

Aug. 25, 1942.

A. L. BROWN

2,293,708

ERROR DETECTOR FOR TELEGRAPH PRINTERS

Filed July 24, 1941 .

2 Sheets-Sheet 1

Fig. 1.

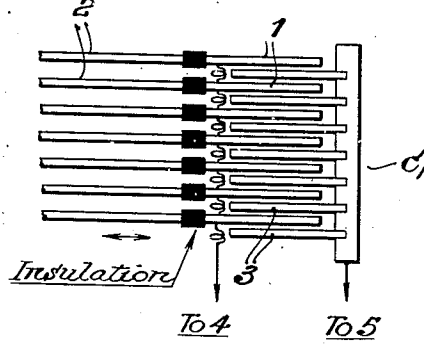
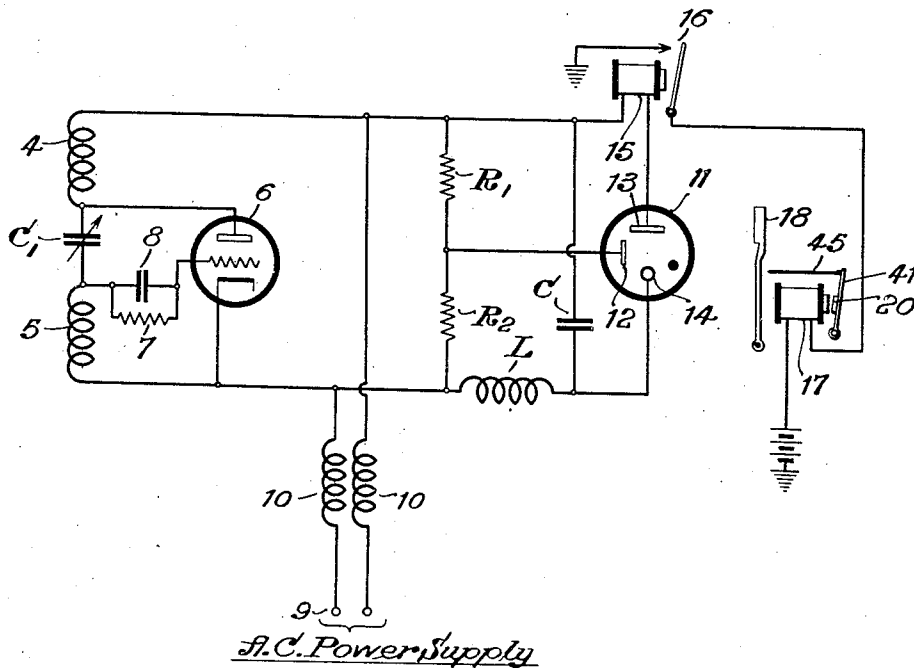


Fig. 2.



