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H. F. KOGLER ET AL
PULSING DEVICE FOR ELECTRICALLY
OPERATED PERFORATORS

2,492,584

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2 Sheets-Sheet 2

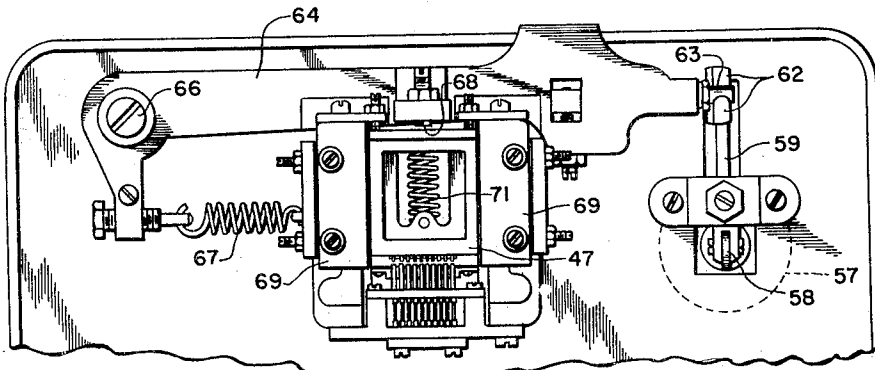


FIG. 2

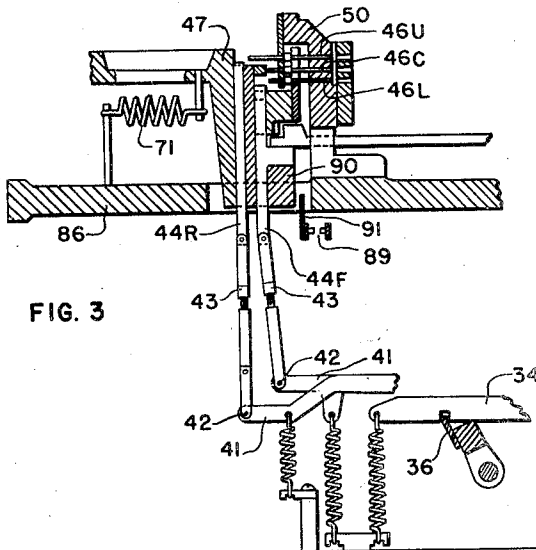


FIG. 3

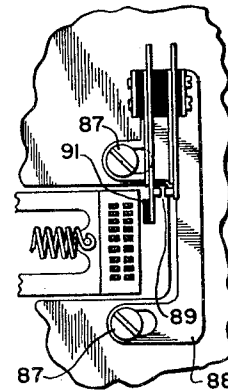


FIG. 4

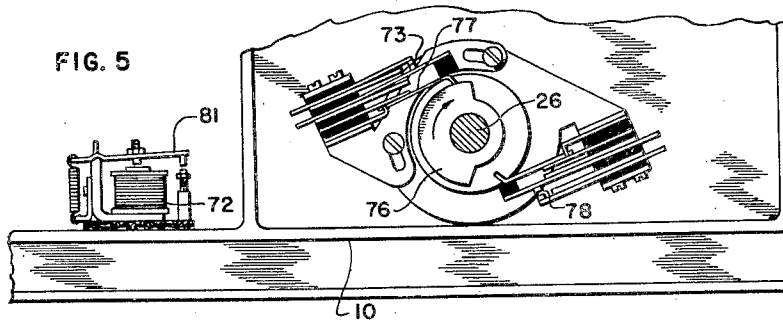


FIG. 5

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PULSING DEVICE FOR ELECTRICALLY
OPERATED PERFORATORS

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6 Claims. (Cl. 164—113)

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This invention relates to perforating apparatus and particularly to telegraph tape perforators wherein power for the perforating operation is furnished by the momentary energization of a punch hammer solenoid.

The invention finds special application in a translating set such as is disclosed in the patent of Gubisch, No. 2,354,115, wherein a five unit code selector mechanism senses a perforated tape and in response to the sensing operations, automatically operates the individual key levers or the space bar of a Wheatstone perforator to thereby transpose five unit code combinations into cable Morse code.

