Jan. 25, 1944. W. Y. LANG 2,340,065

TELEGRAPH SYSTEM

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FIG. 1

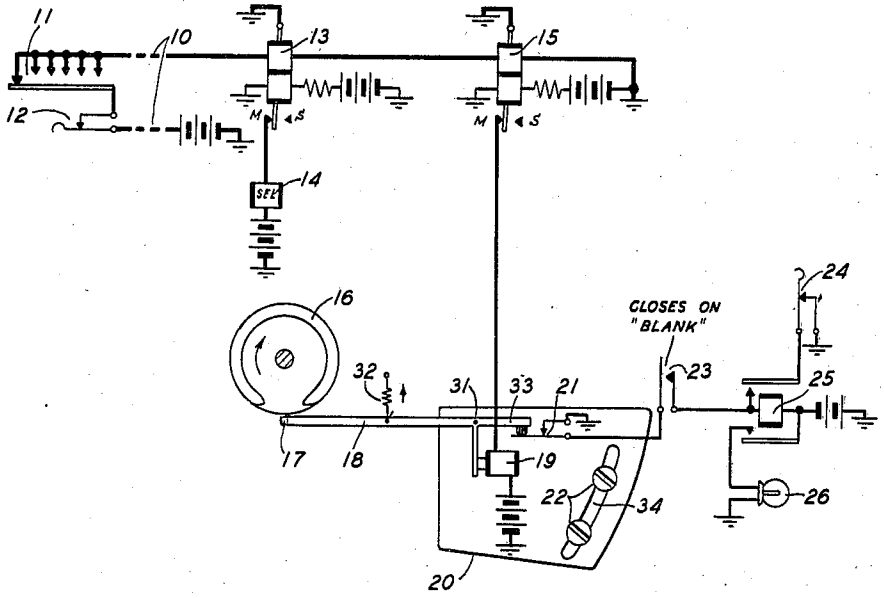

FIG. 2

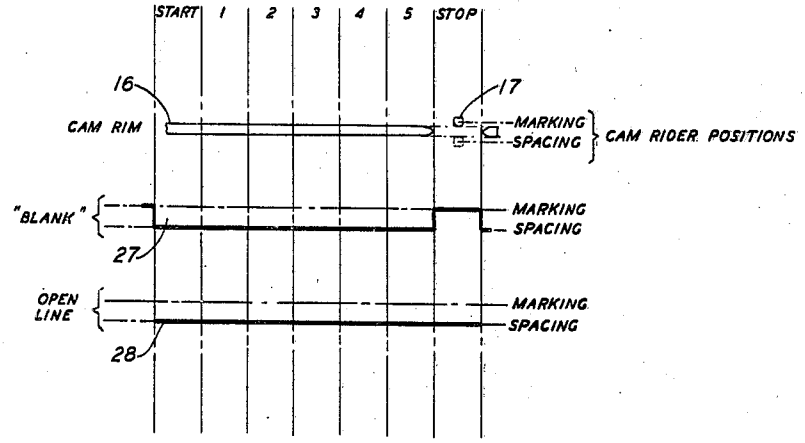

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FIG. 3

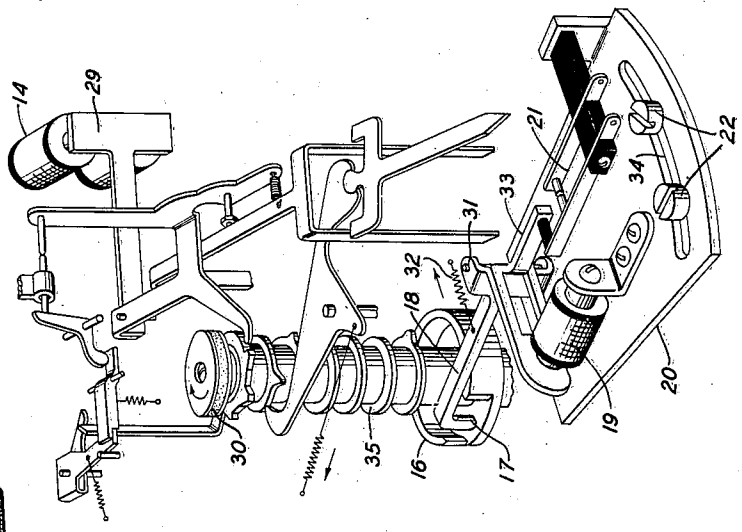
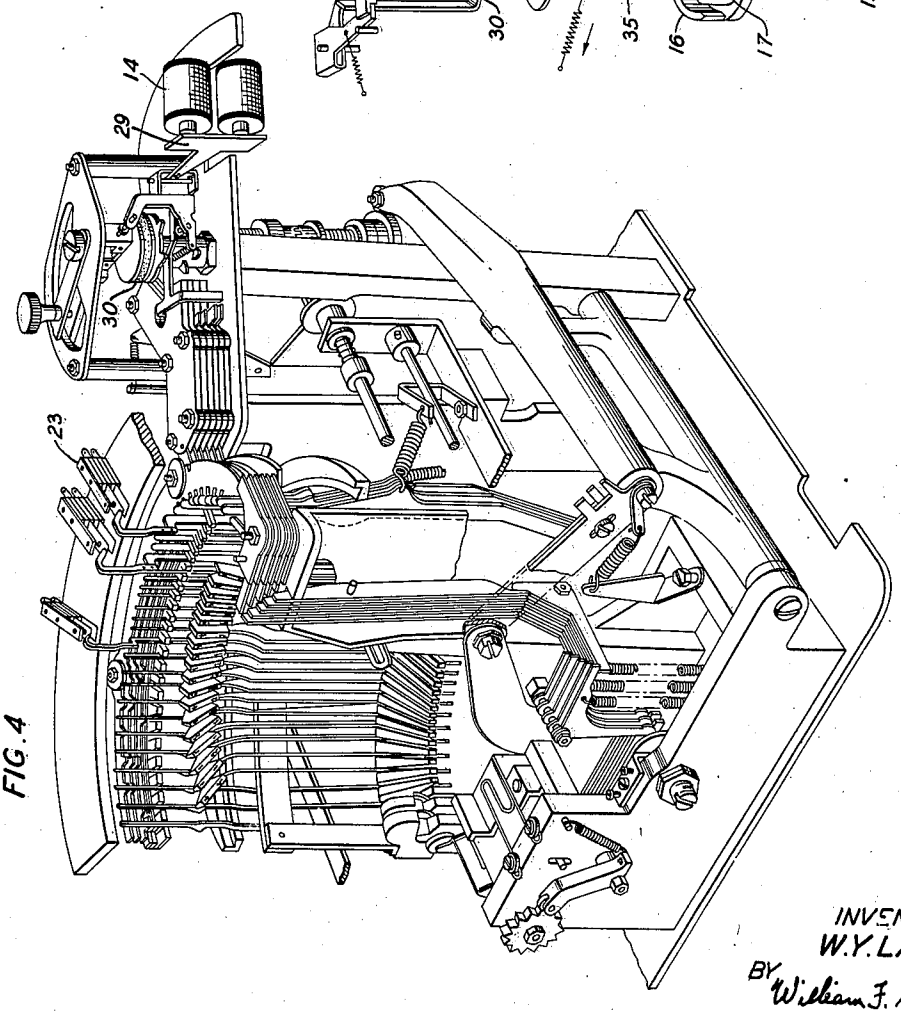


FIG. 4



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UNITED STATES PATENT OFFICE

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TELEGRAPH SYSTEM

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Application March 24, 1943, Serial No. 480,319

8 Claims. (Cl. 178—33)

This invention relates to telegraph apparatus and mechanisms and more particularly to an improved telegraph receiving selector.

In certain telegraph switching systems and in other systems it is sometimes desirable to employ a blank signal, i. e., a code combination in which all of the significant selecting impulses are spacing to perform some switching or other function. When such signals are employed for switching or other functions difficulty is sometimes encountered due to the fact that the usual single magnet selecting mechanism employed for telegraph reception and control of switching and other functions are unable to distinguish between a so-called blank code combination and a break signal or an open line condition which is frequently encountered due to momentary disturbances to which telegraph transmission lines are frequently subjected.

Accordingly one of the objects of this invention is to provide a single magnet selecting arrangement which will readily distinguish between a break signal, an open line or circuit disturbance or "hits" as they are sometimes called and a blank or all spacing code combination transmitted over the line.

In certain types of telegraph transmission systems, each character or function is represented by a code group comprising a plurality of pulses of at least two different signaling conditions which are transmitted over the transmission system. In "start-stop" or "simplex" telegraph systems additional synchronizing pulses are transmitted before and after each code group of pulses in order to maintain synchronism between the transmitting apparatus and the receiving apparatus connected to the system. The synchronizing pulse transmitted before the code pulses is usually called the "start" pulse and is so referred to hereinafter. The synchronizing pulse transmitted after the code pulses is usually called the "stop" pulse. The term "stop" pulse is used in this specification to refer to the pulse following the code pulses of each code combination independently of the character of the pulse in this position. A "code combination" thus includes the synchronizing pulses and the code pulses.