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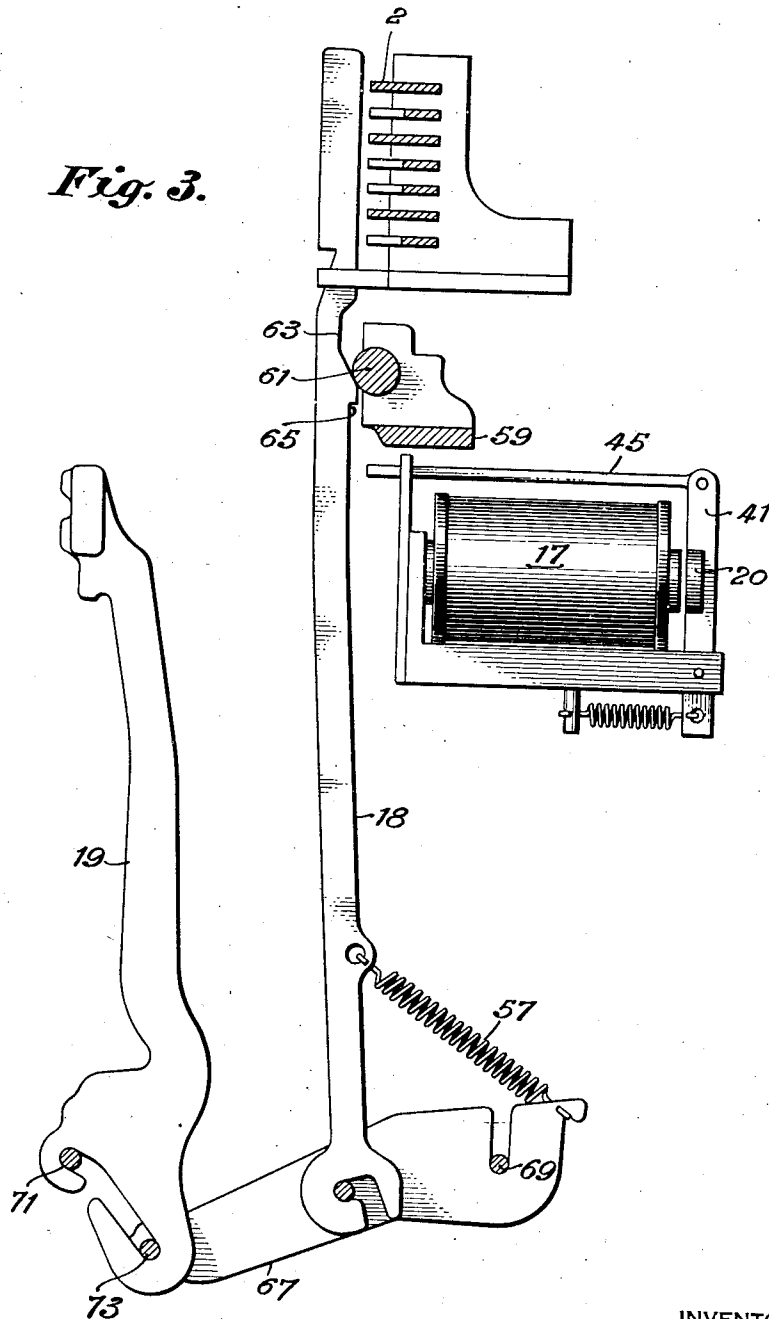
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Fig. 3.



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ERROR DETECTOR FOR TELEGRAPH
PRINTERSAndrew L. Brown, Brooklyn, N. Y., assignor to
Radio Corporation of America, a corporation of
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Application July 24, 1941, Serial No. 403,807

9 Claims. (Cl. 178—69)

This invention relates to error detectors and has particularly to do with the control of printing telegraph receiving apparatus in such manner that errors of transmission of code signals may be clearly indicated. My invention is related to improvements in error detectors such as shown and described, for example, in Patent No. 2,231,397, granted February 11, 1941, to J. A. Spencer. My invention is adapted to be used in connection with conventional printing apparatus of the type which responds to 7-unit code signals and of the type wherein the code signals are composed of marking and spacing elements having a fixed ratio therebetween. The principle of error detection as set forth in the aforesaid Spencer patent is to automatically produce a special response in the telegraph apparatus whenever, due to the occurrence of fading conditions or static impulses or other extraneous disturbances, the received code signal becomes mutilated and contains more or less than the requisite number of marking elements for selecting a character to be printed. My invention, therefore, fits in with systems such as shown and described in United States Patent No. 2,183,147, granted December 12, 1939, to J. B. Moore and R. E. Mathes.

It is an object of my invention to provide means for detecting instances of mutilation of code signals and to provide means for controlling a printing telegraph instrument in such manner as to prevent the printing of characters in response to mutilated signals and to substitute the printing of an error designating symbol.

It is a further object of my invention to provide capacitive means controlled by the code bars of a receiving telegraph instrument for tuning an oscillator in response to which a relay system may be actuated for denoting the absence of mutilation of a received code signal.

It is another object of my invention to provide means for actuating an error symbol printer in response to the reception of a mutilated signal.

