Oct. 26, 1943. R. E. MATHES 2,333,024

TAPE PERFORATING SYSTEM

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Fig. 1

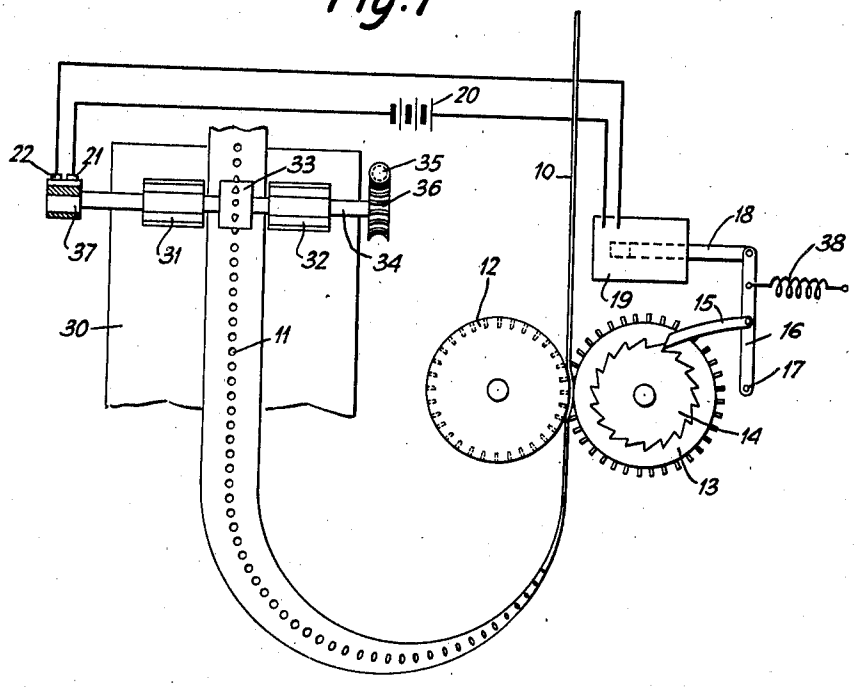


Fig. 2a

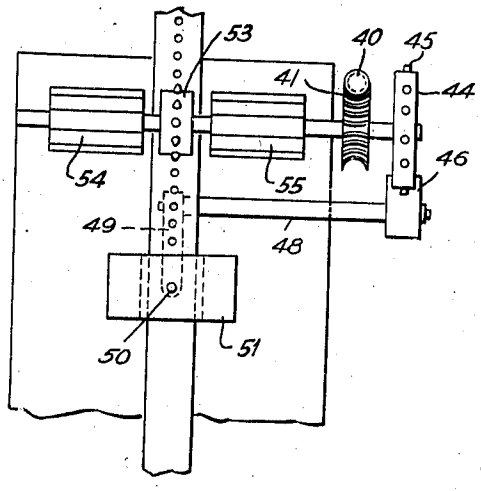
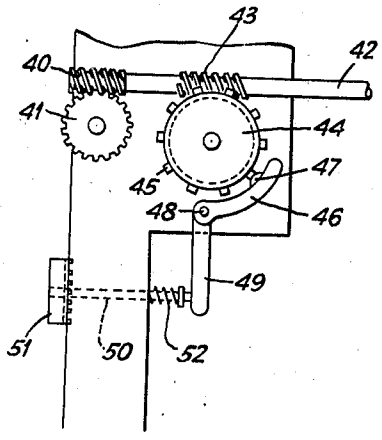