Generally the line is closed during idle periods during the time the transmission circuit is established and this condition is frequently called a marking condition. An open pulse, usually called a spacing pulse, is transmitted before each group of code pulses as a start pulse. After each code combination a marking stop pulse is transmitted and then a spacing start pulse is transmitted before the next group of code pulses, etc.

When a blank code combination is transmitted over the line a spacing start impulse followed by five spacing selecting impulses are transmitted over the line and this in turn is followed by a marking stop impulse.

When the line is interrupted due to hits or other circuit disturbances the stop pulse will also be spacing.

In accordance with the present invention blank code combinations are distinguished from open lines or hits depending upon whether or not a stop pulse is marking or spacing. If the stop pulse is marking the equipment will respond to the code combination as a blank code combination whereas if the stop pulse is spacing the equipment will not respond to the open line or hit as a blank code. In other words, the switching circuits or special functions will not be performed when an open line condition develops or a hit or break signal is received over the line but will be performed when a blank code combination is received.

The foregoing and other objects and features of this invention, the novelty of which is set forth in the claims appended hereto, may be more readily understood from the following specification when read with reference to the attached drawings in which:

Fig. 1 shows in schematic form the equipment and circuits in accordance with this invention for preventing the actuation of circuits controlled by a blank pulse in response to an open line hit or break signal;

Fig. 2 shows the development of a special cam in accordance with the present invention together with graphs of both a blank signal and an open line condition or break signal;

Fig. 3 shows a perspective view of one embodiment of the invention applied to a common type of telegraph selector; and

Fig. 4 shows typical telegraph receiving and selecting mechanisms to which the invention may be applied.

Referring now to the drawings, Fig. 1 shows the circuit arrangements and apparatus in schematic form in accordance with one embodiment of the present invention, 11 represents the transmitting contacts of a transmitting instrument while 12 represents some break contacts which may be employed to transmit break signals over line 10. The break contacts 12 and the transmitting contacts 11 are connected by means of line 10 to a telegraph receiving instrument.

Line 10 may extend between different stations

located at a considerable distance apart and may include any and all of the usual types of telegraphic communication or combinations of them including both voice frequency and high frequency carrier currents and the time division multiplex as well as telegraph channels of composite telephone and telegraph transmission lines. Line 10 may also include any suitable type of repeating and terminal equipment normally employed in the respective types of telegraph transmission. Line 10 may include switching apparatus and also extend through one or more switching centers or central station or exchanges.

It is also within the scope of the present invention to have the transmitting contacts 11 at the same station or closely adjacent the receiving instrument provided with the improved selecting arrangement in accordance with the present invention. As shown in Fig. 1, line 10 extends through windings of relays 13 and 15. Of course, line 10 could extend to a terminal relay and then a circuit from the terminal relay or repeater extend through the line winding of relays 13 and 15. Relay 13 is the usual line relay and controls a selecting magnet 14 of the receiving telegraph instrument which may be of the type sometimes called a teletypewriter and in the case of shorter lines or when repeaters are employed the windings selector magnet 14 of the receiving instrument may be connected directly in series with line 10 instead of having the signals repeated from line 10 to the selector magnet 14 by means of relay 13. Relay 15 has also been provided for actuating control magnet 19 as will be described herein.

As will be apparent to those skilled in the art in case sufficient current flows over line 10, or in the local circuit from repeater of line 10, the winding of magnet 19 may be connected directly in series to this line in the same manner as the selector magnet 14 may be connected in series with the line. It will also be apparent to those skilled in the art that magnet 19 and selector magnet 14 may be controlled from the same receiving or repeating relay by connecting these magnets in parallel to the marking contact of the repeating relay. However, in order to reduce the contact load and wear each of the magnets is provided with a separate relay in the embodiment of the invention shown in Fig. 1.

The selector mechanism controlled by the selector magnet 14 may be of any suitable type such as those disclosed in U. S. Patents 1,745,633 granted to S. Morton et al. on February 4, 1930, and 1,904,164 also granted to S. Morton et al. on April 18, 1933, 2,255,794 granted to Lake, September 16, 1941, and 1,937,376 granted to Zenner on November 28, 1933.

Such selector mechanisms comprise a selecting cam barrel 35 as shown in Fig. 3 provided with a cam for each of the significant selecting impulses and the various levers cooperating with it which cause the receiving mechanism to selectively print or record characters in accordance with the received telegraph signals. The manner of operation of this equipment is described in detail in the above-identified patents. which patents are hereby made part of this application as if fully included herein. Inasmuch as these mechanisms work in their normal manner a detailed description of their operation would serve no useful purpose if repeated herein but would serve only to obscure the present invention.

