March 13, 1945. F. WARBURTON 2,371,367

TELEGRAPH APPARATUS

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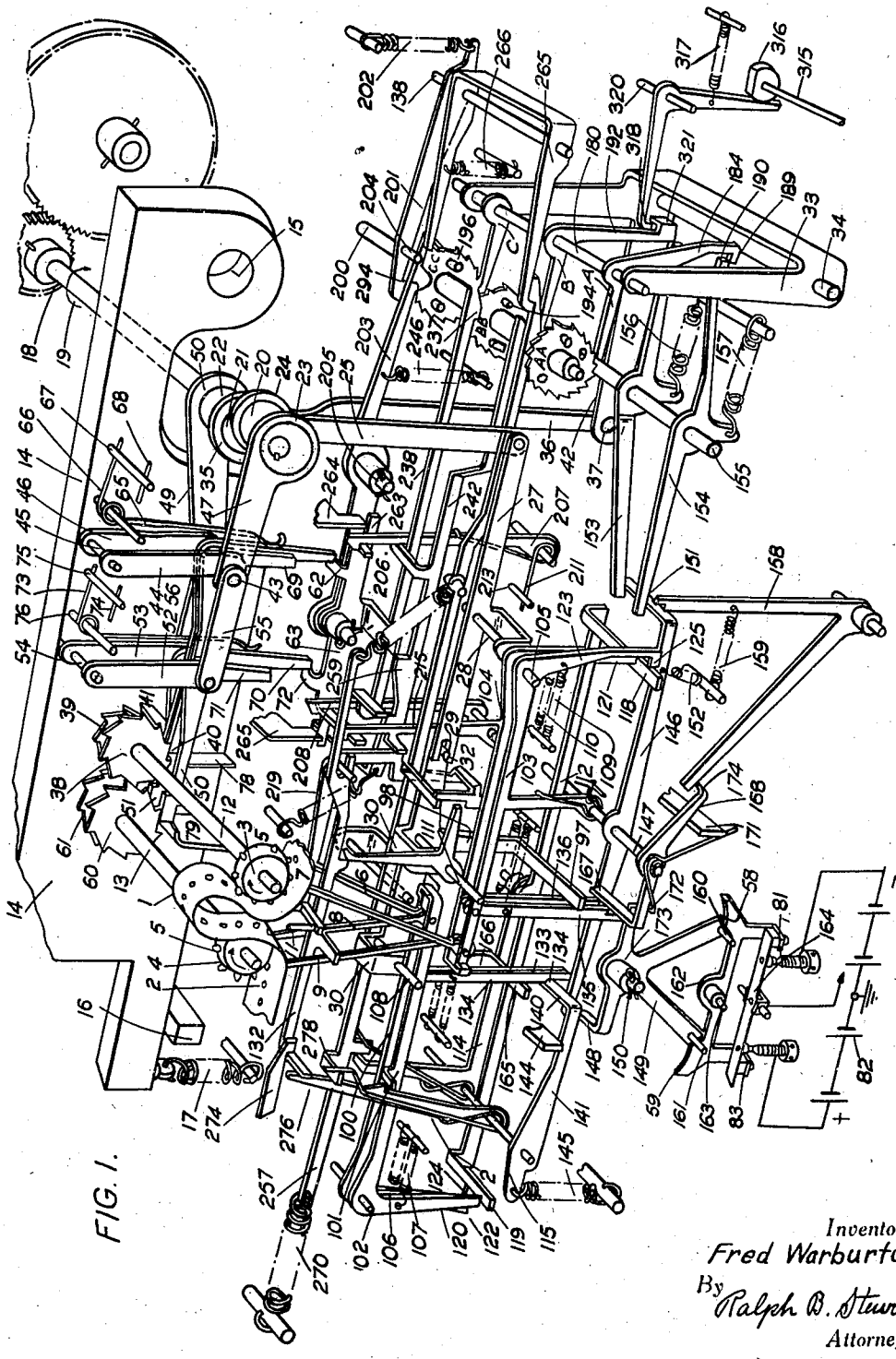


FIG. 1.

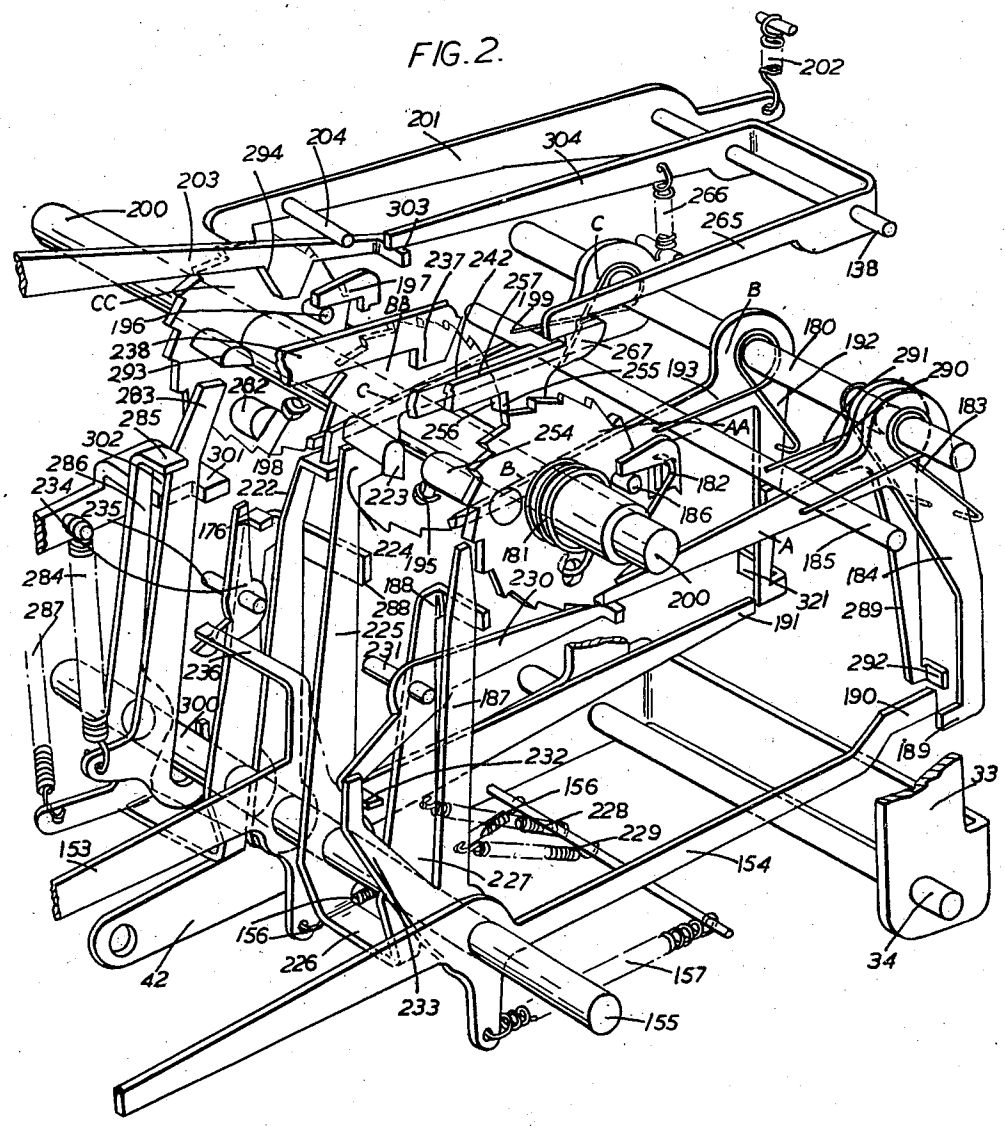
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TELEGRAPH APPARATUS

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FIG. 2.



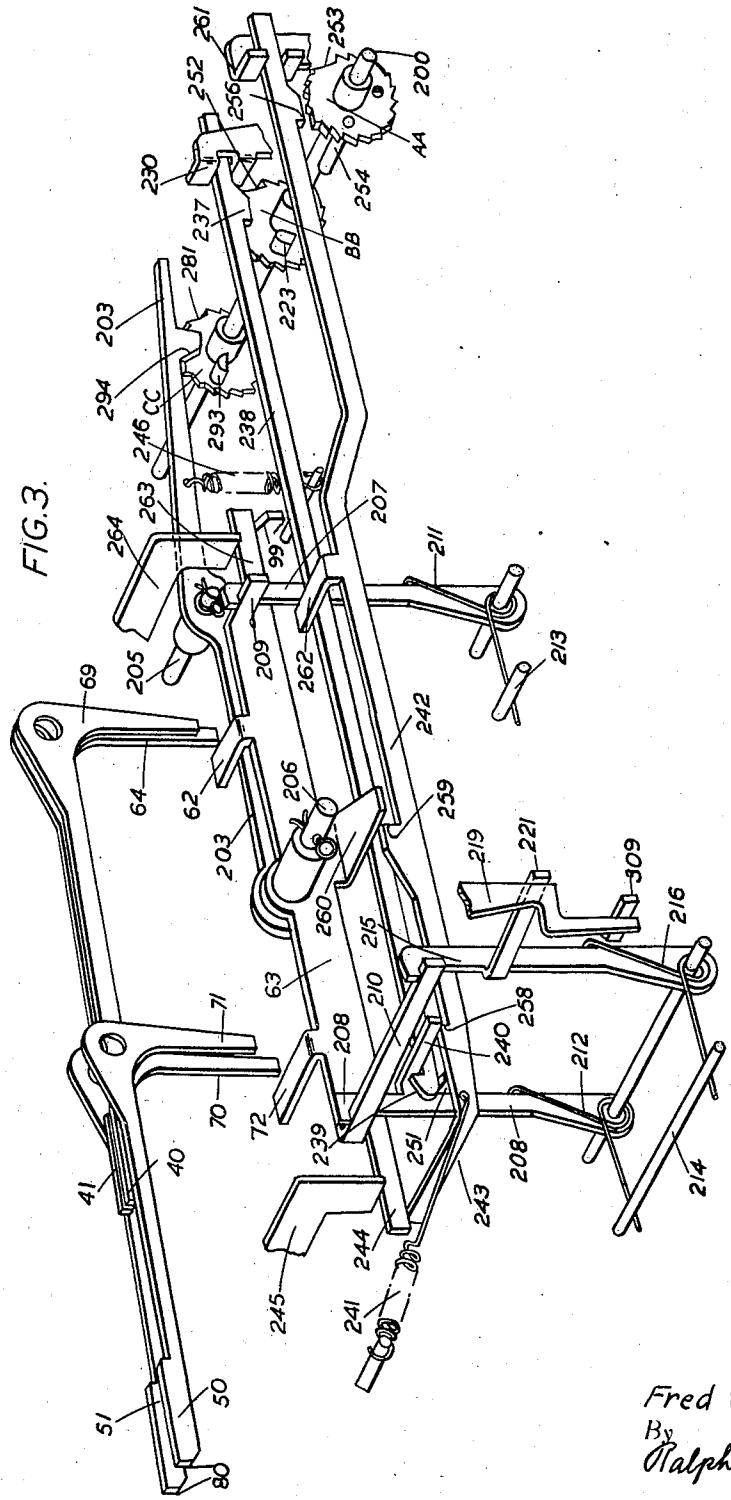
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TELEGRAPH APPARATUS

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FIG. 3.