Fig. 2



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Fig. 3

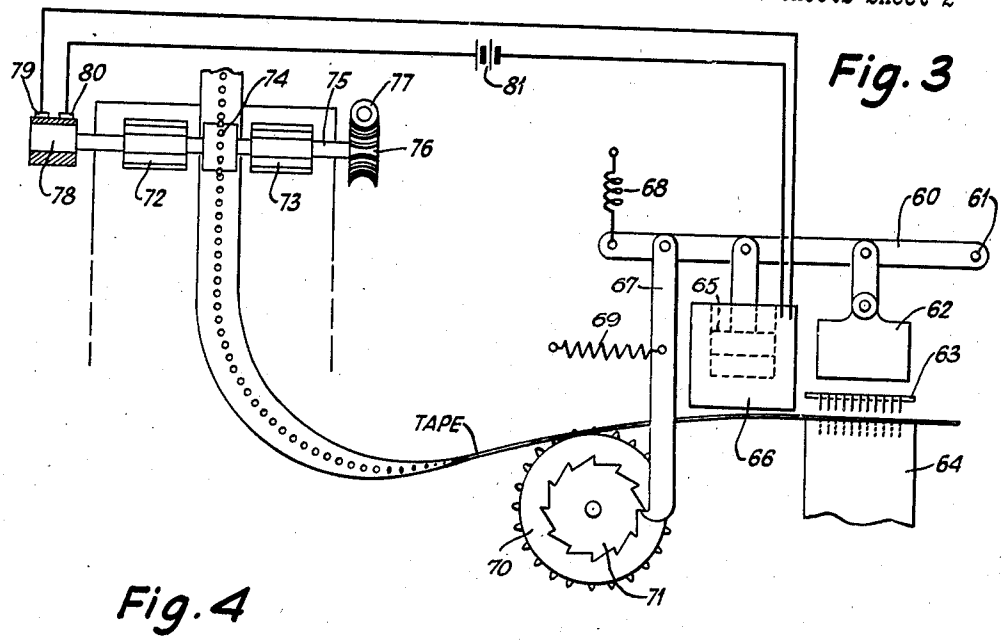
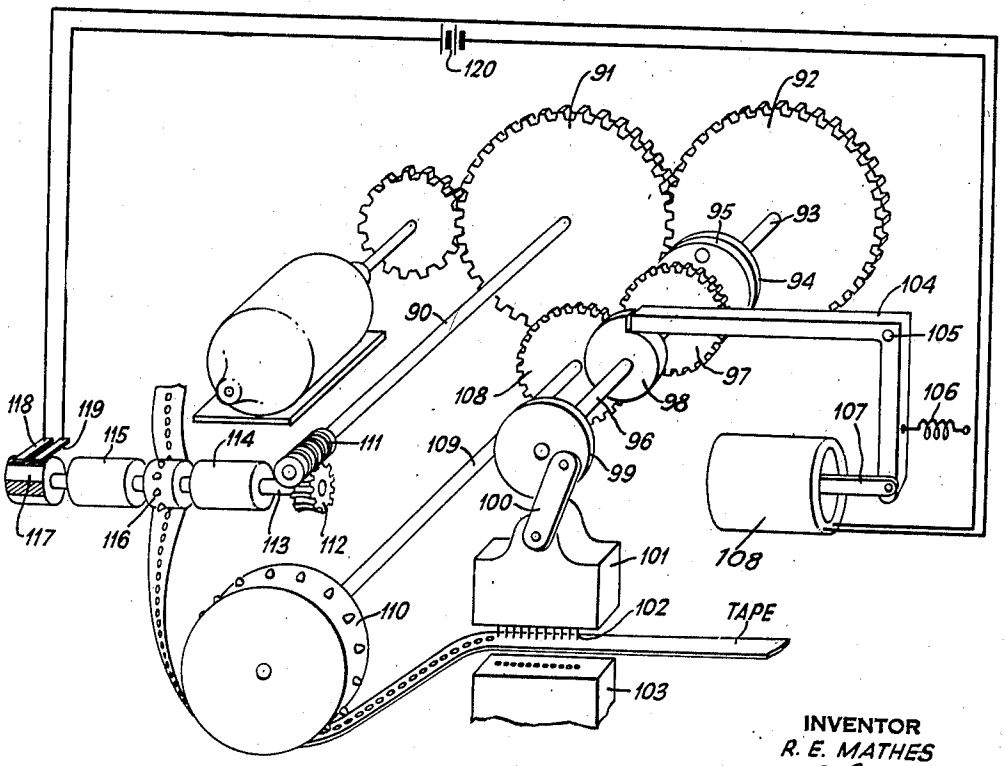


Fig. 4



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TAPE PERFORATING SYSTEM

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Application May 16, 1941, Serial No. 393,778

13 Claims. (Cl. 164—113)

My invention relates, in general, to perforating devices, and more particularly to a device for perforating uniform guide and feed holes in a paper tape such as is used in certain types of telegraph printing systems.