Some difficulty has been encountered in operating Wheatstone perforators automatically since the keyboard thereof is designed primarily for manual operation. In the Wheatstone perforator, substantially uniform operation of the universal contact which controls the punch hammer solenoid is obtainable in manual operation of the keyboard due to the fact that compensation for the length of the key levers and the space bar is made as is described in detail in the patent of Kleinschmidt, No. 1,085,985. The length of a particular key lever, of course, depends upon the row it occupies in the keyboard. The space bar conventionally occupies the outermost or lowest row of the keyboard. Compensation for these varying lengths is accomplished by varying the point at which the key lever and the space bar are connected with their associated notched selector bars. Since a substantially uniform operation of the notched selector bars is thus obtained and since selection of any of said bars causes closure of the universal contact, the pulsing period of the solenoid is maintained at a uniform level in manual keyboard operation.

However, in the translating set shown in the Gubisch patent, all the key levers and the space bar, regardless of their length, are operated at substantially the same distance from their fulcrums by a series of vertically extending links arranged in a single row. Thus, in automatic operation of the Wheatstone perforator, the mechanical balance provided for manual operation was upset and a variable period of closure time for the universal contact resulted. As a consequence, it was found that the selection of the space bar and the longer key levers for operation tended to prolong the closure of the universal contact and therefore prolonged the pulsing of the punch hammer solenoid. This caused an objectionable overheating of the punch hammer solenoid, rendering it sluggish and inefficient in

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operation upon the continuance of such a condition. Moreover, the top row of key levers, which are the shortest key levers, when individually selected for operation tended to cut short the operating time of the universal contact, resulting in a short pulse for the punch hammer solenoid which sometimes was insufficient to complete the punching operation. This latter situation was aggravated by the fact that the top row of key levers usually operates a heavy load of punches to perforate long code combinations and this tended to slow up the movement of the punch head which is under the control of a linkage operable by the punch hammer solenoid.

As already indicated above, the rate of travel of the punch head varies with the number of punches selected for perforating a particular code combination. In manual operation of the Wheatstone perforator, an operator's keyboard technique cures such a deficiency since she applies more or less pressure by means of her fingers in accordance with the length of the code combination, holding the universal contact closed for a greater length of time on the longer code combinations.

The main object of the present invention is to provide a tape perforator having means for insuring the reliable and efficient operation of a punch hammer solenoid associated therewith.

Another object of the invention is to provide a control circuit for a punch hammer solenoid which enables the pulsing of the punch hammer solenoid to vary with the load of punches and which insures a completion of the punching operation with no prolongation of the pulsing time beyond the point actually needed to complete any particular perforating operation.

A feature of the present invention is the provision of means which prevents repeat operations of the keyboard.

Other objects, features, and advantages will appear from the more detailed description which will hereinafter appear.

By the present invention, when the universal contacts of the Wheatstone perforator are operated, a circuit is closed to both the punch hammer solenoid and a control relay. The original operating circuit is then broken by the opening of a cam operated contact pair but meanwhile a new circuit has been prepared which extends through a cam operated safety contact pair and a contact tongue of a control relay. Just before the punch head reaches the end of its operating stroke, it closes a contact pair which by means of a resistance shunts out the winding of the control relay

and causes it to de-energize with a time lag which insures the complete travel of the punch head, before its contact tongue moves away and opens the circuit to the punch hammer solenoid. Thus, control of the operation is now taken away from the universal contacts after the punch solenoid is initially energized so that a variable operation of the universal contacts will not interfere with the pulsing time of the punch solenoid which now varies with the rate of travel of the punch head. This results in a highly efficient performance of the punch solenoid, maintaining it at minimum operating temperature with a minimum change in solenoid characteristics since the punch solenoid is now energized only for a period which insures a complete perforating operation.

Since overpulsing of the punch solenoid might also cause repeat operations of the keyboard the invention possesses the additional advantage of overcoming such an objectionable condition.

The invention may be more fully understood by reference to the detailed description which follows when read with reference to the accompanying drawings wherein:

Fig. 1 is a right end elevational view, partly in section showing parts of the translating set involved in the present invention;

Fig. 2 is a partial plan view of the Wheatstone perforator;

Fig. 3 is a vertical section illustrating particularly the punch block and punch head;

Fig. 4 is an enlarged detail view taken from the bottom showing the shunting contact pair involved in the present invention;

Fig. 5 is a detailed left end elevation view which particularly discloses the cam operated contact pairs and the control relay utilized in the present invention;

Fig. 6 is a schematic circuit illustration of the present invention;

Fig. 7 illustrates a section of tape with the letter "E" combination perforated therein, and

Fig. 8 illustrates a section of tape with the numeral "0" combination perforated therein.