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TELEGRAPH APPARATUS

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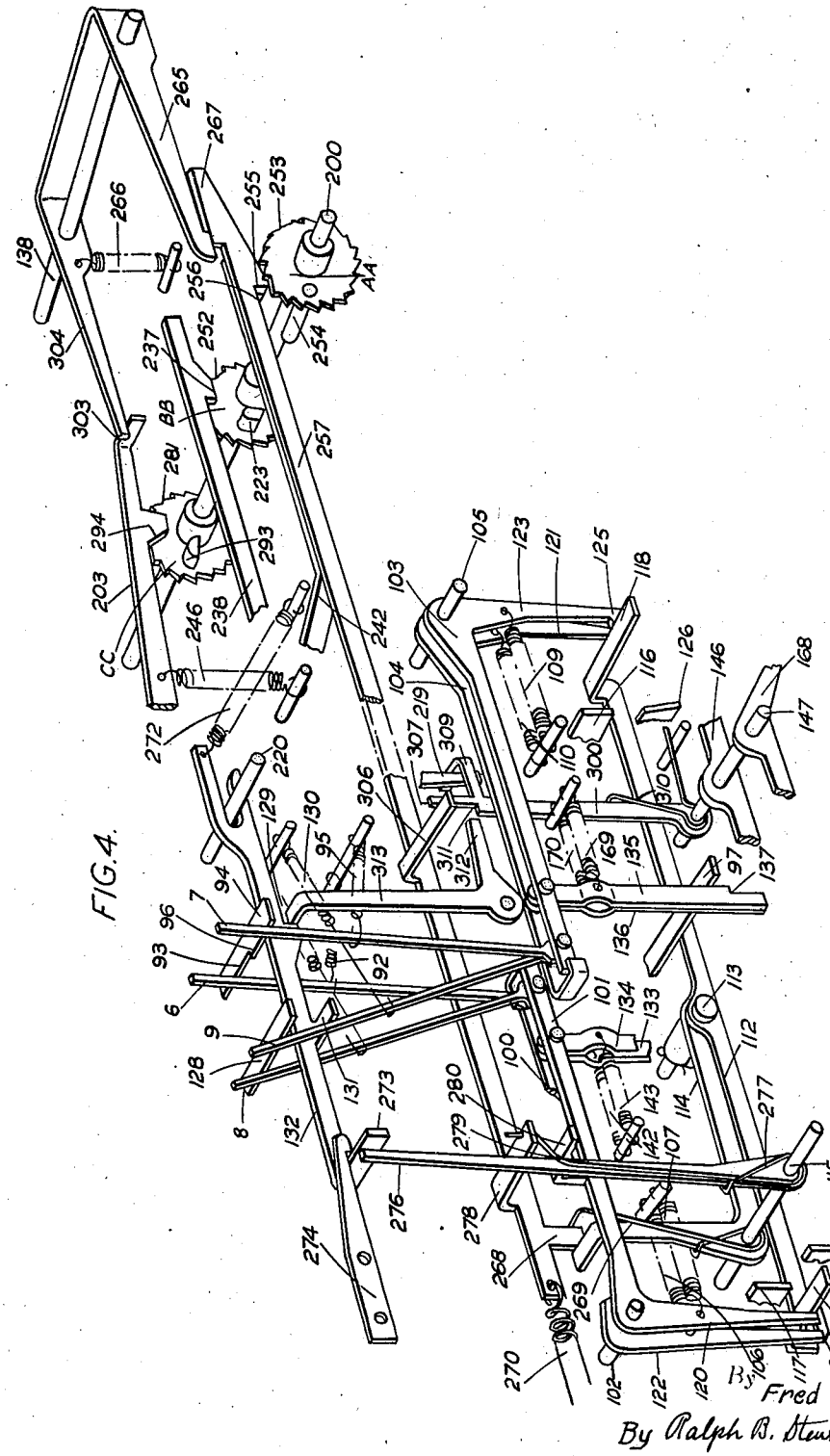


FIG. 4.

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FIG.5.

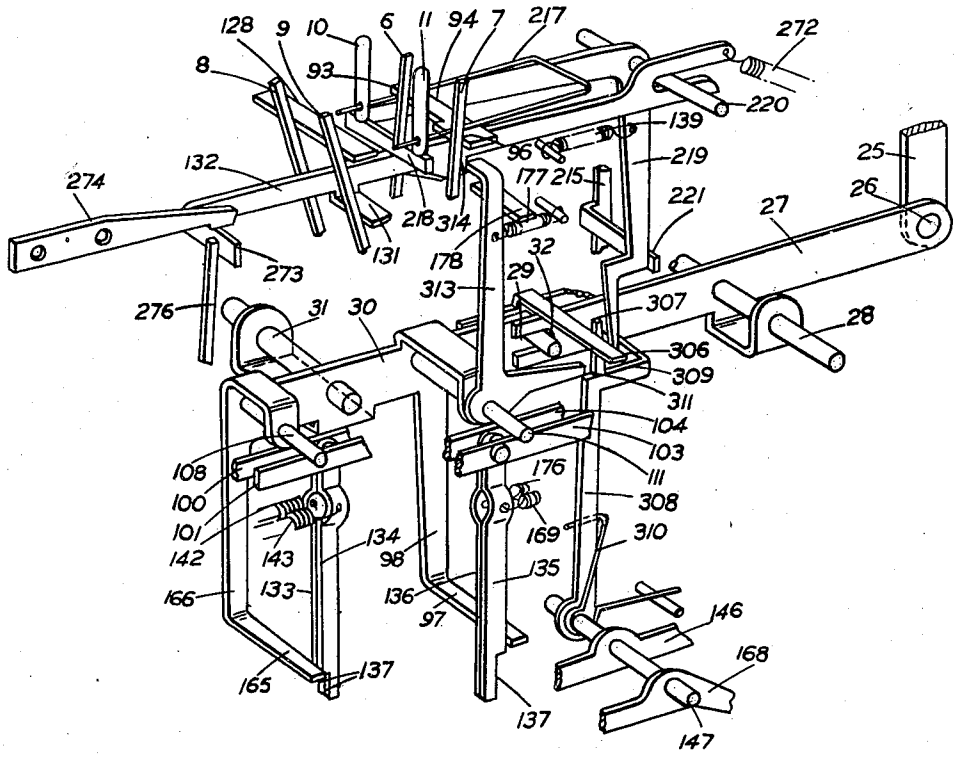
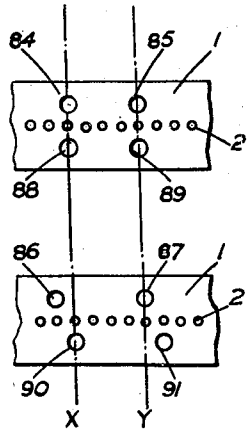


FIG.8.



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TELEGRAPH APPARATUS

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FIG. 7.

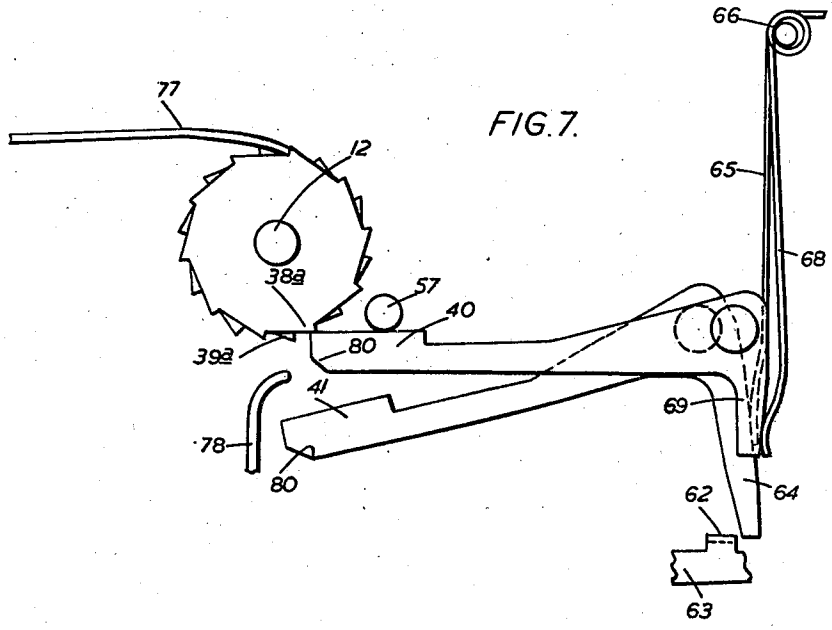
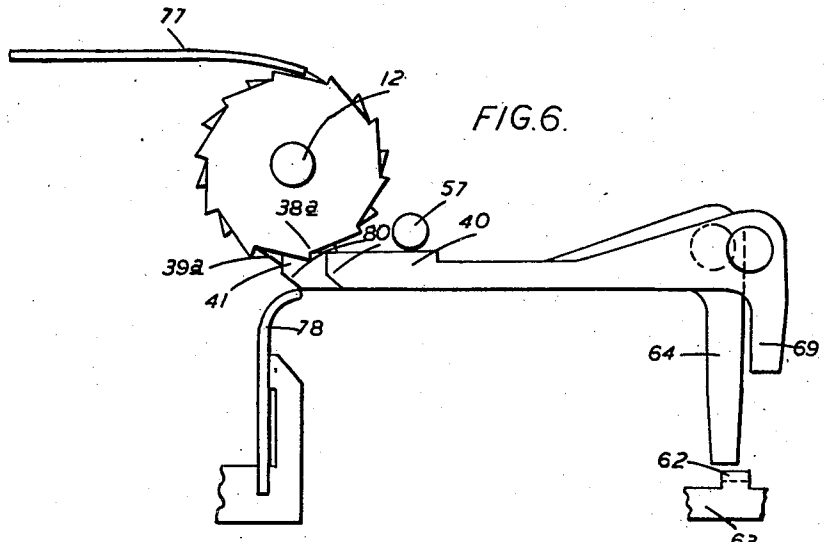


FIG. 6.



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UNITED STATES PATENT OFFICE

2,371,367

TELEGRAPH APPARATUS

Fred Warburton, London, England, assignor to Cable and Wireless Limited, London, England, a British company

Application August 18, 1944, Serial No. 550,066
In Great Britain September 16, 1943

26 Claims. (Cl. 178—17)

This invention releates to telegraph transmitting apparatus actuated under the control of a record strip, such as a perforated tape, bearing a series of words represented in a code comprising permutations of elements such as dots and dashes. A code of this kind may be based on the well known Morse code and consist, for example, of the code known in telegraphy as the Morse Wheatstone code or double current cable code. In such a code the various letters, digits, or other symbols transmitted are represented respectively by code permutations containing different numbers of elements; for example, as is well known, in Morse code the letter E is represented by a single dot and the letter T by a single dash while the less common letters are represented by four elements. Although the invention is particularly applicable to the transmission of such codes, it may also be applied to the kind of code that is used in private teleprinters and in which each letter or the like is represented by a fixed number (such as five) of code elements.

Although the invention may be applied to cable transmission, it is mainly concerned with the case where the transmission takes place by wireless. Then, as is well known, the atmospheric conditions vary from time to time and the signal reception often deteriorates so that it becomes advantageous to repeat each word, the transmission of each word in a series of words being repeated before the transmission of the next word. This involves a substantial increase in the time and labour necessary in preparing the strip and it often happens that, when the strip is prepared with each word recorded twice thereon, the atmospheric conditions have improved so that the "words twice" transmission is unnecessary and the record may then have to be prepared again with each word recorded only once. The object of the present invention, therefore, is to render the preparation of strip with a "words twice" record thereon unnecessary by providing transmitting apparatus that will automatically transmit each word twice, when required, from a record bearing each word once.

According to the invention, telegraph transmitting apparatus, actuated under the control of a record strip bearing a series of words represented in a code comprising permutations of elements such as dots and dashes, is furnished with mechanism for detecting the division between two consecutive words and with transmitting mechanism responsive to the detecting mechanism for repeating the transmission of each word before the transmission of the next word. The detecting mechanism may cause each section of the strip that contains a record of a word to undergo two separate and distinct feeding movements which take place in succession and during each of which the code representations are explored for the transmission of the word. Thus, when the code perforations for the word cover more than a predetermined length of strip, the latter may be caused to gather between two points at which the code representations are explored respectively during the two feeding movements. Generally, the code representations will be in the form of perforations punched in paper tape, the perforations being explored by peckers both for the initial transmission and for the repeat transmission. Accordingly, there may be two pairs of peckers, one for the initial transmission of each word and the other for the repeat transmission, the pairs of peckers being alternately brought into operation for a period corresponding to the length of the word, and the alternate actuation of the pairs of peckers corresponding to the two feeding movements of the tape provided for the initial and repeat transmission of the word.

The physical characteristic of the record which indicates the division between two words may consist of the usual gap provided between the last perforation in one word and the first perforation in the next word. Then the apparatus is arranged so that, on detecting this gap, the repeat transmission is initiated and continues until the tape is once more drawn taut between the two aforesaid points at which the code perforations are explored respectively during the two feeding movements, whereupon the apparatus is automatically rendered capable of detecting the beginning of the next word and effecting the initial transmission thereof.

