Dec. 1, 1942. L. GARCEAU 2,303,734

KEY FOR COMMUNICATION SYSTEMS

Filed April 2, 1941 2 Sheets-Sheet 1

Fig. 1

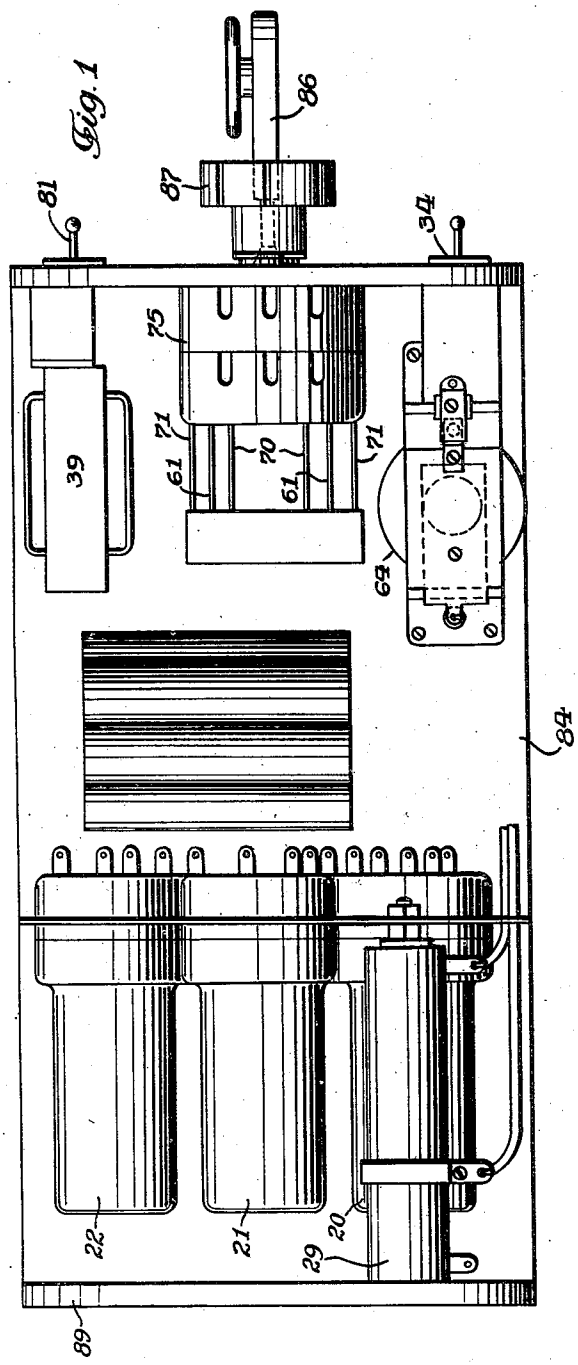
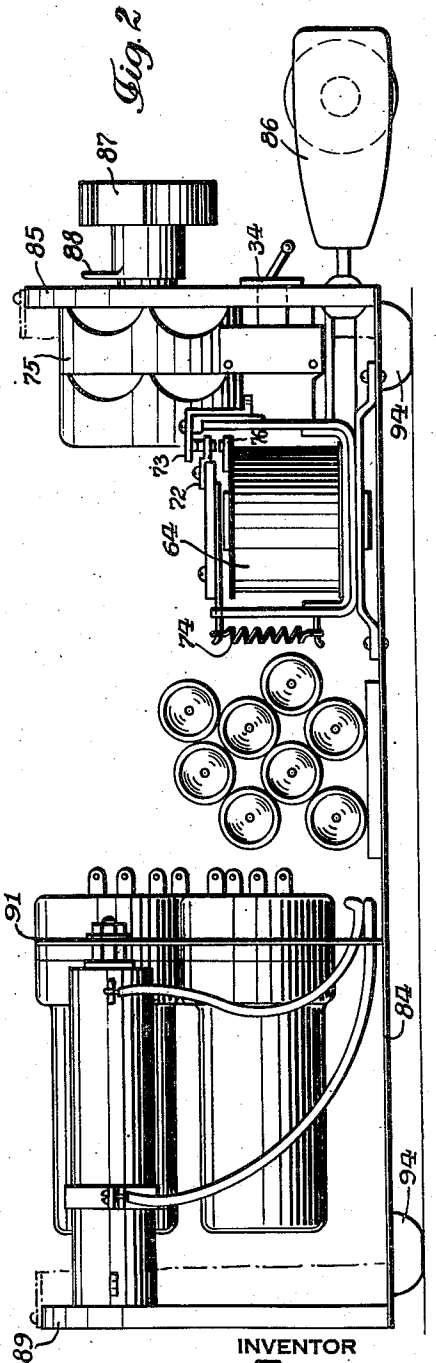


Fig. 2



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Fig. 4.