A detailed description of the invention will now be undertaken but it will be understood that reference should be had to the afore-mentioned Gubisch and Kleinschmidt patents for a more complete description of the apparatus with which the invention is concerned. In Fig. 1, numeral 10 represents the base of a Wheatstone perforator which is indicated generally by the numeral 11. A portion of a five unit code selector mechanism is indicated generally by the numeral 12. As described in the Gubisch patent the code combination presented by a transverse row of perforations perforated in a five unit tape governs the positions of a set of five unit code bars 13. A sixth code bar 14 is provided for shift purposes to increase the number of possible selections in a manner well known in the art. Overlying a portion of the code bars 13 are a series of code levers 16 (only one of which is shown in the drawing) which are pivoted at 17 and urged in a downward direction by individual springs 18. Also mounted on pivot 17, at each end thereof, are code lever bail arms 19 (only one of which is shown in the drawing) which support at their free ends the code lever bail 21. Code lever bail arms 19 are each pivotally connected at 22 to an upwardly extending arm 23 of a cam follower 24 whose movement is controlled by an eccentric cam 25 carried by operating shaft 26. Shaft 26 is released for rotary

movement and a cycle of operations by means of a single revolution clutch (not shown).

During each cycle of operations the code bars 13 are set according to the operation of the five unit sensing mechanism (not shown) and the provision of an alignment of notches in the code bars 13 enables a selected code lever 16 to be drawn downwardly by its individual spring 18 as bail 21 moves from beneath the free ends of all the code levers 16 due to the operation of cam follower 24 by shaft 26. Actually all the code levers 16 move down slightly but only the selected one drops into an alignment of notches in the code bars. The free end of each code lever 16 is bifurcated at 27 and receives thereat a pin 28 carried at the lower end of a vertically extending link 29. The upper end of each link 29 carries a roller 31 which overlies a key lever 32. It is thus evident that when a particular code lever 16 is selected, it will, by means of link 29, draw downwardly an associated key lever 32.

All of the key levers 32 are fulcrumed near their inner ends on a fixed transverse bar 33. Arranged longitudinally of and beneath the key levers 32, are notched selector bars 34 fulcrumed near their inner ends on a transverse bar 36. The key levers 32 of the top row of the keyboard are connected by small straps 37A to their associated notched selector bars 34. Similarly, the key levers of the other rows of the keyboard, B, C, D, and space bar 38 which occupies position E are connected by straps 37B, 37C, 37D and 37E at progressively further distances from the fulcrum 33. In this manner the lengths of the key levers 32 and space bar 38 are compensated for so that in manual operation a substantially uniform operation of the notched selector bars 34 is obtained. Individual springs 35 attached to the rear of levers 34 normally maintain the key levers 32 in their upward position.

The notched selector bars 34 selectively engage T bars 39 each of which is associated with a pivoted connecting bar 41 (Fig. 3) as is more fully disclosed in the Kleinschmidt patent referred to above. Some of the connecting bars 41 are pivotally connected at 42 to links 43 which are connected at the upper ends to a front row of punch interponents 44F. Others of the connecting bars 41 terminate in a downwardly extending portion which are pivotally connected at 42 to links 43 which are connected at their upper ends to a rear row of punch interponents 44R. Punch interponents 44F and 44R extend upwardly to the rear of punch block 50. Interponents 44F control the lower punch pins 46L, while interponents 44R control the upper punch pins 46U. Centrally located with respect to the upper punch pins 46U and the lower punch pins 46L are the feed hole pins 46C which are universally operated each time punch head 47 moves forward as will be later explained. If a T bar is selected it will rock the rear end of its associated connecting bar 41 upwardly and if a front row interponent 44F is connected therewith, for example, the upper end of the interponent will be placed in front of its associated pin 46L so that on operation of the punch head 47 this particular pin will be projected through the tape which is positioned in the guideway 48. The rear row of interponents 44R will be operated in a similar manner.