In order that the invention may be clearly understood and readily carried into effect, telegraph transmitting apparatus in accordance therewith will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of the apparatus, some parts being omitted to avoid too great complexity and consequent obscurity,

Figure 2 is a perspective view of certain parts appearing in Figure 1 and associated parts that are omitted from Figure 1,

Figures 3, 4 and 5 are further perspective views of portions of the apparatus appearing in Figure 1,

Figures 6 and 7 are diagrammatic side elevations of an assembly in the apparatus, the assem-

bly being shown in different operative conditions respectively in the two figures, and

Figure 8 shows two portions of paper tape as used in the apparatus.

It will, of course, be understood that the apparatus appearing in the drawings is supported by a framework which for the sake of clarity has been omitted except such few portions of the framework as have a special functional relationship with the apparatus.

As is usual, the apparatus is operated by paper tape 1 (Figure 1) previously formed with code perforations representing the signals to be transmitted. As shown in Figures 1 and 8, the tape is also formed with a central line of centerholes 2 which enable the tape to be fed through the apparatus by sprockets 3 and 4 each provided with ten equidistantly spaced teeth 5 so that in one revolution of a sprocket the tape is fed forward an amount equal to the distance between ten centerholes 2 and in one tenth of a sprocket revolution the tape is fed forward the distance between two consecutive centerholes which may be referred to as one centerhole feed.

When each word in a signal is to be transmitted only once the sprocket wheels 3 and 4 are rotated clockwise simultaneously and the tape is explored or sensed by peckers 6 and 7 (Figures 1, 4 and 5) which are raised at predetermined instants to determine the presence or absence of code perforations along the tape 1. On the other hand, when each word is to be transmitted twice, the sprocket 4 is stationary during the first transmission while the sprocket 3 feeds the tape past the peckers 6 and 7 and the tape gathers between the sprockets 3 and 4 as shown in Figure 1. For the repeat transmission, the sprocket 4 feeds the tape while the sprocket 3 remains stationary. During this repeat transmission, the packers 6 and 7 are disabled and two further peckers 8 and 9, which have previously been inactive, become operative. Therefore, in a "words twice" transmission each word is first transmitted under the control of the sprocket 3 and the peckers 6 and 7 and then, before any further word is transmitted, it is transmitted again under the control of the sprocket 4 and the peckers 8 and 9. The same electrical contact mechanism is used for both transmissions as will be described presently.

The tape 1 passes over a platform (not shown) which holds the tape in engagement with the sprockets 3 and 4 but which is shaped so as to enable the sprocket teeth 5 and the four peckers 6, 7, 8 and 9 to cooperate with the tape. The platform also permits two center peckers 10 and 11 (Figure 5) to determine whether or not there is a loop of tape, such as that shown in Figure 1, gathered between the sprockets 3 and 4. The latter are respectively fixed to shafts 12 and 13 (Figure 1) journalled in a paper presser member 14 pivoted at 15 to the frame and maintained in contact with a stop 16 by a spring 17. When it is desired to release the paper tape, the sprockets are lifted away from the platform by turning the member 14 against the action of the spring 17.

So long as the apparatus is in operation, a shaft 18 is constantly rotated in the direction of the arrow 19 (Figure 1) and this shaft carries four eccentrics 20, 21, 22 and 23 which drive the various portions of the apparatus. The eccentrics 22 and 23 are arranged, in the way described below, to drive the sprockets 3 and 4 in a manner such that, when the tape is fed, a one centerhole feed takes place during the time occupied by one revolution of the shaft 18. Therefore, all the parts driven by the shaft 18 operate in phase with the feeding of the tape or, conversely, the feeding of the tape is timed in accordance with the actuation of such parts. These parts include a rocker 30 (Figures 1 and 5), for actuating the transmitter contacts and peckers 6, 7, 8 and 9, which is rocked continuously about a spindle 31 (Figure 5) by the eccentric 20 (Figure 1) acting on an eccentric strap 24 having an arm 25 pivoted at 26 to one end of a lever 27 (Figures 1 and 5) centrally pivoted on a fixed spindle 28 and formed at its other end with a fork 29 engaging a pin 32 on the rocker 30. The eccentric 21 rocks a frame 33 (Figures 1 and 2) about a fixed spindle 34 and this frame serves to operate mechanism for controlling the selection of the sprockets 3 and 4 and the pairs of peckers 6, 7 and 8, 9. The eccentric 21 is connected to the rocking frame 33 through an eccentric strap 35 having an arm 36 pivoted at 37 to an extension 42 of the frame 33.

The sprocket 3 is driven through the medium of a pair of ratchets 38 and 39 (Figure 1) fixed to the shaft 12 and the sprocket 4 is driven by a pair of ratchets 60 and 61 (Figure 1) fixed to the shaft 13. The ratchets 38 and 39 are rotated by pawls 40 and 41. The pawl 40 is pivoted at 43 to an arm 47 extending from a strap 48 on the eccentric 23. This pivotal connection is suspended by a link 44 pivoted on a fixed spindle 45. Similarly the pawl 41 is secured by an independent pivotal connection to an arm 49, on a strap 50 mounted on the eccentric 22, and to a second link 46 hanging from the spindle 45. The ratchets 60 and 61 are actuated respectively by pawls 50 and 51 pivoted respectively to links 52 and 53 hanging from a fixed spindle 54. The pawls 50 and 51 lie outside the pawls 40 and 41, the ratchets 60 and 61 being spaced apart further than the ratchets 38 and 39. The pivotal connections at the lower ends of the links 44 and 52 are connected by a link 55 while those at the lower ends of the links 46 and 53 are connected by a link 56. Accordingly, the pawls 40 and 50 are moved to-and-fro simultaneously by the eccentric 23 and the pawls 41 and 51 are moved to-and-fro simultaneously by the eccentric 22. The eccentrics 22 and 23 are mounted 180° out of phase with each other so that the pawls 40 and 50 are advanced while the pawls 41 and 51 are being withdrawn and vice versa.

Each of the ratchets 38, 39, 60 and 61 has ten teeth, i. e. as many teeth as there are teeth 5 on the sprocket 3 or sprocket 4, and the ratchets in each pair 38, 39 or 60, 61 are set so that each tooth in one ratchet lies mid-way between adjacent teeth on the other ratchet. This appears in Figures 6 and 7 which show the manner in which the ratchets 38 and 39 are mounted on the shaft 12. The arrangement is such, therefore, that each centerhole feed takes place in two steps, in the first of which the pawl 41 acts on a tooth on the ratchet 39 to turn the sprocket 3 through one twentieth of a revolution and in the second step the pawl 40 acts on the ratchet 38 to turn the sprocket 3 through a further twentieth of a revolution. Thus, referring to Figure 6, at the end of the first step the pawl 41 reaches the position shown, having advanced the ratchet tooth 39a to the position shown while the pawl 40 is withdrawn to the position shown. Then, for the second step, the pawl 40 is advanced while the pawl 41 is withdrawn and, in

advancing, the pawl 40 engages and feeds forward the ratchet tooth 38a. Now, it is to be noted that it is the movement of the ratchet tooth 39a that causes the tooth 38a to be brought to a position in which it can be acted on by the pawl 40. Accordingly, if the pawl 41 is prevented from engaging the tooth 39a neither of the steps in a centerhole feed will take place and the sprocket 3 will be disabled. Therefore, whenever the sprocket 3 is to stop feeding, the pawl 41, in its forward movement, is prevented from engaging the ratchet 39 by a stop 62, on a discriminating member 63, which is moved into the path of a tail 64 on the pawl 41 and swings the pawl 41 downwards (as shown in Figure 7) away from the ratchet 39. Thus, the tooth 39a is left in the position of Figure 7 instead of being fed to the position of Figure 6 and the relative positions of the tooth 38a and pawl 40 are not such that any feed can take place. The pawl 41 is swung downwards away from a fixed stop 57, which appears in Figures 6 and 7 but is omitted from Figure 1, against the action of a wire spring 65 which acts against the tail 64, is bent round a fixed rod 66, and reacts against a fixed rod 67. A similar spring 68 acts on a short tail 69 on the pawl 40, this spring also being bent round the rod 66 and reacting against the rod 67.

The ratchets 60 and 61 (Figure 1) are operated and controlled in precisely the same way as the ratchets 38 and 39. Thus, the pawl 51 has a tail 70 and, when it is necessary to disable the feed sprocket 4, a stop 72 on the discriminating member 63 is raised in front of the tail 70 so that, in the forward movement of the pawl 51, the latter is swung downwards and misses the ratchet 61. Wire springs 73 and 74, which react against a fixed rod 75 and are wound round a fixed rod 76, tend to maintain the pawls 50 and 51 in their raised positions, the spring 73 acting on the tail 70 and the spring 74 on a shorter tail 71 on the pawl 50.

Return movement of the ratchets is prevented by resilient detents (not shown in Figure 1) such as the detent 77 appearing in Figures 6 and 7. Locking stops 78 and 79 act on the pawls to lock the ratchets at the end of each operative pawl stroke and prevent the ratchets from continuing in their rotation. This is effected by the wedge action of the locking stops on inclined surfaces 80 (Figures 6 and 7) on the pawls.

Before proceeding to describe the manner in which the apparatus functions as tape passes the peckers, the nature of the code used in the present example will now be outlined. This is the well known Morse Wheatstone code in which a dot is represented during one centerhole feed or period, i. e. the time taken for the shaft 18 to make one revolution, by a mark condition occupying the first half of the period and a space condition the second half of the period. A dash occupies two whole centerhole periods and comprises a mark condition occupying the whole of the first period and the first half of the second period and a space condition occupying the second half of the second period. Thus, both a dot and a dash start with a mark condition and end with a space condition. The mark and space conditions may be represented in the transmission line in any convenient way. For example, a mark condition may be represented by connecting the line to a source of current for the required period and a space condition by disconnecting the source from line or reversing the current for the required period. In the arrangement shown in Figure 1 a mark condition is set up by closing contacts 81 to connect the negative side of the source 82 to the line L and a space condition is effected by closing contacts 83 to connect the positive side to the line L.

In the tape, a perforation, such as the perforations 84, 85, 86 and 87 (Figure 8), is located above the row of centerholes 2, as viewed in Figure 8, for each change over from a space condition to a mark condition. These perforations are explored by the pecker 6 (Figures 1, 4 and 5), when the peckers 6 and 7 are in action, or by the pecker 8, when the peckers 8 and 9 are in action. Thus the peckers 6 and 8 may be referred to as mark peckers. On the other hand, for each change-over from a mark condition to a spaced condition, a perforation, such as the perforations 88, 89, 90 and 91, is provided below the row of centerholes 2. Such perforations are explored by the pecker 7 or the pecker 9, whichever happens to be in action at the time, and these peckers may be referred to as the space peckers.

Now, the perforations 84 and 88, which are in transverse alignment with a common centerhole, represent a dot and are both effective in a single centerhole feed. The perforations 86 and 90, on the other hand, represent a dash, and are respectively in transverse alignment with consecutive centerholes to be effective in consecutive centerhole feeds.

To explain precisely the effect of these perforations in relation to the peckers, let the peckers 6 and 7 be considered to be in action and, incidentally, it will be noted particularly from Figure 4 that the mark pecker 6 is held by a spring 92 against an edge 93 on a fixed stop 94 while a spring 95 holds the space pecker 7 against an edge 96 which is slightly in advance of the edge 93 so that the pecker 7 is at all times slightly ahead of the pecker 6 with respect to the direction in which the tape 1 is fed. When the dot perforations 84, 88 (Figure 8) reach the peckers 6 and 7, prior to the first step in a centerhole feed, during the completion of the previous centerhole feed by the pawl 40, the mark perforation 84 registers with the mark pecker 6 which is then allowed to rise through the perforation almost immediately to be withdrawn. Accordingly the mark pecker 6 senses the presence of the perforation 84 and the effect is that the contacts 81 are closed while the contacts 83 are opened so that a mark condition is applied to the line L. The mechanism for this operation is described presently. Prior to the second step of the centerhole feed (i. e. during the completion of a feeding movement by the pawl 41) the space perforation 88 is brought into register with the space pecker 7 which then enters the perforation and is withdrawn. This has the effect of opening the contacts 81 and closing the contacts 83 so that the line is returned to the space condition.

The sensing of the dash perforations 86 and 90 takes place as follows. Before the first step of a centerhole feed the perforation 86 registers with the pecker 6 and is explored thereby so that the contacts 81 are closed and the contacts 83 opened to apply a mark condition to the line L. Before the second step of the centerhole feed, during the completion of a feeding stroke by the pawl 41, the space pecker 7 rises and finds no perforation in register therewith and the effect of this is that the mark condition is maintained, the reason for this being as described below. Prior to the first step of the next centerhole feed, the pecker 6 rises once more and detects the absence of any perforation so that the mark condition is still maintained. Before the second step of this next centerhole

feed, however, the space pecker 7 detects the perforation 90 with the result that the line is returned to the space condition. Therefore, a mark condition covering one and a half centerhole periods followed by a space condition for one half centerhole period occurs as is required for a dash.