In accordance with the present invention an additional cam 16 is mounted upon the same cam barrel 35 as the selecting cams and is caused to rotate with the selecting cams. The additional cam 16 in the embodiment shown in the present invention is a ring type of cam and cooperates with the projection 17 of lever 18 in such a manner that the lever 17 is maintained in either one of the two positions depending upon its setting at a particular instant in the cycle of operation of the cam barrel 35. As is well understood by those skilled in the art, cam barrel 35 is rotated through a friction clutch 30 under control of release levers and mechanisms actuated by the selector magnet 14 as shown in Figs. 1, 3 and 4. Upon the reception of a spacing start impulse, magnet 14 releases and in turn releases cam barrel 35 for rotation through one revolution. During this revolution the selecting mechanism of the receiving instrument is conditioned to selectively control the recording of the character or function represented by the received telegraph signals. Near the end of this revolution of cam drum 35, the printing, perforating, or other function or apparatus of the receiving device will set into operation and cause it to record or further respond to the received signal.

As indicated in Fig. 2 a blank signal comprises a spacing start pulse 5 and spacing significant impulses followed by a stop pulse. This signal is represented by the heavy line 27 shown in Fig. 2. An open line due to trouble conditions or the break signal transmitted over line 10 comprises a spacing start signal, spacing selecting impulses, and also a spacing stop signal. In order to differentiate between the blank signal and an open line or a break signal it is necessary to determine whether or not a stop pulse is marking or spacing.

Added cam 16 together with lever 18 and the controlling magnet 19 have been provided to determine whether or not the stop pulse is marking or spacing. The contour of cam 16 and its orientation with respect to the significant pulses of a telegraph signal is illustrated in diagrammatic form by line 16 of Fig. 2. The projection 17 of lever 18 which cooperates with the cam is also indicated in Fig. 2.

By reference to the development of cam 16 shown in Fig. 2 together with the location of projection 17 it is evident that during the stop pulse the projection 17 of lever 18 is released and permitted to assume either one or the other of two positions depending upon whether or not magnet 19 is energized or deenergized during this time.

As shown in Figs. 1, 2 and 3 the projection 17 is located approximately at the center of the stop interval assuming that the cam 16 in Figs. 1 and 3 is shown in its rest position. It is to be understood that this particular showing of the relative positions of projector 17 and the opening cam 16 is for the purpose of illustration only. As will be readily understood by those skilled in the art the usual arrangement is to release the selectable or controlled element for only a short interval of time during a predetermined portion of the pulse interval in order to secure the best results. Also the length of the opening in cam 16 should be appreciably less than the entire pulse interval. Furthermore, it will be desirable to accurately time the interval during which the test of the stop pulse is made. In order to select this interval the control magnet 19 and the pivot 31 supporting lever 18 are mounted upon a movable plate 20, the position of which relative to the cam barrel 35 may be changed by loosening screws 22 and sliding plate 20 around the cam barrel so screws 22 slide in slot 34.

Thus by properly adjusting the position of plate 20 the particular portion of the stop pulse desired to control the positioning of lever 18 may be selected. Normally lever 18 will not be released in the stop position of the cam drum 35. Instead the rim portion of the cam 16 will have passed the projection 17 and the lever 18 when the cam drum 35 comes to rest. In this manner the operation of lever 18 is in no way effected by the time interval between successive characters or pulses.

Of course, as will be readily apparent to those skilled in the art, if it is so desired the orientation, that is, the position of plate 20 may be so regulated, together with the opening in cam 16 that projection 17 may be free to move when the cam drum 35 is at rest.

Contacts 23 are operated in response to the reception of any signal in which all of the five significant pulses are spacing. The manner in which these contacts are operated is well understood by those skilled in the art and is described in greater detail in United States Patents 2,120,235 and 2,112,234 granted to Beattie et al. on June 14, 1938, and March 23, 1938, respectively, the disclosures of which patents are hereby made a part of this application as if fully included herein. The blank pull bar of the specific type of telegraph mechanism shown in Fig. 4 is selected in response to a blank signal and the selection of this pawl bar through its upper extension causes contacts 23 to be momentarily closed, as is well understood by those skilled in the art.

However, the closure of contacts 23 does not take place during the reception of the blank code combination but during the succeeding revolution of the cam drum 35. This time relation is well understood, is due to the construction of the mechanisms, and is brought about by the fact that the actual printing or recording of each code combination cannot start until the entire code combination has been received. Thus the recording of one code combination takes place during the reception of the succeeding code combination. Similarly contacts 23 are closed in response to the reception of one code combination during the reception of the succeeding code combination since these contacts close concurrently with the printing or with the recording of a character or during the performance of the function represented by the code combination.