In types of printing telegraph systems heretofore known to the prior art, it has been customary to use for certain functions a paper tape in which are perforated a row of sprocket feed holes along the length thereof. Heretofore this tape has been perforated by the manufacturer and this adds considerably to the cost of the tape. The relative cost of unperforated versus perforated tape is not, however, the sole consideration. It has been found that certain mechanical advantages are to be derived from perforating a tape with uniformly spaced feed holes immediately prior to its initial use in a telegraph apparatus. Accordingly, it is one of the objects of my invention to provide a device by which a utilizer may perforate a tape in the manner hereinbefore referred to.

In using pre-perforated tape such as has been customary heretofore, any loss in the tape itself prior to its use by the machine has meant that a more costly form of tape has been wasted. It will be apparent, therefore, that it would be a great benefit to provide an arrangement in which the non-perforated tape were perforated only in such quantities necessary at the time of its usage in the printing telegraph system. Accordingly, it is another of the objects of my invention to provide an apparatus in which the tape is perforated only when used by and in such quantities as necessary for the operation of such devices as hereinbefore referred to.

In carrying out the immediately above identified object it will be appreciated that the optimum usage of the tape will be realized where the control of the device for perforating the tape is subject to the action of the device which utilizes the tape, thus making the amount of tape perforated dependent upon the actual operation of the device which utilizes it. Accordingly, it is another of the objects of my invention to provide an arrangement for perforating tape or like materials to be utilized in other apparatus, and in which the time of perforation and the quantity of perforation will be controlled by the device utilizing the tape.

Accordingly, among the objects of my invention are:

1. To provide an arrangement of the nature described, in which the tape may be perforated at the utilization device.

2. To provide an apparatus of the nature described, in which the tape is perforated only when used by, and in such quantities as necessary, for the operation of the device.

3. To provide an arrangement for perforating tape or like materials to be utilized in other apparatus, and in which the time of perforation and the quantity of perforation will be controlled by the device utilizing the tape.

4. To provide a feed hole punch for tape, in combination with means for actuating the punch in timed relation to the feeding rate of a sprocket wheel over which the tape is to be subsequently passed, the sprocket wheel being operable in continuously periodic cycles.

In general, my invention consists in providing a perforating device in which tape or the like material to be perforated is fed between the male and female elements of a punch apparatus, these elements being electrically controlled except in the form of Fig. 2 and Fig. 2*a* which is mechanical. In the preferred embodiment, the device utiilizing the tape has connected to the driving element thereof, and operable by the driver thereof, a commutator arrangement of the rotary switch type having a plurality of brush members positioned in intimate contact therewith, the commutator serving to alternately energize the punch arrangement which perforates the tape. Since the commutator will be operated only at the time when the utilizing device is actually operating, it will be appreciated that the tape will be punched only at the time when the utilizing device is operated, and the quantity may be controlled so that it is punched only in such quantities as is necessary at the time of utilization.

My invention will best be understood by reference to the drawings, in which:

Fig. 1 shows one embodiment of my invention.

Figs. 2 and 2*a* are different views of another embodiment of my invention.

Fig. 3 is a further embodiment of my invention.

Fig. 4 is a still further embodiment of my invention.

Referring to Fig. 1, there is shown one embodiment of my invention. In this figure the unperforated section of the tape is indicated at 10 and the perforated section at 11. The unperforated tape is passed between a female die wheel 12 and a male punch wheel 13, the latter having fastened in operative relationship thereto a ratchet member 14. Positioned adjacent

the ratchet member is a pawl 15, one end of which engages the teeth of the ratchet 14, and the other end of which is pivotally associated with a pivoted lever member 16 which is pivoted at the point 17. At the end of the lever arm 16, remote from its pivot point 17, this arm is pivotally associated with the armature 18 of a solenoid having windings 19, and which is energized by a source of potential and current 20. The windings 19 of the solenoid are connected serially with the source 20 and two commutator brush members 21 and 22.

