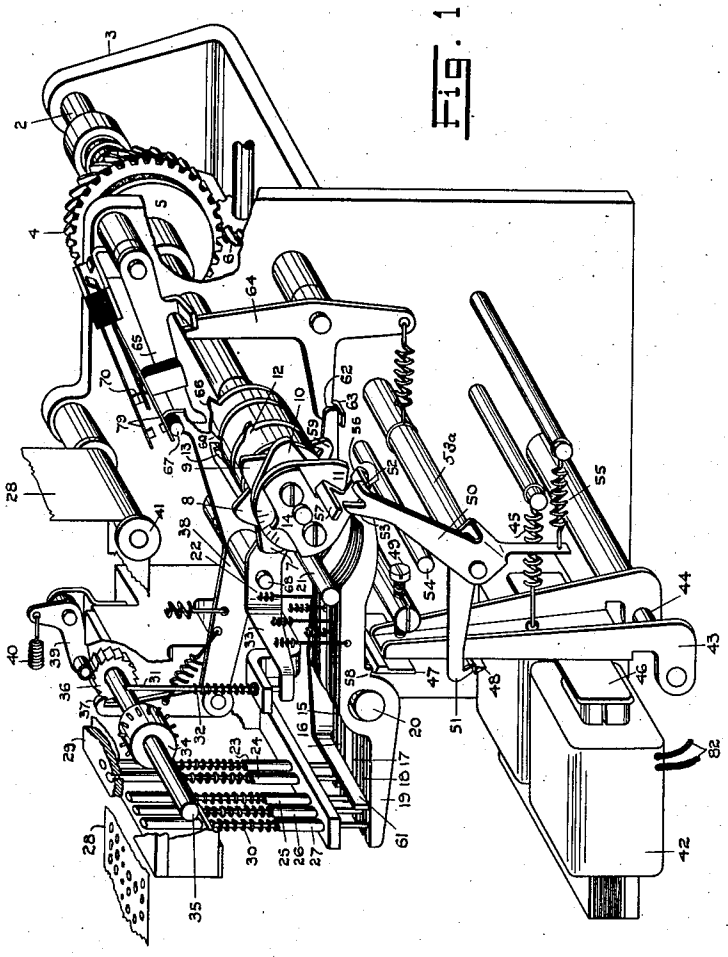
March 5, 1940. E. E. KLEINSCHMIDT 2,192,352

RECEIVING PERFORATOR

Original Filed May 7, 1937 2 Sheets-Sheet 1

Fig. 1



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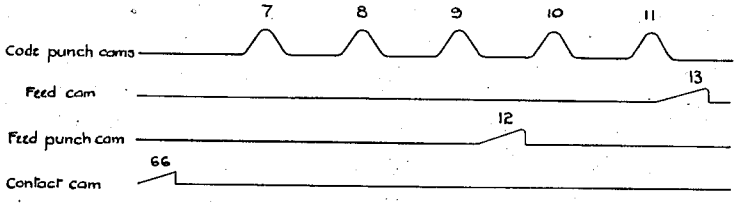

Fig. 7

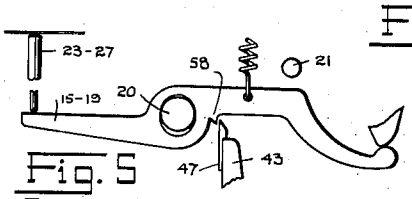

Fig. 5

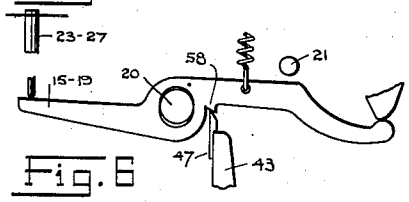

Fig. 6

Fig. 4

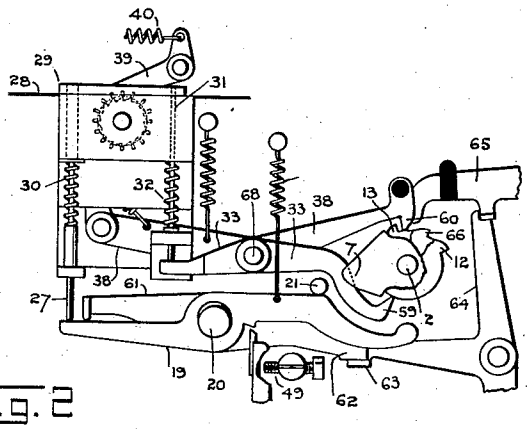

Fig. 2

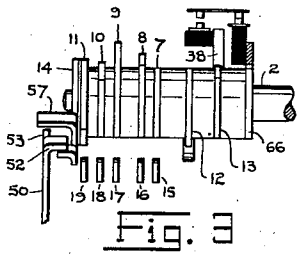

Fig. 3

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UNITED STATES PATENT OFFICE

2,192,352

RECEIVING PERFORATOR

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Application May 7, 1937, Serial No. 141,368
Renewed August 10, 1939

20 Claims. (Cl. 178—92)

This invention relates to telegraph receiving perforators and in particular, to the type in which a group of perforations representing the signals for telegraphing a letter is perforated cross-wise in a tape.