The two mark peckers 6 and 8 are pivotally mounted respectively on mark pecker actuator levers 100 and 101 (Figures 1 and 4) independently pivoted on a fixed spindle 102 and the two space peckers 7 and 9 are pivoted respectively on space pecker actuator levers 103 and 104 independently pivoted on a fixed spindle 105. The actuator levers 100 and 101 are urged in a counterclockwise direction as viewed in Figure 1 by springs 106 and 107 so that the levers tend always to engage a pin 108 on the rocker 30 (Figure 5). The actuator levers 103 and 104 (Figures 1 and 4) are urged clockwise by springs 109 and 110 which tend to maintain the levers in engagement with a pin 111 on the rocker 30. Now, it will be recalled that the rocker 30 is continuously rocked by the eccentric 20 so that it completes one complete oscillation in each centerhole feed. The tendency, therefore, is for the mark peckers 6 and 8 to be allowed to rise under the influence of the springs 106 and 107 as the pin 108 rises in the first part of the oscillation of the rocker 30, while the pin 111 depresses the space peckers 7 and 9. In the second half of the oscillation the peckers 7 and 9 tend to follow the pin 111 upwards while the pin 108 depresses the mark peckers 6 and 8. However, as the pair of peckers 6 and 7 for the first transmission of a word must never be in action simultaneously with the pair of peckers 8 and 9 for the repeat transmission, a pecker discriminating member 112 (see particularly Figure 4), pivoted at 113 to a bellcrank 114 pivoted on a fixed spindle 115, is provided to disable the pairs of peckers selectively. When the bellcrank 114 is moved to raise the discriminating member 112 into engagement with fixed stops 116 and 117, stops 118 and 119 on the discriminating member 112 are located respectively in front of the tips of downward extensions 120 and 121 on the mark and space pecker actuator levers 101 and 104 so that these are prevented from rising sufficiently far to enable the peckers 8 and 9 to be effective. The other mark and space pecker actuator levers 100 and 103 are also formed with downward extensions 122 and 123 but these are so shaped that when the discriminating stops 118 and 119 are in their uppermost positions they do not impede the actuation of the peckers 6 and 7. Toes 124 and 125 are formed on the lower ends of the downward extensions 122 and 123 but, when the discriminating stops 118 and 119 are in their raised positions, these toes can pass under the discriminating stops 118 and 119.

To disable the peckers 6 and 7 and render the peckers 8 and 9 effective, the bellcrank 114 is swung clockwise as viewed in Figure 4 to lower the discriminating member 112 into engagement with fixed stops 126 and 127. The discriminating stops 118 and 119 are then below the extensions 120 and 121, so that the movement of the actuator levers 101 and 104 is no longer impeded, but are in register with the toes 124 and 125 so as to prevent the peckers 6 and 7 from rising far enough to be effective.

It may be noted at this point that the mark pecker 8 is guided by the edge of a fixed member 128 (Figures 4 and 5) against which it is held by a spring 129 (Figure 4). The space pecker 9 is held by a spring 130 against a lug 131 on a slide 132 which, for a reason to be described, can move between a position in which the space pecker 9 lies half a centerhole feed ahead of the mark pecker 8, just as the pecker 7 is slightly ahead of the pecker 6, and a position in which the peckers 8 and 9 are in transverse alignment with respect to the tape feed.

To enable the contacts 81 and 83 to be operated in accordance with the selections of the peckers, latch levers 133 and 134 (see particularly Figures 4 and 5) are pivoted respectively on the mark pecker actuator levers 100 and 101, and latch levers 135 and 136 are pivoted respectively on the space actuator levers 103 and 104. Each of the latch levers 133, 134, 135 and 136 is formed at its lower end with a notch 137. Now suppose that the rocker 30 is swinging counterclockwise as viewed in Figures 1 and 5, so that one or other of the mark pecker actuator levers 100 and 101, according to the setting of the pecker discriminating member 112, is allowed to rise under the influence of its spring 106 or 107 far enough for the pecker 6 or 8 to reach the paper tape, if there is no perforation in register with the pecker the movement of the pecker is arrested by the paper before the associated latch lever 133 or 134 rises high enough for its respective notch to register with a lug 140 on a lever 141 pivoted on the spindle 115. Then, in the return movement of the pecker 6 or 8 there is no effect on the contacts 81 and 83. If, on the other hand, the pecker 6 or 8 registers with a perforation, it rises far enough for the notch 137 in the associated one of the latch levers 133 and 134 to be pulled into engagement with the lug 140 by a spring 142 or 143, the springs 142 and 143 being connected respectively to the latch levers 133 and 134. Then, when the actuator lever 100 or 101 is urged downwards by the rocker pin 108, the latch lever 133 or 134 swings the lever 141 downwards away from a stop 144 against the action of a spring 145. In this movement the lever 141 and lug 140 depress both the left-hand end (as viewed in Figure 1) of a lever 146, pivoted on a fixed spindle 147 and a lug 148 on a contact actuating rocker 149 pivoted on a fixed spindle 150. The movement of the lever 146 takes place against the action of a spring 152 and causes a lug 151 to raise the left-hand ends of levers 153 and 154 about a fixed spindle 155 against the action of springs 156 and 157 connected respectively to the levers. At the end of the movement of the lever 146 a latch lever 158, under the action of a spring 159, snaps into position under the lug 151 so as to maintain this in its raised position. The counterclockwise movement of the contact actuating rocker 149 under the action of the lever 141 causes pins 160 and 161 on the rocker 149, by cam action, to swing a second contact actuating rocker 162 about a fixed spindle 153 in a clockwise direction so as to allow the right-hand end of a leaf-spring 164 to descend and close the contacts 81, the second rocker 162 simultaneously raising the left-hand end of the leaf-spring 164 to open the contacts 83. Thus, the line L is changed over from the space condition to the mark condition. In this movement, the pin 160, after riding up a cam surface to bring about the necessary movement of the second rocker 162, engages an arcuate surface 58 having its center of curvature at the spindle 150. The engagement of the pin 160 with the arcuate surface 58 serves positively to hold the second rocker 162 in the position to which it has been moved.

As the latch lever 133 or 134 is depressing the lug 140 on the lever 141, a projection 165 (see

particularly Figure 5) on a downward extension 166 at the left-hand side of the pecker actuating rocker 30 bears on this latch lever 133 or 134 and swings it out of engagement with the lug 140, the latch lever being moved against the action of its respective spring 142 or 143. Accordingly the lever 141 is immediately returned into engagement with the stop 144 by the spring 145. There is, however, no force tending to cause the contact actuating rocker 149 to follow the lever 141 in its return movement so that the line remains in the mark condition. Moreover, the latch lever 158 prevents the lever 146 from following the lever 141 in its return movement. Thus the right-hand ends of the levers 153 and 154 remain depressed against the action of the springs 156 and 157 and it is to be particularly noted that these levers take up this position when the line is changed over from the space condition to the mark condition.

The action of the space peckers 7 and 9 is similar, and when the rocker 30 is moving in a counterclockwise direction, the pin 111 allows the pecker 7 or 9, whichever the discriminating member 112 permits to be in action, to rise to the tape under the action of the associated spring 109 and 110. If a perforation is explored, the associated latch lever 135 or 136 is raised far enough for its notch 137 to register with a lug 167 (Figure 1) on a lever 168 pivoted on the spindle 147. If no perforation is sensed, the notch 137 cannot engage the lug 167 and in the return movement of the pecker under the action of the rocker pin 111 no change in the state of the apparatus occurs. Assuming, however, that there is a perforation so that the latch lever 135 or 136 is raised to its highest point, the notch 137 thereon is caused to engage the lug 167 under the action of a spring 169 or 170, these springs being arranged to act respectively on the latch levers 135 and 136. In the downward movement of the latch lever 135 or 136 therefore, under the action of the rocker pin 111, the lever 168 is moved counterclockwise away from a stop 171 against the action of a wire spring 172. In this movement the lug 167 acts on an arm 173 on the contact actuating rocker 149 and swings this rocker clockwise about the spindle 150. The rocker pins 160 and 161 then coact with the second contact actuating rocker 162 to open the contacts 81 and close the contacts 83. The line is then changed over from the mark condition to the space condition by the closure of the contacts 83 and the opening of the contacts 81. In this movement, the pin 161, after riding up a cam surface to push the left-hand end of the second rocker 162 downwards, engages an arcuate surface 59 having its center of curvature at the spindle 150. The engagement of the pin 161 with the arcuate surface 59 serves positively to hold the contacts in the position in which the line is in the space condition. A lug 174 on the lever 168 acts on an arm 175 integral with the latch lever 158 so that, as the lever 168 is moved counterclockwise, the latch lever 158 is released from the lever 146 so that the right-hand end of this lever descends under the action of the spring 152 until its left-hand end once more engages the lug 140 on the lever 141. The two levers 153 and 154 are, therefore, freed to respond to the action of their springs 156 and 157 when the line L is changed over to a space condition. A projection 97 on a downward projection 98 on the rocker 30 releases the latch lever 135 or 136 from the lever 168 which is returned to the stop 171 while the lever 158 is made ready to engage the lug 151 again.

Before describing the operation of the apparatus as the tape is being fed by the sprockets 3 and 4, it must be mentioned that the space between two consecutive words in a transmission is represented by three centerholes that are not associated with any code perforations, that is to say the distance between the lines X and Y in Figure 8. Actually it will be seen that four centerhole feeds are required to cause the tape to travel a distance equal to the space between the lines X and Y. It is also to be noted that in Figure 8 real words are not shown; but the two special cases, which sometimes arise in practice, in one of which there are single dots (each representing the letter E), and in the other of which there are single dashes (each representing the letter T), are shown respectively in the upper and lower parts of Figure 8.

Let it now be assumed that a substantial length of blank tape is being fed through the apparatus prior to the arrival of code perforations at the point where the peckers 6 and 7 are operative. While the blank tape is passing, both the sprockets 3 and 4 are in action and there is no loop of tape between them. The line is in the space condition, the contacts 83 being closed. The peckers 6 and 7 are in action but in each exploring movement are arrested by the tape, no code perforation being sensed. The frame 33 is being rocked to-and-fro about the spindle 34. In this rocking movement three pawls A, B and C (see particularly Figure 2) are carried to-and-fro by a spindle 180 mounted at the upper end of the frame 33. In each forward movement of the frame 33 the pawl A engages a tooth on a ratchet AA, pivotally mounted on a fixed spindle 200, and rotates the ratchet AA a short distance against the action of a coil spring 181 (Figure 2) which at one end engages the ratchet AA and at the other end engages a fixed stop 182. The pawl A is maintained in engagement with the ratchet AA by a wire spring 183 which at one end engages a tail 184 on the pawl A and at the other end reacts against a fixed bar 185. The forward movement of the frame 33 causes the pawl A to move the ratchet AA in such a way that a stop pin 186 on the ratchet AA is separated from the fixed stop 182. However, owing to the fact that a backlock lever 187 is held away from the ratchet AA by a lug 188, the movement of the ratchet AA reverses during the return movement of the frame 33 so that the stop pin 186 returns to the stop 182. Thus, as the blank tape is passing, the ratchet AA is merely rocked to-and-fro by the pawl A. Owing to the fact that a space condition obtains, the lug 151 on the lever 146 is in its lowermost position so that the right-hand ends of the levers 153 and 154 (Figures 1 and 2) are raised. Thus, as the frame 33 swings forward, a toe 189 on the tail 184 of the pawl A passes underneath the right-hand end 190 of the lever 154. On the other hand, the right-hand end 191 of the lever 153 is interposed in the path of a tail 192 on the pawl B so that, as the frame 33 swings forward, the pawl B is caused to swing downwards about the spindle 180 against the action of a wire spring 193 which acts on the tail 192 and reacts against the fixed bar 185. Accordingly, during the rocking of the frame 33 while the blank tape is passing, no movement is imparted to a ratchet BB, pivotally mounted on the spindle 200, by the pawl B, and a stop pin 194 (Figure 1) on the