In this particular figure the utilization device is indicated as a Creed reperforator head 30 having a pair of guide means 31 and 32 for the tape and positioned between the guide means is a sprocket wheel 33, the latter being connected to a shaft 34 which is driven through a worm gear arrangement 35 and 36. Also connected to the drive shaft 34 is a commutator member 37 having alternate conducting and non-conducting segments therein. The brush members 21 and 22 are positioned in this illustration in such a manner that a conducting segment of the commutator will electrically connect both brushes together. The action of the device then is as follows:

The utilization device, at the time that it is running, must also necessarily rotate the commutator member 37. This means, then, that as long as the device is running, the circuit consisting of the solenoid windings 19, the source of potential 20, and the brushes 21 and 22, will be energized intermittently. When energy flows through the solenoid windings the armature 18 is moved, which means that the arm 16 advances the ratchet wheel by one tooth thereof, and accordingly the male punch wheel is revolved, thus punching the tape in conjunction with the female die wheel 12.

The speed with which the tape is punched may be governed by the number of segments in the commutator 37. The arm 16, which is connected to the pawl 15, being held in a normally retracted position due to the action of spring member 38, each intermittent energization of the solenoid windings 19 will advance the tape and punch a number of holes, depending on the spacing of the teeth of the ratchet, and the number of punch members on the punch wheel. This will be obvious to one skilled in the art. It will be appreciated that there may be departures from the specific showing without departing from the spirit and scope thereof as, for instance, it may be found best to operate the commutator from the drive shaft through an appropriate gear arrangement in order to control the number of energizations of the solenoid in a given period of time. It will also be appreciated that the Creed reperforator head is merely illustrative of one type of utilization device.

Referring to Fig. 2, there is shown another embodiment of my invention. The utilization device again is illustrated as being the Creed reperforator head. In this figure the normal worm drive consisting of 40 and 41 is operated by the drive shaft 42 and connected on the same drive shaft is a worm gear 43 which drives a gear member co-operatively associated with a cam 44, the latter being substantially cylindrical with projections 45 on the outer periphery thereof. Positioned adjacent the cam 44 is a pivoted crank lever 46 having a protruding feeler 47 at one extremity thereof and being pivotally held at 48. Formed integrally with the crank lever 46 is a lever arm 49 which is arranged to press upon one end of a punch member 50 when the feeler 47 rides over one of the cam projections 45. A spring 52 maintains pressure engagement of the back end of punch 50 against lever arm 49, and also urges the feeler 47 toward the center of the cam 44. A die 51 has a gate formed therein, through which a strip of tape may be guided. The tape is suitably punched with feed holes by the shearing action of the punch 50 when it enters an orifice in the die 51.

Referring to Fig. 2*a*, there is shown the front view of the reperforator head with the associated apparatus. There is also shown the sprocket wheel 53 with the guide members 54 and 55 for the tape. The operation of the device is as follows. The unpunched tape is fed through the gate in the die 51. Since the member 46 with the projecting feeler 47 is normally forced in toward the periphery of the member 44 by the action of the spring 52 and lever arm 49, the punch 50 will be held away from the die member 51 until one of the projections 45 on the cam 44 engages the member 47, at which time the punch 50 will be forced through the tape and into the die member 51. Then, with the passage of the projection 45 past its sector of engagement with the projection 47, the punch 50 will be retracted, due to the action of the spring 52. If desired, the die 51 may have a plurality of punch holes arranged longitudinally of the tape, and in cooperation with a plurality of punches 50, so as to perforate the tape with a number of perforations at each passage of the feeler 47 over a cam projection 45. Since the punch will be operated only by the co-operative action of the member 44 and the member 47 with its appurtenant apparatus hereinbefore described, it will be obvious that the tape will be punched only when the device is actually operated.

Referring to Fig. 3, there is shown a further form of my invention. In this form a lever arm 60 is pivoted at the point 61 and has connected thereto the operating mechanism 62 for a gang punch, the male section of which is shown at 63 and the female section of which is shown at 64. Also joined to the lever arm 60 is the armature 65 of a pot solenoid arrangement having windings 66. Further joined to the arm 60 is a pawl member 67. Also fastened to the arm 60 is a retaining spring 68, and fastened to the pawl 67 is a retaining spring 69. The tape after being punched is moved by a sprocket wheel 70 having co-operatively joined thereto a ratchet member 71, the pawl member 67 being pulled into operative relationship with the ratchet wheel 71 by means of the retaining spring 69. The utilizing apparatus again in this case is illustrated as a Creed reperforator head having guide wheels 72 and 73 between which the punched tape passes, and a sprocket wheel 74, the latter being held upon a shaft 75 which is driven through a worm gear and drive arrangement 76 and 77. Also held upon the shaft 75 is a commutator 78 having alternate conducting and non-conducting segments, and positioned in co-acting relationship thereto are two commutator brushes 79 and 80. These brushes, with a source of potential 81, form a series circuit with the windings of the pot solenoid 66. The operation of the device is as follows.