Perforators now in use, as well as those proposed in the past, are complicated and costly in that all are provided with means to store the received selections which then transfer these selections to a perforator or recording mechanism where separate mechanisms are provided to complete the perforating or recording operation.

In the present invention the devices for storing and transferring the selections, as well as the additional mechanism for perforating or otherwise recording the selections, are entirely eliminated. This simplification greatly reduces the number of parts required and makes possible the construction of a perforator at a much smaller cost. The cost of upkeep is also greatly reduced, and due to the direct action and to the reduced number of adjustments required, the perforator of the present invention will operate more reliably than those previously proposed.

An object of the invention is to provide a simplified mechanism in which the usual means for storing the selections and for operating the selected punches in a group are eliminated.

A further object is to provide a mechanism in which a set of cams operate a set of punch levers in succession and a receiving magnet determines the punching operation of the punch lever so that a perforation is made in the tape for a signal impulse when it is received on the receiving magnet.

A further object is to provide an automatic feed-out device for the perforated tape which is started in operation when a message is completely perforated thereon.

Referring to the drawings,

Figure 1 shows the complete perforator in perspective.

Figure 2 is a detail of the punch and die mechanism.

Figure 3 is a detail of the operating cams.

Figure 4 shows the circuit arrangement for operating the feed-out mechanism.

Figures 5 and 6 are details of the selecting mechanism.

Figure 7 is a timing chart.

Referring now to Figures 1 to 3, inclusive, all the parts of the perforator are mounted on plate 1. Shaft 2 is rotatably mounted in plate 1 and bracket 3. It is rotated by gear 4 through friction coupling 5. Pinion 6 which drives gear 4 is connected to a constant speed motor not shown. As shown in Figures 1, 2 and 3, shaft 2 has mounted thereon a set of code punch cams 7, 8, 9, 10 and 11, a feed punch cam 12, and a feed cam 13. An adjustable stop plate 14 is mounted on the cam assembly. A set of five code punch levers numbered 15, 16, 17, 18 and 19 which cooperate respectively with cams 7, 8, 9, 10 and 11 are mounted on stud 20 and are normally held against the lower part of stud 20 and against stud 21 by springs 22. The bearing aperture in code punch levers 15 to 19 is elongated so that the lower portion can move away from stud 20 for a purpose to be later explained. A set of code punches numbered 23, 24, 25, 26 and 27 are operated by code punch levers 15 to 19; the code punches when operated pass through paper tape 28 and die plate 29. Each of the code punches is provided with a spring 30 to withdraw it from die plate 29 after the punching operation. All of the code punches 23 to 27 are located in a row at right angle to paper tape 28.

Feed punch 31 is provided and has a spring 32 for retracting it from die plate 29 after the punching operation; feed punch 31 is operated by feed punch lever 33 pivoted on stud 68 which cooperates with feed punch cam 12. A feed wheel 34 is mounted on shaft 35 which has attached to it feed ratchet 36 and is operated by feed pawl 37, feed pawl lever 38 also pivoted on stud 68, and feed cam 13. A detent 39 is pressed against feed ratchet 36 by spring 40 and holds feed ratchet 36 in the fed position. Feed wheel 34 is located at a point approximately midway between code punches 23 to 27 and feed punch 31. The feed holes are therefore perforated in advance of the code holes. By this structure it is possible to perforate the code holes very close to the edge of die plate 29 so that the last row can be advanced out of the die immediately after they are perforated.

The blank paper tape 28 to be perforated is fed to the left in Figures 1 and 2 from a storage wheel not shown over roller 41 and from there under die plate 29 and over feed wheel 34.