ratchet BB remains in engagement with a fixed stop (not shown) similar to the fixed stop 182, the ratchet BB being acted on by a coil spring which is similar to the coil spring 181 (Figure 2) but is on the remote side of the ratchet BB from that appearing in Figure 2. The end of the coil spring which engages the ratchet BB appears at 195 in Figure 2. During the passage of the blank tape, moreover, the pawl C has no operative effect on a ratchet CC, pivotally mounted on the spindle 200. This ratchet carries a stop pin 196 which is urged towards a fixed stop 197 by a coil spring similar to the coil spring 181. The end of the coil spring which engages the ratchet CC appears at 198 in Figure 2. The pawl C is urged towards the ratchet CC by a wire spring 199 which at one end acts on the pawl C and at the other end reacts against the fixed bar 185. To enable the pawl C to rotate the ratchet CC, a backlock lever 201 pivotally mounted on a fixed spindle 138 has to be in position to engage the teeth of the ratchet CC, but the backlock lever 201, when the apparatus is in the position being considered, is held away from the ratchet CC against the action of a spring 202 by one end of a lever 203 engaging a pin 204 on the backlock lever 201. Accordingly, as the pawl C moves to-and-fro it merely rocks the ratchet CC backwards and forwards away from and towards the point at which the stop pin 196 engages the fixed stop 197. It is to be noted at this point that the lever 203, which holds the backlock lever 201 in its inoperative position, is pivoted upon a fixed spindle 205 (Figure 3) and at its left-hand end carries a spindle 206 upon which the sprocket discriminating member 63 is mounted. While both the sprockets 3 and 4 (Figure 1) are rotating, the discriminating stops 62 and 72 are held beneath the paths of the lower ends of the tails 64 and 70 of the pawls 41 and 51. These discriminating stops 62 and 72 are held in this position by latch levers 207 and 208 (Figure 3) that engage lugs 209 and 210 on the discriminating member 63. The latch levers 207 and 208 are urged towards the lugs 209 and 210 by wire springs 211 and 212 which react respectively against fixed rods 213 and 214. There is a further latch lever 215 which can engage the lug 210 under the action of a spring 216 reacting against the rod 214, but this latch lever 215 is held out of engagement with the lug 210 while the blank tape is passing, because there is then no loop of tape gathered between the sprockets 3 and 4 so that the center peckers 10 and 11 (Figure 5), which are carried by the limbs of a U-shaped wire 217, are depressed against a lug 218 on a bellcrank 219 pivoted on a fixed spindle 220, and against the action of a spring 139. The lower end of the bellcrank 219 bears against a lug 221 on the latch lever 215 holding the latch lever in its inoperative position.

Now supposing a word, which for convenience can be regarded as a word occupying several centerholes on the tape, arrives at the peckers 6 and 7. The first mark perforation of this word, on being sensed by the pecker 6, results in the line being changed over to the mark condition in the manner described above, and the left-hand ends of the levers 153 and 154 are allowed by the lever 146 to swing counterclockwise under the action of the springs 156 and 157. Accordingly the end 191 of the lever 153 is lowered so that it is no longer interposed in the path of the tail 192 (Figure 2) on the pawl B. Thus, in the to-and-fro motion of the frame 33 the pawl B is able to feed the ratchet BB forward against the action of its associated coil spring, return motion of the ratchet BB being prevented by a backlock lever 222 that is pivoted on the fixed spindle 155 and urged towards the ratchet BB by a spring (not shown). The first step in the rotation of the ratchet BB causes a cam 223 to move beyond a projection 224 on one arm 225 of a U-shaped lever 226 pivoted on the spindle 155. The other arm 227 of this U-shaped lever is formed with the lug 188 against which the backlock lever 187 for the ratchet AA bears. The U-shaped lever 226 and the backlock lever 187 are urged clockwise by springs 228 and 229 so that, as soon as the cam 223 releases the U-shaped lever 226, the backlock lever 187 is allowed to engage the ratchet AA. Nevertheless this does not mean that the ratchet AA is immediately stepped round by the pawl A, because the aforesaid movement of the lever 154, under the action of the lever 146, causes the end 190 of the lever 154 to be interposed in the path of the toe 189 so that, in the to-and-fro movement of the frame 33, the pawl A is rocked about the spindle 180 without engaging the ratchet AA.

It has already been explained that the space between two words is occupied on the tape by three centerholes that are not associated with any perforations. It is also to be remarked that the letters in any word containing more than one letter have their code perforations separated by a single centerhole associated with no code perforation. Accordingly, in the passage of a word past the peckers 6 and 7 there will generally be centerhole periods during which the lever 146 is returned to the point at which the lug 151 is in its lowermost position. This enables the spring 157 to return the lever 154 for one centerhole period to a position in which its end 190 is raised above the toe 189 so that the ratchet AA is fed round one tooth and held in the position in which it is fed by the backlock lever 187. However, as soon as the next letter in the word arises, with the result that the lug 151 is again raised to move the lever 154 clockwise and interpose the end 190 in the path of the toe 189, the pawl A is swung downwards in the next forward stroke of the frame 33 and, in swinging downwards, the end of the pawl A depresses the right-hand end of a lever 230, swinging the latter about a spindle 231 and causing a lug 232 to act on an arm 233 integral with the backlog lever 187. The latter is thus momentarily withdrawn against the action of the spring 229 from the ratchet AA so that the latter is returned by the coil spring 181 to its initial position in which the stop pin 186 engages the stop 182. A letter space, therefore, merely causes the ratchet AA to be fed round one tooth and returned to its initial position without performing any function.

On the other hand, a letter space has no effect on the ratchet BB because when, as a result of a letter space, the lever 146 is moved clockwise, the lever 153 does not follow the lug 151 because, when the lever 153 is initially moved clockwise at the beginning of the word, it is latched in the position to which it is moved by a latch 234 pivoted on a fixed spindle 235 and arranged to engage a projection 236 on the lever 153, the latch being urged to its operative position by a spring (not shown).

It will be seen that the first perforation in a word after registering with the mark pecker 6 has to undergo four centerhole feeds before reaching the second or repeat mark pecker 8.

The apparatus is, therefore, contrived so that when the first mark perforation in a word registers with the repeat mark pecker 8, the second sprocket 4 is arrested but the first sprocket 3 continues to feed until the length of tape comprising the entire word as well as the ensuing word space is gathered between the sprockets. The arresting of the repeat sprocket 4 is effected by the ratchet BB, the cam 223 being so positioned thereon that at the appropriate moment it engages an abutment 237 on a slide 238 formed at its left-hand end (Figure 3) with another abutment 239 engaging a lug 240 on the latch lever 208. The action of the cam 223 on the abutment 237 then withdraws the latch lever 208 from the lug 210. The left-hand end of the sprocket discriminating member 63 is then free to rise under the influence of a spring 246 which tends always to swing the lever 203 clockwise and, thus, lift the spindle 206. The sprocket discriminating member rises until a projection 244 thereon engages a fixed stop 245 but the right-hand end of the discriminating member 63 remains depressed by the latch lever 207 engaging the lug 209. It will be remembered that the latch lever 215 is already withdrawn from the lug 210 and does not impede the upward movement of the discriminating member 63 which causes the discriminating stop 72 to be interposed in the path of the tail 70 of the pawl 51 causing the sprocket 4 to be disabled. The upward movement of the left-hand end of the discriminating member 63 is arrested by the stop 245 before the right-hand end of the lever 203 has moved downwards sufficiently far to allow the backlock lever 201 to engage the ratchet CC.

The slide 238 is supported at its right-hand end by a fixed fork 250 which only appears in Figure 3, having been omitted from Figures 1, 2 and 4 so as to avoid making these figures too complicated. At its left-hand end the slide 238 is supported by a lug 251 on the latch lever 208.

The pawl B (Figure 2) may be positioned so that it tends to feed the ratchet BB forward during a substantial number of reciprocations of the rocking frame 33, depending on the length of the word being transmitted. Therefore, a gap 252 (Figures 3 and 4) is formed in the ratchet BB and is so positioned that when the pawl B has fed the ratchet BB forward four teeth and the cam 223 has withdrawn the slide 238 against the action of the wire spring 212 on the latch lever 208, no further feeding of the ratchet BB can take place. The slide 238, of course, remains held to the right by the cam 223 so long as the backlock lever 222 engages the ratchet BB.

As soon as a loop of tape begins to form between the sprockets 3 and 4, the center peckers 10 and 11 (Figure 5) can rise under the influence of the spring 139 acting through the bellcrank 219, which is thus swung clockwise, as viewed in Figure 5. The lug 221 on the latch lever 215, under the influence of the wire spring 216, is, therefore, free to swing counterclockwise. The nose of the latch lever 215 (Figure 3) can then rest against the right-hand face of the lug 210 and is ready to latch over that lug when it is depressed as described below.

It will be recalled that during the passage of a word containing letter spaces these are not allowed to have any cumulative effect on the ratchet AA because every mark condition following a letter space results in the lever 230 (Figure 2) withdrawing the backlock lever 187. However, when the word space arises, the end 190 of the lever 154 is allowed to remain above the toe 189 long enough for the pawl A to feed the ratchet AA forward by three teeth, further clockwise movement of the ratchet AA being prevented by a gap 253 (Figures 3 and 4) in the teeth. As the third of the three teeth is being fed forward by the pawl A a cam 254 on the ratchet acts on abutments 255 and 256 respectively on a slide 257 and a slide 242, and draws these slides to the right. The slide 242, in this movement, causes the sprocket 3 to cease movement and the sprocket 4 to start, while the slide 257 causes the peckers 8 and 9 to become operative and the peckers 6 and 7 to cease operation. At this point it may be mentioned that when the cam 223 caused the slide 238 to move to the right, the lug 240 (Figure 3) on the latch lever 208 moved to the right of an abutment 258 on the slide 242 so that a spring 241 could raise the slide slightly to bring an abutment 259 on the slide up to the level of an abutment 260 on the sprocket discriminating member 63 (the right-hand end of the slide 242 being mounted on a fork 261, shown only in Figure 3, which permits both longitudinal and slight swinging motion of the slide 242). Accordingly, when the slide 242 is moved to the right, against the action of the spring 241, by the cam 254 on the ratchet AA, two functions are performed by the slide 242. Firstly, a lug 262 on the slide releases the latch lever 207 from the lug 209 on the discriminating member 63. This permits the lever 203, under the influence of the spring 246, to raise the discriminating stop 62 into the path of the tail 64 of the pawl 41 so that the sprocket 3 is disabled. Simultaneously, however, the slide 242, in moving to the right, causes the abutment 259 to engage the abutment 260 and swing the discriminating member 63 counterclockwise as viewed in Figure 3, so that the lug 210 is engaged by the latch lever 215, the discriminating stop 72 now being beneath the tail 70 of the pawl 51. Accordingly, the sprocket 4 is allowed to rotate once more. As the right-hand end of the discriminating member 63 rises, a projection 263 on the discriminating member engages a fixed stop 264. As the left-hand end of the discriminating member 63 descends the projection 244 thereon engages a lateral projection 243 on the slide 242 so as to depress the latter against the action of the spring 241 and free the abutment 259 from the abutment 260.

When the slide 257 is moved to the right by the cam 254, a latch lever 265, pivoted on the fixed spindle 138 and acting under the influence of a spring 266, engages an abutment 267 on the slide 257 and holds the slide in its right-hand position against the action of a spring 270. As the slide moves to the right, a lug 268 thereon acts on a wire spring 269 so as to bias the bellcrank 114 in a clockwise direction as viewed in Figure 4. Thus, the pecker discriminating member 112 tends to descend and, as the toe 125 is withdrawn from beneath the stop 118, the right-hand end of the discriminating member 112 descends to the fixed stop 126. Then, as the toe 124 is withdrawn from beneath the stop 119, the left-hand end of the discriminating member 112 descends to the fixed stop 127. Thus, the discriminating stops 118 and 119 take up the positions in which they disable the peckers 6 and 7 but permit the peckers 8 and 9 to operate.

When the repeat transmission begins, a mark condition again arises with the result that the end 190 of the lever 154 is interposed in the path of the toe 189 of the pawl A. This causes the lever

230 to be moved in a clockwise direction so that the backlock lever 187 is withdrawn from the ratchet AA which then returns to its initial position and permits the spring 241 to return the slide 242 to its left-hand position. However, the left-hand end of the discriminating member 63 remains latched by the latch lever 215 and the right-hand end of the discriminating member remains in its upper position. On the other hand, the slide 257 remains held to the right by the latch lever 265.