When the circuit is closed between brushes 79 and 80 the windings 66 of the pot solenoid are energized by means of the source 81, and a sharp downward stroke of the lever arm 60 results about its pivot 61. This forces the male section 63 of the gang punch down through the tape, thus

perforating the tape. Sequentially, the pawl member 67 advances the ratchet wheel 71, and hence advances the sprocket wheel 70 so that a portion of the free loop of the tape between the gang punch and the sprocket wheel 70 is taken up and advanced to the sprocket wheel 74 of the Creed reperforator head, hence the tape is punched and utilized in accordance with the demand thereon by the reperforator head. Since the reperforator head may be driven by the same driving motor which operates the machine utilizing the tape, and further, since the reperforator head represents one form of utilization apparatus, no further utilizing device has been shown, such, for instance, as an automatic telegraph device. Further, all of the elements that make up a gang punch have not been shown, since such punches per se are well known, but merely a schematic showing has been made for purposes of simplicity.

Referring to Fig. 4, there is shown a further embodiment of my invention. In this figure the apparatus is operated by a shaft 90 from the driving motor, and fastened thereto is a gear wheel 91 which meshes with a driven gear 92, the latter being joined to a shaft 93 having one end thereof fastened in driving relationship to one side 94 of a friction clutch. The other side 95 of the friction clutch is connected to a shaft 96 having thereon a gear member 97, a stop cam 98, and a driving member 99, the latter acting to drive a lever arm 100 which is fastened to the forcing member 101 of a gang punch, the male portion of which is illustrated at 102 and the female section at 103.

Positioned adjacent the periphery of the cam 98 is a stop arm 104 in the form of an L-shaped lever which is pivoted at 105. The spring 106 tends to turn the arm about the pivot, thus forcing the end of the arm against the abrupt section of the face of the cam. Pivotally joined to the extremity of the L-shaped member 104, remote from the end thereof which engages the cam 98, is the armature 107 of a pot solenoid having windings 108.

Positioned adjacent the gear 97 is a driven gear 108 which is fastened to a shaft 109, which in turn has fastened thereon a sprocket wheel 110.

The drive shaft 90 has fastened thereto a driving gear 111 for driving the worm gear 112. Fastened to the worm gear 112 is a shaft 113 having guide wheels 114 and 115, and positioned between these two wheels is a sprocket wheel 116, the latter being adapted to engage the perforated tape. These elements form a part of a Creed reperforator head, as in the previous illustrations.

Also connected on the shaft 113 is a commutator 117 having alternate conducting and nonconducting segments, and positioned in co-operative relationship therewith are two commutator brushes 118 and 119. The operation of the device is as follows.

The circuit between the brushes 118 and 119 is closed when a conducting segment of the commutator comes into contact with the brushes and the windings 108 of the pot solenoid are energized through the source 120. The arm 104, which is normally held into contact with the abrupt face of the cam 98, is pulled away from the cam due to the movement of the solenoid armature 107. This, then, permits movement of the shaft 96 by the action of the friction clutch, and the cam will revolve as long as the solenoid is operating. This length of time depends on the length of the conducting segment in the commutator 117 and the speed with which it is rotated. The shaft 96 being turned in this fashion, the arm 100 will be forced downward during one portion of the cycle and will operate the male section of the gang punch, thus perforating the tape. Sequentially, the gear 108 will be revolved by gear 97 and the sprocket wheel 110, being connected on the same shaft, will be revolved and will take up the tape which has been punched, or at least a section thereof depending on the relationship of the two gears 97 and 108, and the size of the sprocket wheel. The tape, then, is fed to the sprocket wheel 116 on the reperforator head.