In the aforementioned Spencer patent, a system was disclosed wherein an assembly of seven contacts was actuated by the seven code bars of the receiving printer. These contacts were caused to selectively close certain parallel circuits in a resistor network for the purpose of controlling one or more marginal relays. If more or less than three code bars were actuated, the relay operation was such as to release an error symbol type bar, thereby to print the error symbol in place of an intelligence-bearing character. In contrast with used methods, I have found it desirable to employ a plurality of movable capacitive plates, one for each code bar and interleaved with a system of fixed capacitive plates. The over-all capacitance of the movable and fixed plates is varied in accordance with the number of code bars simultaneously actuated. In

response to the selection of any three code bars by marking impulses, I have arranged to control an electronic oscillator, thereby to deliver a high frequency potential of a predetermined frequency which will resonate with a tuned input circuit for a gaseous discharge tube. In the anode circuit of the gaseous tube I place a magnetic relay and cause the same to operate when the tube is ignited. By using alternating current for the power supply, the gaseous discharge tube is self-extinguished in the absence of resonant frequency potentials delivered by the oscillator. Although the oscillator functions continuously, the resonant input circuit for the gaseous tube will permit the latter to ignite only when the output from the oscillator is of the predetermined resonant frequency. The actuation of the magnetic relay in the anode circuit of the gaseous discharge tube may be made effective to control electro-mechanically the locking up of the error designating type bar. During the operation of the printer mechanism, this type bar would be actuated if it were not locked up in response to the actuation of its locking magnet.

My invention will now be described in more detail and by reference to the accompanying drawings in which:

Figure 1 shows a fragmentary view of certain capacitive plates (looking at them edge-wise) assembled so as to be controlled by the respective code bars in a printing telegraph receiver;

Fig. 2 shows a circuit diagram of the elements in combination which are essential for carrying out the invention; and

Fig. 3 shows an end-view elevation of the code bars, together with a conventional type bar operating mechanism and a lock-out means associated with one type bar for the error symbol.

In the description to follow, like parts are given like reference numerals in the several figures. Although the invention is herein illustrated by only one embodiment, several figures are presented for more clearly showing the different features of the invention.

Referring first to Figure 1, I show a number of capacitive plates 1, each attached to the end of its appropriate code bar 2, and preferably insulated therefrom. Interleaved between the plates 1 are stationary plates 3. All of the plates 1 are interconnected and constitute one electrode of the capacitor C₁. All of the plates 3 are also interconnected and constitute the other electrode of the capacitor C₁. The value of the capacitance is, therefore, determined by the number of code bars which are moved inwardly of the capacitive plate assembly.

Referring now to Figure 2, I show the capacitor C₁ in circuit with inductances 4 and 5. Inductance 4 forms part of the anode circuit for a discharge tube 6 which functions as an oscillator,

Inductance 5 is connected between the cathode and the control grid of this oscillator tube 6. The capacitor C_1 intercouple the output and input circuits. In the grid circuit, I preferably dispose a grid leak resistor 7 and shunting condenser 8, as is usual.

An ordinary alternating current power supply, say of 115 volts, and 60 cycles, is indicated at the terminals 9, this power supply being furnished to the oscillatory tube 6 as well as to other elements of the circuit arrangement presently to be described. High frequency chokes 10 may be applied to prevent undesirable dissipation of high frequency output energy from the oscillator 6.

Figure 2 also shows a relay tube 11 which is of the gaseous discharge type. Preferably I employ a cold cathode tube such as is known in the trade under the code symbol OA4—G. This tube has a starter anode 12, a main anode 13 and a cold cathode 14. The starter anode 12 is connected to a junction point between two resistors R_1 and R_2 . These resistors, in series, constitute a voltage divider across the terminals of the alternating current power supply, which terminals are also connected respectively to the cathode and anode of the oscillator tube 6. The resistor R_1 preferably has a value of the order of 15,000 ohms, whereas resistor R_2 has a value of the order of 10,000 ohms.

In shunt with the voltage divider, R_1 , R_2 is a resonant circuit consisting of inductance L and capacitor C . When the high frequency potential derived from the oscillator 6 is superimposed upon the low frequency from the source 9, and is made resonant to the tuned circuit $L-C$, then the effect of this voltage across the capacitor C is to increase the negative potential peaks on the cathode 14, and thus to increase the pulsating potentials between this cathode and the starter anode 12. These peaks start a discharge between the cathode and the starter anode. This discharge produces a further ionization which enables the discharge to transfer to the main anode 13 if circuit values are made suitable therefor. Therefore, current flows between the cathode 14 and the anode 13. This current traverses the winding of a relay 15 and actuates the same.