It is to be noted at this point that when the discriminating member 63 is in the position just described, the right-hand end of the lever 203, on which the discriminating member 63 is pivoted, continues to hold the backlock lever 201 out of engagement with the ratchet CC. This is due to the fact that the backlock lever 201 is only allowed to engage the teeth of the ratchet CC when the discriminating member 63 is in its highest position in which the stops 62 and 72 are preventing the operation of both sprockets 3 and 4.

The sprocket 4 and peckers 8 and 9 continue to operate for the repeat transmission of the word until the tape becomes taut between the two sprockets 3 and 4. The three centerholes comprised within the word space are then centrally located between the sprockets. The tautening of the tape has an immediate effect in that it depresses the center peckers 10 and 11 so as to swing the bellcrank 219 (Figure 5) in a counterclockwise direction about the spindle 220. One effect of this movement is that the lug 221 on the latch lever 215 is pushed to the right by the depending portion of the bellcrank 219 so that the latch lever 215 (Figure 3) is withdrawn from the lug 210 on the discriminating member 63. Owing to the fact that the latch lever 208 is still being held away from the lug 210 by the slide 238, the spring 246, acting through the lever 203, raises the projection 244 on the discriminating member 63 into engagement with the fixed stop 245. Accordingly, the discriminating stop 72 is interposed in the path of the tail 70 of the pawl 51 so that the ratchet 4 is stopped. Now the spindle 206 on the discriminating member 63 has been raised to its highest position by the spring 246 acting on the lever 203 and the right-hand end of the lever 203, therefore, is low enough to permit the backlock lever 201 (Figure 2) to engage the ratchet CC which is now fed forward in a clockwise direction. However, before describing the effect of this movement of the ratchet CC, some further effects of the depression of the center peckers 10 and 11 and the consequent movement of the bellcrank 219 will be described. This movement of the bellcrank 219 results in the lug 218 at the upper end thereof depressing the slide 132 about the spindle 220 against the action of a spring 272 so that a lug 273 at the left-hand end of the slide 132 is disengaged from a fixed latch 274 with the result that the slide 132 is drawn a slight distance to the right by the spring 272. Accordingly, the lug 151 is moved to the position which enables the spring 130 (Figure 4) to draw the pecker 9 into transverse alignment, as aforesaid, with the pecker 8, both peckers now resting against the fixed member 128. The reason for this is that the sprocket 4 is brought to rest when the last space perforation in a word, such as the perforation 88 or 90 (Figure 8), is in register with a line corresponding to the line X in Figure 8 and containing the pecker 8. Therefore, the last space perforation would not be sensed by the pecker 9 if it was not withdrawn to the fixed member 128. If the pecker 9 was not so withdrawn, it would be beyond the last space perforation in the word throughout the interval in which the sprocket 4 remains stationary and at the end of which the peckers 6 and 7 are once more brought into action instead of the peckers 8 and 9, this being an interval lasting for three cycles (that is three centerhole periods or three revolutions of the shaft 18), as will be explained below. If the word ends with a dot, it will be seen that during this three-cycle interval the pecker 8 would sense the mark perforation in the dot again (after the sensing of the space perforation) owing to the stationary condition of the tape, were it not for the fact that a device is provided for preventing this redundant actuation of the mark pecker 8. This device comprises a latch lever 276 (Figure 4) which follows the lug 273 to the right as the slide 132 is pulled to the right by the spring 272, the latch lever 276 moving under the influence of a wire spring 277 about the spindle 115. It will be seen that one end of the wire spring 277 engages the latch lever 276 and the other end engages a lug 278 on the slide 257. The slide 257 is drawn to the right and held in its right-hand position by the latch lever 265 at the instant being at present considered, so that as soon as the slide 132 is drawn to the right by the spring 272, the latch lever 276 is free to enable a projection 279 thereon to engage over a lug 280 on the mark pecker actuator lever 101 to prevent the mark pecker 8 from sensing a perforation. Therefore, if the last code unit in the word is a dot, there is no danger of the line being changed back to the mark condition before the first mark perforation in the next word is explored for the first transmission of that word. It may be mentioned that when the lever 276 swings clockwise as viewed in Figure 4, the pecker actuator lever 101 is too high to enable the projection 279 to move over the lug 280, but during the following cycle, as the actuator lever 101 is depressed by the pin 108, the spring 277 moves the projection 279 over the lug 280 to latch the actuator lever.

Returning now to the ratchet CC, this, as mentioned above, becomes effective when the backlock lever 201 (Figure 2) engages the ratchet CC and the ratchet CC is then fed round four teeth by the pawl C after which, in all ordinary circumstances, the backlock lever 201 will be raised (in the manner described presently) once more to release the ratchet which then returns to its initial position with the pin 196 engaging the stop 197. However, for the purposes of safety a gap 281 (Figures 3 and 4) is provided in the ratchet teeth so that the pawl C cannot feed the ratchet round more than four teeth. The first tooth feed of the ratchet CC brings a cam 282 into engagement with a lever 283. In the second and third feeding movements of the ratchet CC the cam 282 forces and then holds the lever 283 in a counterclockwise direction, as viewed in Figure 2, about the spindle 155 and against the action of a spring 284. In this movement the lever 283, acting on a lug 285 on one arm of a U-shaped member 286, forces this U-shaped member counterclockwise about the spindle 155 against the action of a spring 287. The result of this is that a lug 288 on the other arm of the U-shaped member 286 withdraws the backlock lever 222 from the ratchet BB and the projection 224 of the arm 225 of the U-shaped member 226 from the cam 223 so that the ratchet BB is released and returned to its initial position. The other arm 227 of the U-shaped member 226 is also, of course, moved so that the lug 188 re-

leases the backlock lever 187 from the ratchet AA which also then returns to its initial position in which the stop pin 186 engages the stop 182. A lug 176, also on the U-shaped member 286, acts on the latch lever 234 and releases it from the projection 236 on the lever 153 which, under the influence of the spring 156, immediately returns to the position in which it engages the lug 151, the latter now being in the position corresponding to the space condition of the line. The lever 154 has, of course, already followed the lug 151 to its lowermost position. When the first mark perforation in the next word is sensed, the levers 153 and 154 are, of course, returned in a clockwise direction and it may be noted that, in order to prevent the end 190 of the lever 154 from rising prematurely, a locking lever 289 is pivoted on the spindle 180 on the frame 33. This locking lever has an arm 290 which is urged towards the fixed bar 185 by a wire spring 291. Thus, as the frame 33 swings forward in a counterclockwise direction, a lug 292 on the locking lever 289 rides over the end 190 of the lever 154 and prevents the end 190 from rising prematurely. When the frame 33 is at the end of its backward stroke, the lug 292 is clear of the end 190 so that the latter can rise. Then, when the frame 33 swings forward, the lug 292 engages the rear face of the end 190 and the locking lever 289 swings ineffectively about the spindle 180 against the action of the wire spring 291.

The backlock levers 187 and 222 are withdrawn during two complete cycles so that adequate time is given for the ratchets AA and BB to return to their initial positions. As the ratchet BB returns, the cam 223 thereon is restored to the position shown in Figure 2, the projection 224 on the arm 225 being held, at this moment, out of the path of the cam 223 by the engagement of the lug 288 with the arm 225. This movement of the cam 223 allows the wire spring 212 to draw the latch lever 208 (Figure 3) slightly to the left so that the nose of the latch lever 208 rests against the lug 210 on the sprocket discriminating member 63. Thus, the latch lever 208 is ready to latch over the lug 210 as soon as the discriminating member 63 is depressed. The latch lever 207 is also ready to latch over the lug 209 on the discriminating member 63. The said depression of the discriminating member 63 takes place when a cam 293 on the ratchet CC engages a cam surface 294 on the lever 203 and lifts the latter so as to swing it counterclockwise about the spindle 205 and depress the spindle 206 (Figure 3). As the spinle 206 descends, the right-hand end of the sprocket discriminating member 63 descends until the projection 263 thereon engages a fixed stop 99. As the discriminating member approaches this position the wire spring 211 urges the latch lever 207 into latching cooperation with the lug 209. Then the fixed stop 99 acts as a fulcrum for the discriminating member 63 while, as the spindle 206 continues to descend, the left-hand end of the discriminating member is lowered, the left-hand projection 244 thereon pressing on the lateral projection 243 on the slide 242 and lowering the left-hand end thereof against the action of the spring 241. This continues until the wire spring 216 moves the latch lever 208 into latching cooperation with the lug 210 on the discriminating member 63. The latter is now in its lowermost position and the discriminating stops 62 and 72 are both beneath the tails 64 and 70 of the pawls 41 and 51 so that both ratchets start to feed once more after an interval corresponding to the word space that must be interposed between the repeat transmission of a word and the first transmission of the next.

The aforesaid counterclockwise movement of the lever 203, through the pin 204, causes the backlock lever 201 to be raised against the spring 202 so that the ratchet CC is enabled to return to the initial position (in which the stop pin 196 engages the stop 197) after the fourth feeding movement of the ratchet CC. During this fourth feeding movement the cam 282 on the ratchet CC is raised above the top of the lever 283, and, in the return movement of the ratchet CC under the action of its associated coil spring corresponding to the coil spring 181 of the ratchet AA, the cam 282 bears on the top of the lever 283 and depresses it against the action of the spring 284, the lever 283 being furnished at its lower end with a slot 300 which, besides permitting the pivotal movement of the lever 283 about the spindle 155, also permits this downward movement of the lever. It will be seen that this downward movement of the lever permits the cam 282 to snap past the lever 283 which, except when it is moved counterclockwise by the cam 282, bears against a fixed stop 301. The U-shaped member 286 then also bears against a fixed stop 302.

Returning to the final feeding movement of the ratchet CC, this results in a lug 303 (Figures 2 and 4) at the end of the lever 203 lifting an arm 304 integral with the latch lever 265, so that the latter is raised against its spring 266 from the abutment 267 on the slide 257 so that the latter is withdrawn by the spring 270 (Figure 4) to its left-hand position. An incident to this movement is that the lug 278 on the slide 257 withdraws the latch lever 276 from the lug 280 on the mark pecker actuator lever 101. Also, as the spring 270 urges the slide 257 to the left, it swings the bellcrank 114 clockwise so as to lift the pecker discriminating member 112 to position the discriminating stops 118 and 119 at the points in which they disable the repeat peckers 8 and 9 but render the peckers 6 and 7 operative.

From the foregoing description it will be seen that after a period in which both the sprockets 3 and 4 are idle and the line is maintained in the space condition (the duration of the period corresponding to the word space that must be interposed between the repeat transmission and the first transmission of the next word) the movement of the lever 203 starts both sprockets 3 and 4 simultaneously and renders the peckers 6 and 7 operative. Accordingly, the first mark perforation in the next word is immediately explored with the result that the line is changed over to the mark condition and the feeding movement of the ratchet BB is initiated once more, as already described, so as to disable the sprocket 4 at the appropriate moment to cause the tape to gather between the two sprockets 3 and 4. The sequence of operations then, of course, proceeds as already described.

It will be noted, however, that although the transmission of the next word has already begun the slide 132 has not yet been returned to its initial position. The movement to the left, as aforesaid, of the slide 257 prior to the transmission of the next word has already carried a lug 306 (Figure 4) from a projection 307 on a detent 308. The detent 308, however, cannot follow the lug 306 because of the engagement with a hook 309 thereon of the tail end of the center pecker

bellcrank 219. As soon, however, as the center peckers are allowed to rise by the loop in the tape between the first and second transmissions of the next word, the bellcrank 219 moves so as to allow a spring 310 to swing the detent 308 counterclockwise to bring a shoulder 311 thereon into the path of an arm 312 on a bellcrank 313 carried by the pin 111 on the rocker 30. Thus, as the rocker 30 swings clockwise, the bellcrank 313 is swung counterclockwise by the shoulder 311 away from a fixed stop 178 (Figure 5) upon which the bellcrank 313 normally slides, and against the action of a spring 177. The top of the bellcrank 313 is thus caused to act on an abutment 314 on the slide 132 and return this slide to the latched position. When the slide 257 (Figure 4) is pulled once more to the right to initiate the repeat transmission of the said next word, the lug 306 acts on the projection 307 to shift the detent 308 clockwise against the spring 310. Therefore, the bellcrank 313 is able once more to follow the path in which it bears continuously upon the stop 178 and, at the end of the repeat transmission, the slide 132 can be unlatched and remain in its unlatched position.