It will be appreciated that various structural modifications may be made without departing from the spirit and scope of my invention, and such modifications and equivalents will at once suggest themselves to those skilled in the art to which this invention belongs. One such modification might be that the arrangements in Figs. 1 and 3 may be mounted adjacent to but separate from the utilizing device per se, or they may be mounted as an integral part thereof. Similarly, the arrangement according to Fig. 4, which is shown as integral with the utilizing device per se, may be operated separately therefrom merely by using a separate driving motor therefor instead of gearing to the drive shaft of the machine. Accordingly, I claim all the equivalents which fall fairly within the spirit and scope of my invention as defined in the hereinafter appended claims.

What I claim is:

1. Apparatus for performing a cutting operation upon a material to be utilized which bears a timed relationship to the utilization of said material, which comprises a utilizing device, cutting means, a ratchet member operatively associated with said cutting means, a pawl for driving said ratchet member, solenoid means for actuating said pawl, and circuit-closing means actuated in timed relationship to the operation of said utilizing device for intermittently causing the energization of said solenoid means whereby said cutting means is operated by the action of said pawl upon said ratchet.

2. Apparatus for performing a cutting operation upon a material to be utilized which bears a timed relationship to the utilization of said material, which comprises a utilizing device, cutting means comprising a gang punch, solenoid means, means connecting the armature of said solenoid means to said gang punch, means for energizing the windings of said solenoid means, rotatable switching means driven in timed relationship to the operation of said utilizing means, and brush members positioned adjacent said switching means and in co-operative relationship therewith, said brush members being connected to said means for energizing the windings of said solenoid means and to the windings of said solenoid means whereby the gang punch is operated when said solenoid windings are energized by the action of said switching means on said brushes.

3. Apparatus for performing a cutting operation upon a material to be utilized which bears a timed relationship to the utilization of said material, which comprises a utilizing device, cutting means, means driven in timed relationship to the operation of said utilizing device, clutch means, means for driving said clutch means, means for deterring the positive action of said

clutch means, cutting means operated by said clutch means, and means for controlling the action of said deterring means for said clutch in accordance with the position of the means driven in timed relationship to the action of said utilizing device.

4. Apparatus in accordance with claim 3, wherein said means for deterring the positive action of said clutch device comprises a cam having an abutted section in the periphery thereof and lever means for stopping the rotation of said cam when said lever means is positioned in a definite position.

5. Apparatus in accordance with claim 3, wherein said means for deterring the positive action of said clutch device comprises a cam having an abutted section in the periphery thereof, lever means for stopping the rotation of said cam when said lever means is positioned in a definite position, and solenoid means for operating said lever means, said solenoid means being actuated by the action of said device driven in timed relationship to the operation of the utilizing device.

6. Apparatus for performing a cutting operation upon a material to be utilized and bearing a timed relationship to the utilization of said material subsequent to said cutting operation, comprising a utilizing device, cutting means, rotatable switching means driven in timed relationship to, and in common with the operation of said utilizing device, electrical means for actuating said cutting means, and means for controlling the operation of said electrical actuating means by said switching means.

7. In a telegraph instrument, a tape, a toothed sprocket wheel operable in continuously periodic cycles, means for punching sprocket feed holes in said tape, said holes being suitably spaced for subsequently meshing with the teeth of said sprocket wheel, and means reciprocally operable in timed relationship to the feeding rate of said sprocket wheel for causing a periodic actuation of said punching means.

8. A telegraph tape feed-hole perforator in combination with a toothed sprocket wheel operable in continuously periodic cycles and arranged to feed said tape to a utilization device, said perforator comprising an intermittently acting punch, a die member cooperatively associated with said punch, said punch and die members being operable upon said tape while it is being advanced by said sprocket wheel, and means for controlling the length of tape fed through said perforator in dependence upon the rate of tape feed produced by said sprocket wheel.

9. A device according to claim 8 and including electromagnetic means for producing reciprocating movements of said punch into and out of said die member.

10. A device according to claim 8 and including a shaft for said sprocket wheel, a rotary switching member having conducting and non-conducting segments mounted on said shaft, circuit-closing brushes bearing upon said switching member, and solenoid means in circuit with said brushes, and with an electric source, for actuating said perforator.

11. A device according to claim 8 and including a reciprocally driven actuator for said perforator, and cam means geared to said sprocket wheel for driving said actuator.

12. A device according to claim 8 and including gang punch members in said perforator.

13. A device according to claim 8 wherein the last said means includes a friction clutch on a drive shaft for said perforator, and electromagnetic means for releasing said drive shaft so as to rotate intermittently.

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