By using an alternating current power supply, no special provision need be made for extinguishing the tube 11. In fact, this tube becomes self-extinguished repeatedly with the negative pulses from the low frequency power supply applied to the anode 13.

In circuit with the relay contacts 16 I provide a control magnet 17 for locking the "pull bar" 18 associated with the error symbol type bar 19.

The side view elevation shown in Figure 3 includes some of the conventional structure of a printing telegraph receiver in order that the operation of the pull bar 18 and its mechanical connections with the type bar 19 may be more readily understood. If the code bars 2 have been duly selected, then those which are selected in response to a marking impulse have been moved into position for opening up an alignment of notches opposite one of the pull bars for the respective printing characters. This selected pull bar is permitted to drop into the code bar notches under the tension of a spring 57. Immediately the printing bail 59 is raised and its associated printing bail roller 61 is also pushed up into the notches 63 in back of each pull bar 18. As the selected pull bar drops into the notches of the code bars 2 the printing bail 59 engage with a

shoulder 65 on the pull bar 18. Hence the pull bar is lifted and swings the type bar actuator upwardly about the pivot center 69. The type bar 19 swings on the pivot center 71 and is caused to make a stroke against the paper by the upward movement of the pin 73 which is supported at the end of the actuating bar 67. All of the pull bars 18 are substantially alike and function in the same manner. There is just one fundamental difference, however, between the selection of the error designating type bar 19 and the selection of any other type bar. The difference resides in the manner in which the error designating pull bar 18 is controlled, compared with the normal control of the other pull bars by direct selection of the core bars 2. In back of the error pull bar there is always an open alignment of notches in the code bars 2. But when proper intelligence-bearing signals are received the magnet 17 pulls up its armature 20 on the lever arm 41 and causes a push rod 45 to be thrust against the edge of the pull bar 18, thus restraining the pull bar from entering the code bar notches. When an error occurs, magnet 17 does not operate; hence, the push rod 45 remains clear of the pull bar, thus permitting it to enter the notches in the code bars. The error designating type bar 19 is then actuated by its pull bar 18 and caused to print an error designating symbol in response to the next stroke of the printing bail 59.

In the operation of my invention, when un mutilated signals are received, namely those which uniformly contain three marking impulses, the capacitor C_1 is adjusted to tune the oscillator 6 to a predetermined frequency indicative of normal reception. The normal frequency of the oscillator resonates with the tuned input circuit for the gaseous tube 11 and causes the latter to ignite. The magnetic relay 15 then closes its contacts 16 and energizes the magnet 17. The relay 15 is of the slow release type so that its armature does not follow the alternations of the power supply 9.

The magnet 17 is preferably operated by direct current. The pulling up of its armature 20 (as when the signal is not mutilated) causes the pull bar 18 for the error-designating type bar 19 to be restrained from actuation. The printer will then operate in a normal manner to select each type bar corresponding to the transmitted signals. If, however, the signal is mutilated so that only one or two marking impulses are received, or more than three such marking impulses, then the value of the capacitor C_1 will be made such that high frequency potentials delivered by the oscillator 6 will not resonate with the tuned circuit $L-C$. Accordingly, the gaseous tube relay 11 will not be ignited and relay 15 will not be energized. Since the code combination of more or less than three marking elements in the code signal will not make a selection of any intelligence-bearing type bar and since the magnet 17 is not energized in this case, the error indicator pull bar 18 will be free to actuate the error symbol type bar and accordingly the error symbol will be printed.

It will be clear from the above description that I have substituted a capacitive tuner in an oscillator circuit in place of the resistive network and marginal relays shown by my associate Mr. Spencer in his aforementioned patent. I thus avoid the difficulty of adjusting the operation of such marginal relays within very close tolerances, as was necessary in order to discrim-

inate between times when 1, 2 or 3 such relays in series should be actuated. With my system, the slight variations in capacitance of the unit C₁ are utilized to control very dependably the frequency of output from the oscillator tube 6. Furthermore, there is now no need for increasing the load upon the code bars as was required in order to actuate the contact springs of Spencer's system. Many other advantages of my system will be apparent to those skilled in the art.

Modifications of my invention are, of course, possible and they may suggest themselves in view of the foregoing disclosure. The spirit and scope of the invention is, therefore, to be regarded as of such breadth as is defined by the claims.