Assuming first that a blank code combination is received, reception of this code combination will cause all of the five selecting elements to be positioned to their spacing position and cause the selection of the blank pull bar which in turn causes contacts 23 to be momentarily operated shortly after the completion of the reception of the blank code combination.

Since the blank code combination was transmitted a marking stop pulse will immediately follow the fifth spacing impulse. Magnet 19 will, therefore, be operated during the time the projection 17 of lever 18 is free from the rim of cam 16. Consequently projection 17 will be held outside of the rim of cam 16. With projection 17 held outside of the rim of cam 16, contacts 21 will remain closed so that when the contacts 23 later close a circuit is completed for the operation of relay 25 from battery through the winding of relay 25 and closed contacts 23 and 21 to ground. As shown in Fig. 1, relay 25 completes a circuit for maintaining itself operated under control of key 24 and completes a circuit for lighting a signal lamp 26.

It will be at once apparent to those skilled in the art that the simultaneous closure of contacts 23 and 21 in response to the reception of a blank signal may cause the operation of other relays or magnets which, in turn, will perform other functions, such as switching or controlling of other circuits or equipment including the connections of other lines or transmission paths or equipment to the receiving line or circuit.

When it is desired to release relay 25 key 24 will be operated momentarily which interrupts the locking circuit of relay 25 and permits this relay to release.

If, however, a break signal, an open line or a hit, which is longer than the complete code combination, is received over the line the five selecting pulses will again cause the selection of the blank pull bar and the later actuation of contacts 23. In this case, however, a spacing pulse will be received immediately following the No. 5 selecting pulse. Consequently magnet 19 will be released or deenergized when the projection 17 of lever 18 is freed by cam 16. Spring 32 will then cause projection 17 to move inside the rim of cam 16 where it will be held during the succeeding revolution of the cam drum 35. As shown in the drawing, with the projection 17 held inside the rim of cam 16 the outer end 33 at lever 18 will cause contacts 21 to open. Consequently when the blank contacts 23 close shortly after the completion of the first revolution of the cam drum 35 the circuit of relay 25 will not be completed because contacts 21 are held open all during the entire succeeding revolution of cam drum 35 and thus of cam 16. In this manner the circuit of relay 25 is completed only when a blank code combination is transmitted but is not completed when a break signal or momentary circuit interruption causes break signals to be received by the receiving selector.

It also will be apparent to those skilled in the art that this invention is not limited to distinguishing between code combinations having marking and spacing stop pulses but may be employed to distinguish between code combinations having either marking or spacing pulses in any one of the other positions of the combination.

What is claimed is:

1. In a permutation code selector, apparatus responsive to the reception of a permutation code having all the significant code impulses thereof spacing for closing a contact and other apparatus responsive to a following spacing control impulse for opening the circuit through said contact.

2. In a permutation code selector, apparatus responsive to the reception of a permutation code having all the significant code pulses thereof spacing for closing a contact and other apparatus responsive to a following spacing pulse for preventing the completion of any circuit through said contact.

3. In a permutation code selector, apparatus responsive to a predetermined code combination for performing a switching operation, and selective equipment responsive to the succeeding pulse for controlling the performance of said switching operation.

4. In a start-stop permutation selector, apparatus responsive to the reception of a predetermined code for selecting electrical circuits, and control circuits responsive to the following stop pulse for controlling the selected circuit.

5. In a start-stop permutation selector, a rotative element, equipment for releasing said element for rotation through one revolution in re-

sponse to a start pulse, mechanically operative selective apparatus responsive to the following code pulses for selecting electrical apparatus, and other mechanically selective apparatus responsive to the stop pulse for controling the selected apparatus.

6. A telegraph start-stop permutation code selector comprising a rotatable element, apparatus responsive to a start pulse to cause the rotation of said element through one revolution, a two position stop pulse member, a stop pulse cam rotated by said rotatable element and cooperating with said stop pulse member, and apparatus to position said member in either of its positions under control of a stop pulse.

7. In a telegraph start-stop selector a two position member, a rotatable cam for holding said member in either of its two positions during the major portion of the revolution, and apparatus responsive to a stop pulse to position said member in one of its positions.

8. In a start-stop telegraph permutation code selector, a rotatable element, equipment for releasing said element for rotation through one revolution in response to a start pulse, operatable members, selective apparatus jointly controlled by succeeding pulses of the code and said rotatable element for selecting an operatable member, a two position element, a cam rotated by said rotatable element cooperating with said two position element, apparatus for positioning said element under control of the stop pulse, and equipment for operating the selected operatable member under control of said two position element.

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