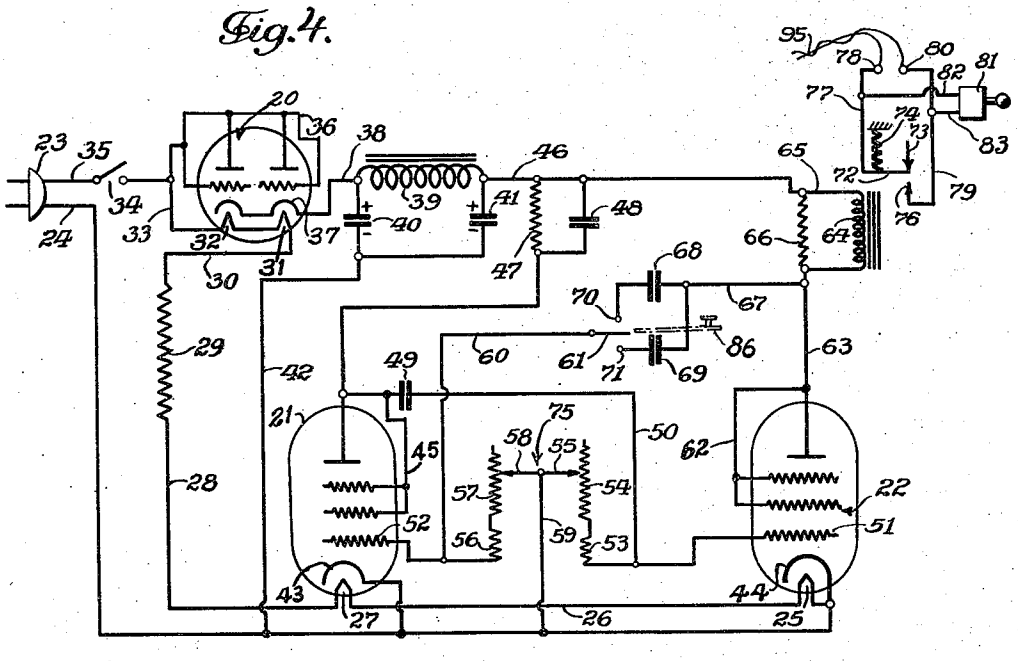


Fig. 5.

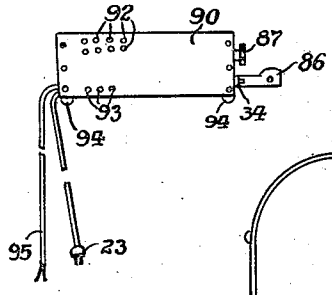
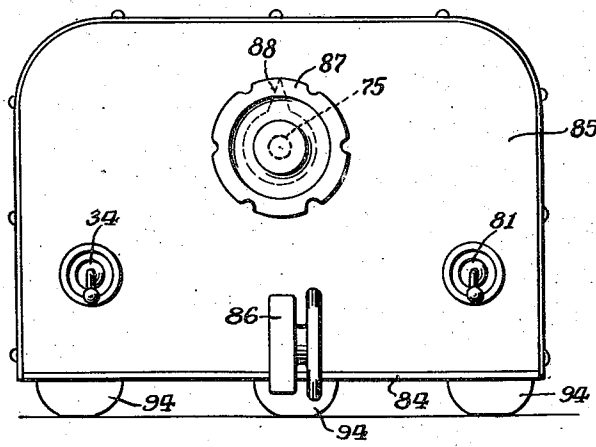


Fig. 3.



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KEY FOR COMMUNICATION SYSTEMS

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Application April 2, 1941, Serial No. 386,438

5 Claims. (Cl. 178—82)

This invention relates to improvements in keys for communication systems and is directed more particularly to the provision of a key for producing electronically dot, dash, and space intervals of constant timing and mathematically accurate.

Another object of the invention is the provision in combination with a key, of a multi-vibrator having circuits including constants, some of which are adapted to be changed by said key to produce oscillations, the peaks of which are substantially equal to the spaces therebetween, when the key is in one position, and adapted to produce oscillations when said key is in another position, the peak durations of which are substantially larger than the peaks produced when the key is in said first position, the spaces between the oscillations remaining substantially the same for either position of the key.

The electronic circuits herein described include two triodes which together constitute a relaxation type oscillator which produces substantially square wave forms.

When the grid condensers and the two grid leaks are equal, the oscillations produced are symmetrical. The durations of the wave produced in the plate circuit of one tube is equal to that produced in the plate circuit of the other tube. One of these equal grid condensers is connected to the plate of the other tube by the key when the latter is in the "dotting" position. When the key is in the "dashing" position it connects a condenser of larger capacity between said grid and the plate of the other tube with the result that the spaces between the peaks are the same length as they were between the "dots" but the durations of the peaks is increased. When the key is in the middle or neutral position neither of the connectable grid condensers is connected in the circuit, therefore no feedback coupling exists and the multi-vibrator cannot function as such.