I claim:

1. In receiving apparatus responsive to code combinations of selecting and non-selecting elements, a capacitor having a plurality of stationary plates interleaved with movable plates, means responsive to the reception of selecting elements of said code combinations for independently adjusting said movable plates to change their capacitive effect, an oscillator having said capacitor in its tuning circuit, and error detecting means controlled by said oscillator and operable to denote departures from a predetermined tuning frequency of said oscillator, which departures are caused by the adjustment of an abnormal number of said movable plates in response to the reception of a mutilated signal.

2. The combination according to claim 1 and including relay means operable by said oscillator in response to the output therefrom of energy having said predetermined frequency, for preventing the operation of said error detecting means.

3. The combination according to claim 1, wherein said error detecting means includes a relay having a controlled gaseous discharge tube, a magnetic relay in the output circuit of said tube, and a circuit arrangement providing control of said tube from output energy of said predetermined frequency delivered by said oscillator.

4. The combination according to claim 1, wherein said error detecting means includes a type bar on a receiving printer, magnetic locking means to prevent the cyclic release of said type bar, and a relay circuit operatively interposed between the output circuit of said oscillator and said locking means, whereby said type bar is locked up whenever said oscillator delivers energy of said predetermined frequency.

5. In an error detecting device for a telegraph receiver, a capacitor, a plurality of interleaved movable and stationary plates in said capacitor, each movable plate being adjustable independently of the others, means responsive to the reception of a code signal consisting of a fixed number of selecting elements and a fixed number of non-selecting elements for increasing the capacitive effect of said movable plates corresponding with the selecting elements of said code signal, an oscillator tunable by said capacitor to a predetermined frequency when said code signal as received is un mutilated, and an error indicator controlled by said oscillator when tuned by said capacitor to a different frequency in response to the reception of a mutilated code sig-

nal consisting of an erroneous number of selecting elements.

6. An error detecting device for a telegraph printer comprising a high frequency oscillator circuit including an adjustable capacitor for tuning the same, said capacitor having a plurality of stationary plates interleaved by independently movable plates, a set of code bars in said printer, each operable in response to the reception of a marking impulse of a code signal, each of said movable plates being shiftable under control of an appropriate one of said code bars, an error indicating mechanism, means responsive to the tuning of said oscillator circuit to a predetermined frequency for locking out said error indicator mechanism, and means operable in response to the operation of more or less than a fixed number of said code bars for tuning said oscillator to a different frequency, thereby to release for operation said error indicating means.

7. The method of automatically indicating the reception of a mutilated code signal having an abnormal ratio between its selecting and non-selecting elements, which comprises producing oscillations of a predetermined frequency in response to the reception of all code signals possessing a fixed normal ratio between their selecting and non-selecting elements, producing oscillations of a different frequency in response to the reception of a code signal having an abnormal ratio between its selecting and non-selecting elements, and making an error indication only when said oscillations are of said different frequency.

8. In the operation of a telegraph printer having a code selector member for each element of an equal length signal to be decoded, and having type members one of which bears an error-designating symbol, the other type members having a font of type, the method of controlling said error-designating type member which comprises producing oscillations, varying the frequency of said oscillations as a function of the number of said code selector members which are actuated for the marking elements of each code signal, utilizing the oscillations of a predetermined frequency to lock out said error-designating type member whenever a type member bearing a character from said font is to be selected, and causing said error-designating type member to be released for actuation whenever the selection of said selector members is abnormal in number, thus causing the oscillations produced to be of an abnormal frequency.

9. In combination, an electron discharge tube oscillator having input and output circuits, tuning means intercoupling said input and output circuits, said tuning means being constituted as a capacitor having a plurality of stator plates interleaved by independently movable plates, separate means for actuating each of said movable plates, a gaseous discharge tube having a resonant input circuit tuned to one of the frequencies to which said oscillator may be tuned by said capacitor, a relay in the output circuit of said gaseous tube, and an operating potential source suitably connected to the electrodes of said oscillator tube and through said relay to said gaseous tube, whereby the relay is actuated only when said oscillator is tuned to the frequency to which the input circuit of said gaseous tube is resonant.

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