If it is required to prevent the apparatus from operating as aforesaid and to transmit each word once, a spindle 315 (Figure 1) is turned to cause a cam 316 to permit a spring 317 to cause a hook 318 on a bellcrank 319, pivoted on a fixed spindle 320, to engage over a lug 321 on the tail 192 of the pawl B so that this is always swung away from the ratchet BB as the frame 33 swings counterclockwise. Thus, the ratchet BB is never operated in these circumstances to pull the slide 238 to the right and release the backlock lever 187.

When repeat transmitting is taking place, in the special case where the letter E is separated from the next succeeding word by a word space (as shown at the top of Figure 8), the first transmission is accompanied, as usual, by the actuation of the ratchet BB. Thus when the isolated dot, representing the letter E, reaches the repeat sprocket 4, the slide 238 is drawn to the right to stop that sprocket. However, owing to the absence of any further mark perforation beyond the dot, the ratchet AA rotates so as to draw the slide 242 to the right simultaneously with the slide 238. Accordingly, the lug 240 (Figure 3) on the latch lever 208 does not move beyond the abutment 258 and the spring 241 cannot lift the slide 242 to bring the abutment 259 into engagement with the abutment 260. The movement of the slide 242, therefore, does not perform its usual function of starting the sprocket 4, but it does, as usual, act on the latch lever 207 to stop the sprocket 3. In this case of the letter E appearing as a word, also, no loop of tape arises between the sprockets 3 and 4, and so the center peckers 10 and 11 are not allowed to rise. Therefore, the abutment 311 is not interposed in the path of the bellcrank 313 and the slide 132 is not relatched but remains in the unlatched condition necessary before the last space condition at the end of a word.

I claim:

1. Telegraph transmitting apparatus comprising, in combination, means for feeding therethrough a record strip bearing a series of words represented in a code comprising permutations of elements such as dots and dashes and, further, bearing physical characteristics indicating the division between the words in each pair of consecutive words, means for transmitting signals corresponding to the elements on the record strip, mechanism for detecting the physical characteristics of the record strip representing the division between words, mechanism responsive to said detecting mechanism for repeating the transmission of each word before the transmission of the next word.

2. Telegraph transmitting apparatus comprising, in combination, means for feeding therethrough a record strip bearing a series of words represented in a code comprising permutations of elements such as dots and dashes, and, further, bearing physical characteristics indicating the division between the words in each pair of consecutive words, mechanism for detecting the physical characteristics of the record strip representing the division between words, means responsive to said detecting mechanism for controlling said feeding means to cause each section of the record strip that contains the record of a word to undergo two separate and distinct feeding movements, means for exploring, during each of said two movements, the code elements representing the particular word, and means controlled by said exploring means for transmitting signals corresponding to the code elements twice for each word.

3. Telegraph transmitting apparatus comprising, in combination, means at one point in the apparatus for the feeding therethrough a record strip bearing a series of words represented in a code comprising permutations of elements such as dots and dashes and, further, bearing physical characteristics indicating the division between the words in each pair of consecutive words, second means at a second point in the apparatus for feeding the record strip therethrough, mechanism for detecting the physical characteristics of the record strip representing the division between words, means responsive to said detecting mechanism for operating said two feeding means alternately, means for exploring the code representations of one particular word in each of two successive feeding movements of the record strip effected respectively by said two feeding means, and means for transmitting signals, corresponding to the code elements in the said word, firstly during the first of said feeding movements and secondly during the second of said feeding movements.

4. Telegraph transmitting apparatus comprising, in combination, a sprocket wheel at one point in the apparatus for feeding therethrough a record strip bearing a series of words represented in a code comprising permutations of elements such as dots and dashes and, further, bearing physical characteristics indicating the division between the words in each pair of consecutive words, as well as bearing a line of sprocket holes to be engaged by said sprocket wheel for feeding the strip, a second sprocket wheel at a second point in the apparatus for feeding the record strip therethrough, mechanism for detecting the physical characteristics of the record strip representing the division between words, means responsive to said detecting mechanism for operating said two sprocket wheels alternately, the strip being caused to gather between the two sprocket wheels when the first of said wheels is operating and to be fed from between the two wheels when the second is operating, means for exploring the code representations of one particular word in each of two successive feeding movements of the record strip effected respectively by said two sprocket wheels, and means for transmitting signals, corresponding to the code elements in the said word, firstly during the first of said feeding movements and secondly during the second of said feeding movements.

5. Telegraph transmitting apparatus comprising, in combination, means for feeding therethrough a record strip bearing a series of words perforated according to a code consisting of permutations of two kinds of elements and, further, bearing characteristics indicating the division between the words in each pair of consecutive words, two sets of peckers for exploring the code perforations, mechanism for detecting the physical characteristics of the record strip representing the division between words, mechanism responsive to said detecting mechanism for causing said two sets of peckers in succession to explore the code perforations pertaining to each word, and transmitting means controlled by said peckers for transmitting each word first in accordance with one set of peckers and then a repetition in accordance with the other set of peckers.

6. Telegraph transmitting apparatus comprising, in combination, means for feeding therethrough a record strip bearing longitudinally a series of equally spaced centreholes and a series of words represented by code perforations each associated with one centrehole, the strip further bearing physical characteristics indicating the division between the words in each pair of consecutive words, second means at a second point in the apparatus for feeding the record strip therethrough, each of said two feeding means being adapted to feed the record strip forward in steps determined by the spaces intervening between each pair of centreholes, mechanism for detecting the physical characteristics of the record strip representing the division between words, means responsive to said detecting mechanism for operating said two feeding means successively in respect of and for a period corresponding to the length of each word, means for exploring the code perforations representing a word in each of the two successive feeding movements pertaining to the word, and means for transmitting signals corresponding to the code perforations representing the said word firstly during the first of the said feeding movements and secondly during the second of the said feeding movements.

7. Telegraph transmitting apparatus comprising, in combination, means at one point in the apparatus for feeding therethrough a record strip bearing a series of words represented by perforations arranged according to the Morse code and, further, bearing physical characteristics indicating the division between the words and each pair of words, and second means at a second point in the apparatus for feeding the record strip therethrough, two ratchet and pawl mechanisms allocated respectively to said two feeding means for actuating same, mechanism for detecting the physical characteristics of the record strip representing the division between words, means responsive to said detecting mechanism for disabling said two ratchet and pawl mechanisms in succession whereby each portion of the strip bearing a perforated representation of a word undergoes two separate feeding movements, means for exploring the perforations representing the word in each of said feeding movements, and means for transmitting signals corresponding to the said perforations firstly during the first of said feeding movements and secondly during the second of the said feeding movements.

8. Telegraph transmitting apparatus comprising, in combination, means at one point in the apparatus for feeding therethrough a record strip bearing a series of words represented by perforations constituting permutations of signal elements of two different kinds, the strip further bearing characteristics indicating the division between the words in each pair of consecutive words, second means at a second point in the apparatus for feeding a record strip therethrough, two ratchet and pawl mechanisms, each comprising two staggered ratchet wheels and two pawls, allocated respectively to said two feeding means for driving same, mechanism for detecting the physical characteristics of the record strip representing the division between words, means responsive to said detecting mechanism for causing said two feeding means to operate in succession by first preventing one only of the pawls in one of said ratchet and pawl mechanisms from engaging its associated ratchet wheel and then preventing one only of the pawls in the other ratchet and pawl mechanism from engaging its associated ratchet wheel, whereby each portion of the strip bearing the perforations representing a word undergoes two successive feeding movements firstly under the control of one ratchet and pawl mechanism and then under the control of the other ratchet and pawl mechanism, means for exploring the code perforations representing the said word in each of the said feeding movements of the record strip, means for transmitting signals according to the perforations firstly during the first of the said feeding movements and secondly during the second of the said feeding movements.

9. Telegraph transmitting apparatus comprising, in combination, means for feeding therethrough a record strip bearing a series of words perforated according to a code consisting of permutations of two kinds of elements and, further, bearing characteristics indicating the division between the words in each pair of consecutive words, such characteristics consisting of a gap of predetermined length between the last code perforation in one word and the first code perforation in the next word, two sets of peckers for exploring the code perforations, mechanism for detecting a gap as aforesaid between the groups of perforations representing consecutive words, mechanism responsive to said detecting mechanism for causing said two sets of peckers in succession to explore the code perforations pertaining to each word.

10. Telegraph transmitting apparatus comprising, in combination, means at one point in the apparatus for feeding therethrough a record strip bearing a series of words represented in a code comprising permutations of elements such as dots and dashes and, further, bearing physical characteristics indicating the division between the two words in each pair of consecutive words, second means at a second point in the apparatus for feeding the record strip therethrough, means responsive to the code elements for transmitting signals corresponding to same, a cyclically movable member, means operable upon the transmission of the first code element in a word for initiating the movements of said cyclically moving member for a predetermined number of cycles, means for arresting the strip at said second point upon the completion of said predetermined number of cycles, mechanism for detecting the physical characteristics of the record strip representing the division between words, means responsive to said detecting mechanism for initiating the feeding of the strip at said first point and arresting the feeding of the strip at said second point.

11. Telegraph transmitting apparatus comprising, in combination, means at one point in the

apparatus for feeding therethrough a record strip bearing a series of words represented in a code comprising permutations of elements such as dots and dashes and, further, bearing physical characteristics indicating the division between the two words in each pair of consecutive words, second means at a second point in the apparatus for feeding the record strip therethrough, means for sensing the code elements at each of said points, means for transmitting signals in accordance with said sensing means, a cyclically movable pawl, a ratchet operable by said pawl, means operable upon the transmission of the first code element in a word for initiating the movements of said pawl for a predetermined number of cycles, means controlled by said ratchet for arresting the strip at said second point upon the completion of said predetermined number of cycles, mechanism for detecting the physical characteristics of the record strip representing the division between words, means responsive to said detecting mechanism for initiating the feeding of the strip at said first point and arresting the feeding of the strip at said second point.

12. Telegraph transmitting apparatus comprising, in combination, means at one point in the apparatus for feeding therethrough a record strip bearing a series of words represented in a code comprising permutations of elements such as dots and dashes and, further, bearing physical characteristics indicating the division between the two words in each pair of consecutive words, means for sensing the code elements at the first of said points, second means for sensing the code elements at the second of said points, mechanism for detecting the physical characteristics of the record strip representing the division between words, means responsive to said detecting mechanism for transmitting signals corresponding to the code elements in a word firstly under the control of said first-mentioned sensing means and, as a repetition prior to the transmission of the next word, under the control of said second sensing means, a cyclically movable member, means operable upon the transmission of the first code element in a word, in the first transmission of the word, for initiating the movements of said cyclically movable member for a predetermined number of cycles, means for arresting the strip at said second point upon the completion of said predetermined number of cycles, a second cyclically moving member controlled by said detecting mechanism for arresting the feeding of the strip at the first point and initiating the feeding of the strip at the second point, whereby that portion of the strip bearing the representation of a word of any length, after being fed past said first point, is fed past said second point.

13. Telegraph transmitting apparatus comprising, in combination, means at one point in the apparatus for feeding therethrough a record strip bearing a series of words represented in a code comprising permutations of elements such as dots and dashes and, further, bearing physical characteristics indicating the division between the two words in each pair of consecutive words, means for sensing the code elements at the first of said points, second means for sensing the code elements at the second of said points, mechanism for detecting the physical characteristics of the record strip representing the division between words, means responsive to said detecting mechanism for transmitting signals corresponding to the code elements in a word firstly under the control of said first-mentioned sensing means and, as a repetition prior to the transmission of the next word, under the control of said second sensing means, a cyclically movable member, means operable upon the transmission of the first code element in a word, in the first transmission of the word, for initiating the movements of said cyclically movable member for a predetermined number of cycles, means for arresting the strip at said second point upon the completion of said predetermined number of cycles, a cyclically movable pawl, a ratchet operable by said pawl, means associated with said detecting mechanism for initiating the movement of said pawl for a predetermined number of cycles, said ratchet being operative on the completion of said predetermined number of cycles to arrest the feeding of the strip at the first point and initiate the feeding of the strip at the second point, whereby that portion of the strip bearing the representation of a word of any length, after being fed past said first point, is fed past said second point.

