped with the locking device of the "forward," "in" and "reverse" levers.

Associated with the fourth, or right-hand, loose pin 60, is a rotatable button 90 having an arm 91 which, through rotation of the button, may be caused to overlie the upper end of this pin and

5 prevent upward movement thereof. It will be obvious that when any of the "forward," "in," or "reverse" levers is locked to the yoke, and the yoke is operated, not only will the associated pin 60 actuate the corresponding punch but the lever

10 will be caused to rotate, thereby actuating the associated link 84 and the ratchet mechanism to which it is connected, thus causing a corresponding operation of the associated ratchet disc 76, 77 or 78. Ratchet discs 76 and 78 are loosely

15 mounted on shaft 72 and are geared at 92 to shaft 73, and the ratchets associated with these discs act oppositely thereupon so that when one ratchet is actuated shaft 73 is rotated in one direction and when the other is actuated this shaft is operated in the opposite direction, there-

20 fore, moving the slide 30 in or out as selected. Movements of these ratchets are obtained through operation of the "in" and "out" levers. Ratchets 77 and 79 are directly keyed to shaft 72, and the

25 ratchet wheels associated therewith are reversely disposed so that reverse operations of the worm 33 are obtained by operation of the "forward" and "reverse" levers. Levers 88 are normally held in their lowered positions through tension springs

30 93 connected between a cross bar 94 and these levers.

The punching operations of which the present machine is capable are illustrated in Fig. 9. It will be obvious that to obtain the "in," "forward" or "reverse" movements it is simply necessary to lock the lever 88 corresponding to these move-

35 ments to the yoke and then depress the arm 61, or if combination of either "forward" or "reverse" movement with an "in" movement is desired, to simultaneously lock "in" and "forward" or "re-

40 verse" levers to the yoke, as likewise shown by the punching indications on Fig. 9. For a "stop" operation, the stop button is rotated to cause its arm 91 to overlie the associated pin. Each oper-

45 ation of the lever will result in the formation of track openings to be engaged by the track pins 49a of the draw roll and by the corresponding pins of the paper tower 24.

It will be obvious that, since the selections for

50 movement of the carriage are entirely a matter of judgment of the operator, it will often occur that a selection will be erroneous, necessitating resetting of the mechanism before the actual punching occurs. The mechanism hereinbefore

55 described not only enables the operator to reset the mechanism, but provides a warning of the initiation of the actual punching operation.

Examining Figures 10 and 11, it will be noted that while the pawl 83 is, in the lowered position

60 of link 84, held out of engagement with its associated ratchet, a primary movement thereof engages the pawl with the ratchet swinging the pawl about the pivot 82 upon the lever 80. As shown in Fig. 11, continued upward movement of

65 link 84 rotates the ratchet disc effecting the operation of the shaft, and the movement of arm 61 necessary to complete operation of the ratchet disc leaves the operating pin 60 just out of en-

70 gagement with the associated punch 51. At this time the second arm 80a of the bell crank lever 89 has come into engagement with the stop 81a, thus preventing further movement of the lower end of link 84 and holding the ratchet 83 in the

75 associated notch of the ratchet disc, preventing

further actuation of the shaft which has just been operated.

In the final movement of the arm 61 the punch is operated and during this operation the spring 86 of link 84 is compressed placing an additional

5 strain on arm 61 which will serve to warn the operator. Since the primary movement of the arm 61 has actuated the shaft, the operator can see whether or not the template 40 is properly

10 following the lay-out diagram 28 and if it is not he can immediately correct the error. If it is found that the structure has moved "in" when it should not have been moved "in," the "in" but-

15 ton is released to release the lever 88 associated therewith and permitted to return to its normal position. Still holding the arm 61 in its mid-

20 depressed position, he now engages the "out" lever with his hand and depresses the forward end thereof, thereby reversing the previous "in" operation and restoring the mechanism to its

25 original position. If a "forward" operation has been mistakenly employed, this may be corrected by permitting the arm 61 to elevate to its normal position, disengaging the "forward" lever, engag-

ing the "reverse" lever and again partially de-

pressing the arm.

While we have, at present, shown the punching operations as confined to "in," "forward," "reverse" and "stop," it will be obvious that additional functions of the machine may be con-

30 trolled by the addition of further controllable punches, the present arrangement being illustrated due to the fact that ordinarily feeding operations are usually made only into and across

35 the work, either in a forward or reverse direction. The construction illustrated being capable of considerable modification without departing from the spirit of the invention, we do not wish to be understood as limiting ourselves thereto except

40 as hereinafter claimed.