A receiving magnet 42 is connected in the normally energized circuit of a transmitter by wires 82 according to the usual practice. Armature lever 43 is pivoted on stud 44 and held in the retracted position by spring 45. Armature lever 43 carries an armature 46 to cooperate with magnet 42, a fulcrum plate 47 having an upper beveled edge and a triangular stop projection 48. In the retracted position, armature lever 43 rests against stop screw 49. A start-stop lever 50, pro-

vided with stop and cam projection 51, stop lug 52 and cam face 53, is mounted on stud 53a and held in normal position against stop 54 by spring 55. Adjustable stop plate 14 is provided with stop lug 56 and cam lug 57.

Referring to Figures 1, 2, 5 and 6, each code punch lever is provided with an angular bearing and locking ledge 58 which cooperates with fulcrum plate 47 during the selecting and punching operation. The bearing ledges 58 are formed so that in the attracted position of armature lever 43 as shown in Figures 2 and 6 they will engage with fulcrum plate 47 and pivot thereon when one of the code punch cams 7 to 11 operates the punch lever of which it forms a part. When the bearing ledge of a punch lever engages fulcrum plate 47 to pivot (Figure 6) thereon, the angular face engages the angular face of fulcrum 47 and also locks armature lever 43 in position until the punching operation is completed. When the bearing ledge of a punch lever does not pivot on plate 47 but passes in front of it (Figure 5) as will occur when a code punch cam 7 to 11 operates a punch lever while armature lever 43 is in the retracted position, armature lever 43 will be locked in that position by the vertical face of ledge 58 until the punch lever returns to its rest position. The purpose of this construction is to increase the operating margins of the perforator under adverse signalling conditions by providing in the selecting mechanism a definite point of determination for completing a selecting operation after it has been initiated by the selecting magnet.

Perforating operation

Figure 1 shows the perforator apparatus as so far described in normal operating condition with armature lever 43 attracted and it is assumed that gear 4 is being rotated by pinion 6 and motor not shown at a constant speed in timed relation with the speed of a transmitter. Under these conditions shaft 2 and the cams mounted thereon are held stationary by stop lug 52 engaging with stop lug 56.

I will describe the operation of the perforator when it is receiving the letter A which consists of the following impulses: one no current start impulse, two current impulses, three no current impulses, and the normal current stop condition. Upon the reception of the no current start impulse, armature lever 43 is released and stop projection 51 drops off stop projection 48 under the action of spring 55, disengaging stop lug 52 from stop lug 56. Shaft 2 thereupon revolves. The first pulse for the letter A will attract armature lever 43 placing fulcrum plate 47 under bearing ledge 58 of code punch levers 15 to 19. As shaft 2 revolves, code punch cams 7 will engage with code punch lever 15, (Figs. 5 and 6) pressing same downward causing its bearing ledge 58 to engage with fulcrum plate 47. Code punch lever 15 now pivots on fulcrum plate 47 and forces code punch 23 through paper tape 28.

The second pulse for the letter A also holds armature lever 43 attracted until code punch cam 8 has engaged code punch lever 16 to force code punch 24 through the paper tape 28 in the same manner as just described.

The third pulse for the letter A being no current, releases armature lever 43 moving fulcrum plate 47 out of the path of bearing ledges 58 (Fig. 5) so that when code punch cam 9 engages with code punch lever 17, its bearing ledge 58 does not fulcrum on plate 47 and code punch 25 is not operated. Code punch lever 17 now fulcrums on code punch 25 at the end opposite to that engaged by code punch cam 9. The springs 22 which have less tension than the springs 30 will be extended and the punches will not be moved. The fourth and fifth impulses for the letter A are also a no current condition, armature lever 43 therefore remains retracted and neither of the code punches 26 and 27 are operated. The then following normal stop pulse will attract armature lever 43 and cam lug 57 will engage cam face 53 and move start-stop lever 50 to replace projection 51 on top of stop projection 48. This action will momentarily withdraw armature lever 43 slightly from its attracted position. While shaft 2 is rotating and while code punch levers 15 to 19 are being operated, feed punch cam 12 engages projection 59 forming part of feed punch lever 33 and operates that lever to force feed punch 31 through the paper tape 28. After the code punches have been operated, feed cam 13 engages with projection 60 forming part of feed pawl lever 38, operating it to move feed ratchet 36 one tooth, thus feeding paper tape 28 forward the space equal to one row of perforations.

Automatic feed-out device

It is found desirable in various types of transmitting systems to automatically feed out the tape after the message has been completely perforated therein. To accomplish this the following devices are provided:

As shown in Figure 1 a universal bar 61 is pivoted on stud 20 and has a projection 62 which engages projection 63 forming part of latch lever 64. At every revolution of shaft 2 a cam 66 operates lever 65 to set in on latch lever 64 thereby closing the contacts 70. Feed pawl lever 38 has a stud 67 that engages with contact springs 79 to close them momentarily whenever feed cam 13 operates feed pawl lever 38.