14. Telegraph transmitting apparatus comprising, in combination, means at one point in the apparatus for feeding therethrough a record strip bearing a series of words represented in a code comprising permutations of elements such as dots and dashes, and, further, bearing physical characteristics indicating the division between the two words in each pair of consecutive words, means for sensing the code elements at the first of said points, second means for sensing the code elements at the second of said points, mechanism for detecting the physical characteristics of the record strip representing the division between words, means responsive to said detecting mechanism for transmitting signals corresponding to the code elements in a word firstly under the control of said first-mentioned sensing means and, as a repetition prior to the transmission of the next word, under the control of said second sensing means, a cyclically movable member, means operable upon the transmission of the first code element in a word, in the first transmission of the word, for initiating the movements of said cyclically movable member for a predetermined number of cycles, means for arresting the strip at said second point upon the completion of said predetermined number of cycles, a second cyclically movable member, means associated with said detecting mechanism for initiating the movement of said second cyclically movable member for a predetermined number of cycles corresponding to the period required to feed a point on said strip from said first point to said second point, whereby that portion of the strip bearing the representation of a word of any length, after being fed past said first point, is fed past said second point.

15. Telegraph transmitting apparatus comprising, in combination, means for feeding therethrough a record strip bearing a series of words perforated according to a code consisting of permutations of two kinds of elements and, further, bearing characteristics indicating the division between the words in each pair of consecutive words, such characteristics consisting of a gap of predetermined length between the last code perforation of one word and the first code perforation of the next word, two sets of peckers for exploring the code perforations, mechanism, including an element arranged to remain in a predetermined position for a period corresponding to the time taken by said feeding means to feed a point on the strip past a point in the apparatus, for detecting a gap as aforesaid between the

groups of perforations representing consecutive words, mechanism responsive to said detecting mechanism for causing said two sets of peckers in succession to explore the code perforations pertaining to each word.

16. Telegraph transmitting apparatus comprising, in combination, means at one point in the apparatus for feeding therethrough a record strip bearing a series of words represented in a code comprising permutations of elements such as dots and dashes and, further, bearing physical characteristics indicating the division between the words in each pair of consecutive words, second means at a second point in the apparatus for feeding the record strip therethrough, mechanism for detecting the physical characteristics of the record strip representing the division between words, means responsive to said detecting mechanism for causing said first-mentioned feeding means to operate while said second feeding means remains idle and the strip gathers between said two points, means for sensing the code elements representing a word while the strip is being fed by said first-mentioned feeding means, means for thereupon causing said second feeding means to feed the strip forwards while the strip between said two points becomes taut, means for sensing the said code elements representing the word while the strip is being fed by the second feeding means, means for transmitting signals corresponding to the code elements under the control of said two sensing means, so that the word is transmitted and then retransmitted, and mechanism responsive to said tautening of the strip for resetting the apparatus for the transmission of a new word after the repeat transmission of the preceding word.

17. Telegraph transmitting apparatus comprising, in combination, means at one point in the apparatus for feeding therethrough a record strip bearing a series of words represented in a code comprising permutations of elements such as dots and dashes and, further, bearing physical characteristics indicating the division between the words in each pair of consecutive words, second means at a second point in the apparatus for feeding the record strip therethrough, mechanism for detecting the physical characteristics of the record strip representing the division between words, means responsive to said detecting mechanism for causing said first-mentioned feeding means to operate while said second feeding means remains idle and the strip gathers between said two points, means for sensing the code elements representing a word while the strip is being fed by said first mentioned feeding means, means for thereupon causing said second feeding means to feed the strip forwards while the strip between said two points becomes taut, means for sensing the said code elements representing the word while the strip is being fed by the second feeding means, means for transmitting signals corresponding to the code elements under the control of said two sensing means so that the word is transmitted and then retransmitted, a resilient device arranged to be depressed by said strip as it becomes taut between said two points, and trip members operable by said resilient device to reset the apparatus to transmit a new word after the repeat transmission of the preceding word.

18. Telegraph transmitting apparatus comprising, in combination, means at one point in the apparatus for feeding therethrough a record strip bearing a series of words represented in a code comprising permutations of elements such as dots and dashes and, further, bearing physical characteristics indicating the division between the words in each pair of consecutive words, second means at a second point in the apparatus for feeding the record strip therethrough, mechanism for detecting the physical characteristics of the record strip representing the division between words, means responsive to said detecting mechanism for causing said first-mentioned feeding means to operate while said second feeding means remains idle and the strip gathers between said two points, means for sensing the code elements representing a word while the strip is being fed by said first-mentioned feeding means, means for thereupon causing said second feeding means to feed the strip forwards while the strip between said two points becomes taut, means for sensing the said code elements representing the word while the strip is being fed by the second feeding means, means for transmitting signals corresponding to the code elements under the control of said two sensing means so that the word is transmitted and then retransmitted, a resilient device arranged to be depressed by said strip as it becomes taut between said two points, and trip members operable by said resilient device to arrest the feeding of said strip at both points.

19. Telegraph transmitting apparatus comprising, in combination, means at one point in the apparatus for feeding therethrough a record strip bearing a series of words represented in a code comprising permutations of elements such as dots and dashes and, further, bearing physical characteristics indicating the division between the words in each pair of consecutive words, second means at a second point in the apparatus for feeding the record strip therethrough, mechanism for detecting the physical characteristics of the record strip representing the division between words, means responsive to said detecting mechanism for causing said first-mentioned feeding means to operate while said second feeding means remains idle, and the strip gathers between said two points, means for sensing the code elements representing a word while the strip is being fed by said first-mentioned feeding means, means for thereupon causing said second feeding means to feed the strip forwards while the strip between said two points becomes taut, means for sensing the said code elements representing the word while the strip is being fed by the second feeding means, means for transmitting signals corresponding to the code elements under the control of said two sensing means so that the word is transmitted and then retransmitted, a resilient device arranged to be depressed by said strip as it becomes taut between said two points, trip members operable by the depression of said resilient device, ratchet and pawl mechanism rendered operative by said trip members, and cam mechanism adapted to be operated by said ratchet and pawl mechanism to reset the apparatus to transmit a new word after the repeat transmission of the preceding word.

20. Telegraph transmitting apparatus comprising, in combination, means for feeding therethrough a record strip bearing a series of words perforated according to a code consisting of permutations of two kinds of elements and, further, bearing characteristics indicating the division between the words in each pair of consecutive words, second means at a second point in the apparatus for feeding the record strip therethrough, a pair of peckers at said first point

for sensing code perforations in the record strip, a second pair of peckers at the second point for sensing the code perforations, one of the peckers in each said pair normally lying slightly ahead of the other with respect to the direction of movement of the strip, mechanism for detecting the physical characteristics of the strip indicating the division between words, means associated with said detecting mechanism for causing said first-mentioned feeding means to feed the strip forward at the first point for a distance corresponding to the length of a word while the strip gathers between the two points and for rendering said first-mentioned pair of peckers operative during such feeding movement while said second pair of peckers is disabled, further means for causing said second feeding means to feed the strip forward at said second point while the strip becomes taut and for rendering said second pair of peckers operative during such feeding movement while said first pair of peckers is disabled, mechanism responsive to the tautening of the strip, and means responsive to said last-mentioned mechanism for moving the forward one of said second pair of peckers to a position in which it is in alignment with the said other pecker with respect to the direction of movement of the strip.

21. Telegraph transmitting apparatus comprising, in combination, means at one point in the apparatus for feeding therethrough a record strip bearing a series of words represented in a code comprising permutations of elements such as dots and dashes, and, further, bearing physical characteristics indicating the interval between words in each pair of consecutive words, second means at a second point in the apparatus for feeding the record strip therethrough, mechanism for detecting the physical characteristics of the record strip representing the interval between words, means responsive to said detecting mechanism for arresting the operation of said second feeding means while said first-mentioned feeding means imparts a feeding movement to said strip corresponding to the length of a word and the ensuing interval between words, and for arresting the operation of said first-mentioned feeding means while the said second feeding means imparts a feeding movement to said strip corresponding to the length of said word, means for thereupon arresting the operation of both said feeding means for a period corresponding to the interval between words and then initiating the operation of at least said first-mentioned feeding means, means for exploring the code representations of said word, first in said first-mentioned feeding movement and then in said second-mentioned feeding movement, and means responsive to said exploring means for transmitting signals corresponding to said code representations.

22. Telegraph transmitting apparatus comprising, in combination, means at one point in the apparatus for feeding therethrough a record strip bearing a series of words represented in a code comprising permutations of elements such as dots and dashes, and, further, bearing physical characteristics indicating the interval between the words in each pair of consecutive words, second means at a second point in the apparatus for feeding the record strip therethrough, a single discriminating member controlling said two feeding means, mechanism for detecting the physical characteristics of the record strip representing the interval between words, mechanism responsive to said detecting mechanism for actuating said discriminating member to arrest said second feeding means while said first-mentioned feeding means imparts a feeding movement to said strip corresponding to the length of a word and the ensuing interval between words, and for actuating said discriminating member to arrest said first-mentioned feeding means while said second feeding means imparts a feeding movement to said strip corresponding to the length of said word, means for thereupon actuating said discriminating member to arrest both feeding means for a period corresponding to the interval between consecutive words and thereupon initiate the operation of at least said first-mentioned feeding means, means for exploring the code representations of said word, first in said first-mentioned feeding movement and then in said second-mentioned feeding movement, and means responsive to said exploring means for transmitting signals corresponding to said code representations.

23. Telegraph transmitting apparatus comprising, in combination, means for feeding therethrough a record strip bearing a series of words perforated according to a code consisting of permutations of two kinds of elements and further bearing characteristics indicating the division between the words in each pair of consecutive words, two sets of peckers for exploring the code perforations, mechanism for causing said two pairs of peckers to move towards and away from the strip, a single selectively controlled discriminating member operative either to interrupt the motion of one pair of peckers in their movement towards the strip while leaving the other pair free to explore code perforations or to interrupt the last-mentioned pair while leaving the first-mentioned pair free to explore code perforations, mechanism for detecting the physical characteristics of the record strip representing the division between words, means responsive to said detecting mechanism for actuating said discriminating member to cause said two sets of peckers in succession to explore the code perforations pertaining to each word, and transmitting means controlled by said peckers for transmitting each word first in accordance with one set of peckers and then a repetition in accordance with the other set of peckers.

24. Telegraph transmitting apparatus comprising, in combination, means for feeding therethrough a record strip bearing a series of words represented in a code comprising permutations of elements such as dots and dashes and, further, bearing physical characteristics indicating the division between the words in each pair of consecutive words, a set of transmitting contacts, means for operating said set of contacts to transmit signals corresponding to the elements on the record strip, mechanism for detecting the physical characteristics of the record strip representing the division between words, mechanism responsive to said detecting mechanism for operating said same set of contacts to repeat the transmission of each word before the transmission of the next word.

25. Telegraph transmitting apparatus comprising, in combination, means for feeding therethrough a record strip bearing a series of words represented in a code comprising permutations of elements such as dots and dashes and, further, bearing physical characteristics indicating the division between the words in each pair of consecutive words, relatively movable transmitting

contacts movable between two positions corresponding to mark and space line conditions, a rocker adapted to move said contacts between said positions, a second rocker adapted to operate by cam action on said first-mentioned rocker and positively hold the latter alternately in the position in which the contacts are in the mark position and in the position in which the contacts are in space position, means for operating said second rocker to transmit signals through said contacts corresponding to the elements on the record strip, mechanism for detecting the physical characteristics of the record strip representing the division between words, and mechanism responsive to said detecting mechanism for operating said second rocker to repeat the transmission through said contacts of each word before the transmission of the next word.

26. Telegraph transmitting apparatus comprising, in combination, means at one point in the apparatus for feeding therethrough a record strip bearing a series of words represented in a code comprising permutations of elements such as dots and dashes, and, further, bearing physical characteristics indicating the division between the words in each pair of consecutive words, second means at a second point in the apparatus for feeding the record strip therethrough, mechanism for detecting the physical characteristics of the record strip representing the division between words, means responsive to said detecting mechanism for operating said two feeding means alternately, means for exploring the code representations of one particular word in the first of two successive feeding movements of the record strip effected respectively by said two feeding means, second means for exploring the code representations of the same word in the second of said two successive feeding movements, means for transmitting signals corresponding to the code elements in the said word, firstly during the first of said feeding movements and secondly during the second of said feeding movements, and mechanism operable at will to disable one of said exploring means and to render both said feeding means operative to carry the strip past the other of said exploring means, whereby each word is explored and transmitted once only.

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