We claim:

1. Apparatus for producing control strips of the type described, means to feed a strip to be punched, means to support a pattern, a tool-simulating template, means to move said template

45 to follow the outline of the pattern comprising a plurality of independently selectable and actuable operating elements each of which when actuated imparts a movement to the template differing from those imparted by the remaining

50 elements, an actuator for said operating elements and to which each element is connected in the selection thereof and a punch for each element actuated by said actuator to punch the strip only when the corresponding operating element has

55 been selected.

2. A device as claimed in claim 1 wherein the actuator has primary and secondary movements and the operating elements are moved by the primary movement thereof while the punches are

60 actuated by the secondary movement thereof.

3. A device as claimed in claim 1 wherein the actuator has primary and secondary movements and the operating elements are moved by the primary movement thereof while the punches are

65 actuated by the secondary movement thereof, and means to definitely limit movement of a selected operating element at the close of the primary movement of the actuator, the connection between the operating element and the actuator

70 comprising a member yielding to permit the secondary movement of the actuator.

4. Apparatus for producing control strips of the type described, means to feed a strip to be punched, means to support a pattern, a tool-

75

simulating template, means to move said template to follow the outline of the pattern comprising a plurality of independently selectable and actuatable operating elements each of which
 5 when actuated imparts a movement to the template differing from those imparted by the remaining elements, an actuator for said operating elements and to which each element is connected in the selection thereof, a punch for each operating element, an operating pin for each punch
 10 loosely mounted on the actuator and means to hold the pin of the corresponding punch against movement effective upon selective connection of an operating element to the actuator.

15 5. A device as claimed in claim 4 wherein the actuator has primary and secondary movements and the operating elements are moved by the primary movement thereof while the punches are actuated by the secondary movement thereof.

20 6. A device as claimed in claim 4 wherein the actuator has primary and secondary movements and the operating elements are moved by the primary movement thereof while the punches are actuated by the secondary movement thereof, and means to definitely limit movement of a selected operating element at the close of the primary movement of the actuator, the connection between the operating element and the actuator comprising a member yielding to permit
 25 the secondary movement of the actuator.

30 7. Apparatus for producing control strips of the type described, means to feed a strip to be punched, means to support a pattern, a tool-simulating template, means to move said template to follow the outline of the pattern comprising a carriage, a shaft to actuate said carriage transversely, a slide on said carriage, a shaft to actuate said slide longitudinally of the carriage, said slide supporting said template, a plurality of independently selectable and actuatable operating elements for said shafts each of which when actuated imparts a movement to the slide differing from those imparted by the remaining elements, an actuator for said operating elements, and to which each element is connected in the selection thereof and a punch for each operating element actuated by said actuator to punch the strip only when the corresponding element has been selected.

35 8. A device as claimed in claim 7 wherein the actuator has primary and secondary movements and the operating elements are moved by the

primary movement thereof while the punches are actuated by the secondary movement thereof.

9. A device as claimed in claim 7 wherein the actuator has primary and secondary movements and the operating elements are moved by the primary movement thereof while the punches are actuated by the secondary movement thereof, and means to definitely limit movement of a selected operating element at the close of the primary movement of the actuator, the connection between the operating element and the actuator comprising a member yielding to permit the secondary movement of the actuator.

10. Apparatus for producing control strips of the type described, means to feed a strip to be punched, means to support a pattern, a tool-simulating template, means to move said template to follow the outline of the pattern comprising a carriage, a shaft to actuate said carriage transversely, a slide on said carriage, a shaft to actuate said slide longitudinally of the carriage, said slide supporting said template, a plurality of independently selectable and actuatable operating elements for said shafts each of which when actuated imparts a movement to the slide differing from those imparted by the remaining elements, an actuator for said operating elements and to which each element is connected in the selection thereof, a punch for each operating element, an operating pin for each punch
 15 loosely mounted on the actuator, and means to hold the pin of the corresponding punch against movement effective upon selective connection of an operating element to the actuator.

11. A device as claimed in claim 10 wherein the actuator has primary and secondary movements and the operating elements are moved by the primary movement thereof while the punches are actuated by the secondary movement thereof.

12. A device as claimed in claim 10 wherein the actuator has primary and secondary movements and the operating elements are moved by the primary movement thereof while the punches are actuated by the secondary movement thereof, and means to definitely limit movement of a selected operating element at the close of the primary movement of the actuator, the connection between the operating element and the actuator comprising a member yielding to permit the secondary movement of the actuator.

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