Referring to Figure 4, the contact springs 70 and 79 are connected in series and are placed in a circuit with stepping magnet 71 and battery 80. Armature lever 72 which cooperates with magnet 71 carries a spacing pawl 73 that operates ratchet wheel 74. Detent 75 is provided to hold ratchet wheel 74 in its various set positions. To the ratchet is attached projection 76 which in its normal position engages with contact spring 77 to hold the same out of contact with contact spring 78. Contacts 77 and 78 are in a circuit bridging perforator receiving magnet 42.

Automatic feed-out operation

In the arrangement set forth it is contemplated that a blank combination, that is: a combination of signals which perforate no holes in the paper tape 28 shall be transmitted at the end of every message. As previously mentioned, contact cam 66 operates lever 65 to latch it on latch lever 64 closing contacts 70. This happens at the beginning of every operating cycle as shown by the timing chart, Figure 7. If thereafter a blank combination of signals is received on magnet 42, none of the code punch levers 15 to 19 will be operated and therefore universal bar 61 will not be operated. At the end of the cycle feed pawl lever 38 will be operated by feed cam 13 and will momentarily close contacts 79 establishing a circuit through the stepping magnet 71 and battery 80. Stepping magnet 71 will thereupon operate its armature lever 72, stepping ratchet wheel 74 one tooth. This action will disengage projection 76 from contact spring 77 permitting it to con-

tact with spring 78 and close a circuit around the perforator receiving magnet 42. After a message has been received by the perforator it is expected that there will be a short interval before the following message is started. During this interval the normal stop current is on the transmission line.

When receiving magnet 42 is shunted by contact springs 77 and 78 it becomes deenergized releasing armature lever 43 and permitting shaft 2 to rotate in the manner previously described. Under this condition armature lever 43 is not attracted and fulcrum plate 47 remains out of the path of bearing ledges 58, none of the code punch levers 15 to 19 are operated, contact operating lever 65 remains latched on latch lever 64 and for every revolution of shaft 2 contact spring 79 will close momentarily, causing stepping magnet 71 to step ratchet wheel 74 one tooth for each revolution of shaft 2. This continues until projection 76 again engages with contact spring 77 to break its connection with contact spring 78, thereupon receiving magnet 42 is again energized, armature lever 43 attracted and when cam lug 57 engages with cam face 53, start-stop lever 50 is reset and stop lug 56 will engage with stop lug 52 and remain there until another message is transmitted into the perforator.

When a combination of signals other than a blank is received on magnet 42 at least one of the code punch levers 15 to 19 is operated and universal bar 61 will be operated to operate the latch lever 64 and release contact lever 65 permitting contact 70 to open. When thereafter the feed pawl lever 38 operates to close contact spring 79 no circuit will be established through the stepping magnet 71. The automatic feed-out device will therefore remain inoperative whenever a combination of signals other than blank is received on magnet 42.

While the invention herein described is shown in connection with the operation of a receiving perforator to operate in the circuit of transmitter sending five unit permutation code and start-stop signals, it is to be understood that its application is not limited thereto but has a wide field in various forms of telegraph systems using different signalling codes.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. A telegraphic receiving perforator comprising a group of punches, a group of punch levers, one for each unit in a code, a group of cams for operating the punch levers in succession one at a time, and a receiving magnet for selectively controlling the operation of the punch levers on the punches.

2. A telegraphic receiving perforator comprising a group of punches, a group of punch levers, one for each unit in a code, a group of cams for operating the punch levers in succession one at a time, and magnet operated means associated with the punch levers to cause the latter to operate a punch, or to prevent the operation of a punch, in accordance with the signals received on said magnet.

3. A telegraphic receiving perforator comprising a group of punches and mechanism to operate said punches to perforate a record tape in code groups in accordance with received code signals, and means to automatically advance the tape through the perforator a predetermined number of code groups when the first group of code signals of predetermined combination is received.

4. A telegraphic receiving perforator comprising a group of punches, a group of operating punch levers, one for each unit in a code, a group of cams for operating the punch levers in succession one at a time, said levers under normal or inactive operation pivoting on the punches and under active operation pivoting at a point between the punches and the cams on an abutment which is movable in or out of the pivoting point of the punch lever to thereby selectively control the operation of the punch levers on the punches.