In addition to selecting certain T bars 39, all notched selector bars 34 in their downward movement operate the universal T lever 49 which is at

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the extreme left of T bars 39, as is shown in Fig. 1. Operation of the universal T lever 49 causes lever 51 (Fig. 1), which is similar to connecting levers 41, to move upwardly. The rear end of lever 51 has connected therewith, by means of insulating piece 52, a universal contact operating bar 53 which operates against universal contact 54 which is screw threaded and has a knurled head 56 for adjustment purposes.

Upon each operation of the universal contact 54, punch hammer solenoid 57 is energized and its plunger 58 is moved downwardly. The plunger 58 has pivotally connected thereto at its upper end a laterally extending arm 59 of a bell crank 61 whose vertical arm terminates in a bifurcation 62 which straddles an extension pin 63 carried by the main operating lever 64 (Fig. 2). Main operating lever 64 is pivoted at 66 and is normally urged in a counterclockwise direction by means of a large spring 67. When punch hammer solenoid 57 is energized bell crank 61 pivots counterclockwise as viewed in Fig. 1 and the main operating lever 64 moves clockwise as viewed in Fig. 2. As the main operating lever 64 moves forward an adjustable screw 68 carried thereby engages the rear of the punch head 47 and moves it forward in guideways 69 against the action of a compression spring 71. The forward movement of punch head 47 causes selected ones of the pins 46U and 46L to be driven through the tape as previously explained. Two of the feed pins 46C are driven through the tape for the shortest code combination and the total number of feed pins 46C operated may increase with the length of the perforated code combination. On the return stroke of main operating lever 64, the pins 46U and 46L and 46C are withdrawn from the tape and a new section of blank tape is fed into punching position by means not shown.

Referring now particularly to Fig. 6, the operation of the circuit involved in the present invention will be described. Upon each closure of the universal contact 54, an obvious circuit is made for punch hammer solenoid 57 and control relay 72 which extends through cam controlled contact pair 73 and over conductor 74. In each cycle of operations, shaft 26 is released for rotary movement by a single revolution clutch not shown. After a partial revolution of shaft 26, cam 76 carried thereby will enable a follower 77 associated with contact pair 73 to move to a low part of the cam and open the original operating circuit. However, a new circuit has now been established which extends from battery, through cam safety contact pair 78, as its follower 89 now rides the high part of cam 76, over conductor 79, through contact tongue 81, through the winding of control relay 72 and resistances 82 and 83 to ground. It is obvious that control of the circuit is now taken away from the universal contact after it has once operated and transferred to control relay 72. Resistance 78 and condenser 75 are provided for spark prevention purposes.

Beneath shelf 86 (Figs. 3 and 4) which supports the main operating lever 64, punch head 47, punch block 50 and other parts of the apparatus, there is adjustably mounted by screw and slot connections 87, a plate 88 which supports a shunting contact pair 89. Carried by one of the blades of the contact pair 89 is an insulating projection 91 which extends upwardly into the path of movement of a portion 93 of punch head 47. As the punch head 47 moves forwardly, as explained, just before it reaches the end of its stroke it closes contact pair 89 (Fig. 6) shunting out the winding

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of control relay 72 through resistance 83. This enables control relay 72 to de-energize with a time lag which delays the opening of its contact tongue 81, thereby delaying the breaking of the circuit to punch hammer solenoid 57 until the punching operation has been completed. The opening of safety contact pair 78 in each operation is a precautionary measure to insure that there will be no accidental closure of the circuit to the control relay 72 and punch hammer solenoid 57 when the perforator should be inactive. Since the rate of travel of the punch head 47 varies with the punch load to be operated by the punch head at a particular time, the shunting contact pair 87 after being adjusted to the proper position will be operated at an instant which insures the complete travel of the punch head with no unnecessary overpulsing or clipping of pulses supplied to the punch solenoid.

As an example of the two extremes of punch loads for perforating characters, an inspection of Figs. 7 and 8 will show that the letter E which is composed of a single dot has only one upper perforation and one lower perforation, besides two feed hole perforations. The numeral 0 (zero), on the other hand, is made up of five dashes and receives five upper and five lower perforations, plus ten feed hole perforations. It is thus seen that there may be considerable variation in the load carried by the punch head 47.

As stated earlier in the description the invention has the additional advantage of preventing repeat operations of the keyboard which might occur if pulses applied to the punch solenoid were unnecessarily prolonged.

Various changes and modifications may be made in the present invention without departing from the spirit and scope thereof.