5. A telegraphic receiving perforator comprising a group of code punches, means to operate said punches to perforate a record tape, and an electro magnet to operate a selecting mechanism to selectively control the operation of the punches on the record tape, means operated by direct operation of the selecting mechanism to make the electro magnet inactive for a predetermined number of punching operations.

6. A telegraphic receiving perforator comprising a group of code punches, a set of punch levers to operate said punches to perforate a record tape, and an electro magnet to operate selecting mechanism to selectively control the operation of the punches on the record tape, means operated by the punching mechanism to short circuit the electro magnet for a predetermined number of punching operations when a group of signals of predetermined combination are received on the said magnet.

7. A telegraphic receiving perforator comprising a receiving magnet, an armature cooperating with said magnet, a group of punch levers, one for each unit in a code and arranged to cooperate with said armature, a group of code punches, a series of cams, one for each punch lever and arranged to operate directly the levers in succession, said cams operating in timed relation to the signals received on the magnet and the co-operating faces of the armature and the punch levers so located that when a punch lever is operated by its cam in one position of the armature, it engages the latter to pivot thereon and operate a punch, and in the other position of the armature it does not engage therewith and does not operate a punch.

8. A telegraphic receiving perforator comprising a group of punches and a group of punch levers, a set of cams rotated in timed relation with the received signals to directly and selectively operate the punch levers and the punches, one at a time.

9. A telegraphic receiving perforator comprising a group of punches, a group of punch operating levers each having two pivoting points, a group of cams each individual to a punch lever and rotated in timed relation with received signals, a selecting magnet, an armature lever therefor carrying a fulcrum member that will engage directly with a pivoting face of a punch lever in one position of the armature lever and thereby

operate a punch and not engage with the pivoting face in the other position of the armature lever.

10. A telegraphic receiving perforator comprising a group of punches, a group of punch operating levers each individual to a punch, cam means to operate the punch operating levers in succession, and magnetically controlled means to control the operation of the punch levers on the punches.

11. A telegraphic receiving perforator comprising a group of punches, a group of punch operating levers, and cam means to operate the punch operating levers, magnetic means to directly control the selective operation of the punch operating levers on the punches, a contact device under the control of the selective operation of the punches, and means operated by said contact device to control the selective operation of the punches.

12. A telegraphic receiving perforator comprising a group of punches, a group of punch operating levers, a set of cams rotated in timed relation with received signals to always operate the punch operating levers in succession, a fulcrum movable into two positions, said punch operating levers when operated by the cams engaging with the fulcrum to operate the punches and to lock the fulcrum against movement when it is in one of its positions and to engage with the fulcrum to lock it against movement but not operate the punches when the fulcrum is in its other or second position.

13. A telegraphic receiving perforator comprising a group of punches that are operated in succession one at a time by a group of cams under the selective control of a receiving magnet.

14. A telegraphic receiving perforator comprising a group of punches that are operated in succession one at a time by a group of cams under the selective control of a receiving magnet, said selective control comprising an armature for said magnet, a set of operating members that are always operated in succession by the cams, said armature engaging with the operating members in two positions to thereby selectively operate the punches to lock the armature against movement regardless of any change in the magnetic character of the magnet.

15. A telegraphic receiving perforator comprising a group of punches, operating means for said punches, signal responsive means controlling said operating means, and interlocking means for said operating and signal responsive means to increase the operating margins under adverse signalling conditions.

16. A telegraphic receiving perforator comprising a group of punches, operating means individual to each of said punches, signal responsive means controlling said operating means, and interlocking means for said operating and signal responsive means to increase the operating margins under adverse signalling conditions.

17. A telegraphic receiving perforator comprising a group of punches, operating means individual to each of said punches, signal responsive means successively controlling said operating means, and interlocking means for said operating and signal responsive means to increase the operating margins under adverse signalling conditions.

18. A telegraph receiver operated by equal length groups of two-element permutation code signals and comprising selecting means, recording means, spacing means and means under the direct and immediate control of a single group of code signals received by the selecting means to initiate the operation of only the spacing means for a predetermined number of spaces.

19. A telegraph perforator operated by equal length groups of two-element code signals and comprising selecting means, code hole perforating means, feed hole perforating and spacing means, and means to operate the feed hole and spacing means apredetermined number of times including selective means that are operable by a predetermined group of code signals to initiate the operation of said feed hole and spacing means.

20. In a receiving perforator a group of punches, a group of cams to always operate a group of punch operating levers one at a time and in timed relation with received signals, and a receiving magnet to control the selective operation of the punch operating levers on the punches.

EDWARD E. KLEINSCHMIDT.