What is claimed is:

1. A Wheatstone perforator including a plurality of selectable punch elements, a punch solenoid, a punch head operable by said solenoid for operating selected punch elements to perforate strip material, a control relay, a universal contact means for initially operating said punch solenoid and said control relay, means for thereafter transferring control of said punch solenoid solely to said control relay, a shunting circuit for said control relay, and contact means operable by said punch head at a predetermined point in the operating stroke of said punch head to operate said shunting circuit, said shunting circuit including resistance means for delaying the de-energization of said control relay to thereby delay the de-energization of said punch solenoid to insure a full operating stroke of said punch head in a predetermined period of time.

2. A perforator including a selector mechanism, a plurality of punch elements selectable by said selector mechanism, a punch solenoid, a punch head operable by said solenoid for actuating selected punch elements to perforate strip material, a control relay, a universal contact means operable in each perforating operation for initially energizing said punch solenoid and said control relay, means for thereafter transferring control of the energization of said punch solenoid to said control relay and maintaining said control relay energized, a shunting circuit for said control relay and contact means operable by said punch head at a predetermined point in the operating stroke thereof for operating said shunting circuit, said shunting circuit including resistance means for delaying the de-energization of said control relay to thereby delay the de-

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energization of said punch solenoid to insure the completion of the operating stroke of said punch head in a predetermined interval of time.

3. A perforator including a selector mechanism, a plurality of selectable elements selectable by said selector mechanism, a punch solenoid, punching means operable by said solenoid for actuating selected punch elements to perforate strip material, a control relay, a switch operable in each perforating operation for initially energizing said punch solenoid and said control relay, means for thereafter transferring control of the energization of said punch solenoid to said control relay and maintaining said control relay energized, a shunting circuit for said control relay, and an adjustable switch means operable by said punching means at a predetermined point in the operating stroke thereof to effect the operation of said shunting circuit, said shunting circuit including resistance means for delaying the de-energization of said control relay to thereby delay the de-energization of said punch solenoid to insure the completion of the operating stroke of said punching means in a predetermined interval of time.

4. A Wheatstone perforator including a selector mechanism, a plurality of punch elements selectable by said selector mechanism, a punch solenoid, punching means operable by said solenoid for actuating selected punch elements to perforate strip material, a control relay, an initial operating circuit including a universal contact and a cam operated contact for initially energizing said punch solenoid and said control relay, means for opening said cam operated contact to break said initial operating circuit, a second cam operated contact closable before said first cam operated contact opens for providing a new energizing circuit for said control relay and for thereby transferring control of the energization of said punch solenoid to said control relay, a shunting circuit for said control relay and an adjustable contact operable by said punching means at a predetermined point in the operating stroke thereof to operate said shunting circuit, said shunting circuit including resistance means for delaying the de-energization of said

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punch solenoid to insure the completion of the operating stroke of said punching means in a predetermined interval of time.

5. A perforator including a selector mechanism, a plurality of punch elements selectable by said selector mechanism, a punch solenoid, punching means operable by said solenoid for actuating varying numbers of said selected punch elements to perforate strip material, means for initially energizing said solenoid, control means, a circuit including a cam operated contact for transferring the control of the energization of said solenoid to provide control means after said solenoid has been initially energized, and means associated with said control means for prolonging the energization of said solenoid only for an interval gaged by the completion of the operating stroke of said punching means.

6. In a perforator, including a selector mechanism, a series of key levers for operating said selector mechanism, a plurality of punch elements selectable by said selector mechanism, a punch solenoid, a punch head operable by said solenoid for actuating varying numbers of said selected punch elements to perforate strip material according to the key lever selected for operation, means operable by any key lever for initially energizing said solenoid, control means, a circuit including a cam operated contact for transferring the control of the energization of said solenoid to said control means after said solenoid has been initially energized, and means associated with said control means for prolonging the energization of said solenoid only for an interval gaged by the desired time of completion of the operating stroke of said punch head.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,316,795	Lake	Apr. 20, 1943
2,343,882	Carr	Mar. 14, 1944

Certificate of Correction

Patent No. 2,492,584

December 27, 1949

HAROLD F. KOGLER ET AL.

It is hereby certified that errors appear in the printed specification of the above numbered patent requiring correction as follows:

Column 6, line 73, for "circulit" read *circuit*; column 8, line 13, for the word "provide" read *said*;

and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 6th day of June, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.

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