Still another object of the invention is the provision of a key which when moved to one position, produces electronically a series of spaced "dashes"; and when moved to its other position, produces electronically a series of spaced "dots"; whereby an operator may, by moving said key, control the electronic production of a series of spaced dots and dashes forming a message.

Yet another object of the invention is the provision of a key and electronic circuits associated therewith, said key being adapted, when in one position, to complete a circuit for producing oscillations to be used as "dots," and adapted when in another position to complete a circuit for producing oscillations to be used as "dashes," a relay having its actuating winding subjected to said oscillations, and having switching means for controlling an external circuit or circuits.

Other objects will be apparent to those skilled in the art.

General description

In the invention herein shown and described by way of example, my new and improved key which may be termed an electronic "bug" key, like all keys of the "bug" type uses the easy side to side motion of a paddle shaped handle. Associated with the paddle and contacts controlled thereby, is electronic means, the circuit of which is shown in the drawings and will hereinafter be described in detail.

When the paddle is pressed to the right with the thumb a series or succession of dots is produced, the first of which is instituted when contacts associated with the paddle are closed. This series of dots is continuously instituted as long as the key is closed in that direction. When the paddle is pressed to the left a series of dashes is instituted and they also are continuous while the key is closed in that direction. The reduction in labor of "sending" is obvious.

The key is moved only at the beginning and end of a character and to change from dashes to dots or vice versa.

The transmission of figures of the continental code is also simplified as only three motions of the wrist are required for any character.

One of the most important advantages of my new electronic key is the improvement in the accuracy of sending. It is well known that characters are made up of dots, spaces and dashes, the length of which bear definite mathematical relationships. For example, the length of spaces between dots or dashes is supposed to be exactly equal to that of the dots. The length of the dashes is supposed to be exactly equal to the interval of three dots. A dash plus a following space is equal to two dots plus their following spaces. Very few operators, whether they use the simple or mechanical "bug" keys, preserve this relationship with any accuracy.

My improved electronic key makes inaccurate sending impossible. The dots and spaces are automatically made equal. The dashes are also always made three times as long as the dots and even the spaces between a dash and a dot or vice versa are made equal to the spaces between dots regardless of how fast the paddle is flipped

from the dotting to the dashing position or back.

It is very easy to learn to use my electronic key and operators who are used to the mechanical type of bug key are able to send easily with my electronic bug key after practicing about half an hour. Learning may be made even simpler by the fact that when desired the dashes or dots can be made by successive individual motions of the paddle.

As is well known in the art, the adjustment of any mechanical bug key is a complex and time-consuming operation requiring the stopping of transmission to set up a number of different contact screws and to try out a number of different weight positions. Contrasted with this, my new key can be adjusted instantly even during the process of a transmission. A single knob on the panel when rotated in one direction lengthens and when rotated in another, shortens simultaneously the periods of dot, dash and spaces and at the same time preserves their exact proportion.

By means of this knob I am able to adjust the speed at which the dots and dashes are instituted so that a minimum range of 8 words per minute up to a maximum range of 100 or more words per minute may be obtained.

My electronic key is provided with a small panel upon which is mounted the single knob referred to above and two other controls—one is the on and off switch for the power supply and the other is a shorting switch which short-circuits the switching means controlled by the internal relay. This is particularly useful for land line telegraph work where the circuit is normally closed for reception, and it is also useful for radio applications where the key is to be left closed to hold a channel with a continuous carrier, or to make transmitter adjustment with the key closed.

There are no mechanical adjustments.

In the embodiment herein shown and described all of the apparatus is housed in a small cabinet approximately the same size as the regular mechanical "bug" key. It requires a power supply of approximately 17 watts at 110 volts, either alternating or direct current.

It is intended for continuous operation and is suitably ventilated to dissipate the heat generated, and the constants of the circuits are unaffected by considerable variation in tube characteristics.

When my electronic "bug" key is to be used for the operation of a high power radio transmitter or wherever a radio-frequency circuit is to be keyed, it may be preferable to employ an additional keying relay. Since my key operates very quietly, a monitoring device may be associated with the transmitter to which my key is connected.

Referring to the drawings:

Figure 1 is a plan view of my improved electronic "bug" key showing the arrangement of the elements;

Figure 2 is a left side elevation of the key;

Figure 3 is an end elevation of the key showing the front panel and the controls thereon; and,

Figure 4 is a circuit diagram showing the internal connections of the various elements of my new electronic "bug" key.

Considering first Figure 4, the tube **20**, which may be, for example, a type 12SC7, is employed as a rectifier. The device also includes tubes **21** and **22**, which may be, for example, types 12SJ7.

A connector plug **23** is provided for connecting the device to a source of current, and has one conductor **24** connected to the heater **25** of the tube **22**, and this heater is in turn connected via wire **26** to the heater **27** of tube **21**. A conductor **28** connects heater **27** to a resistor **29**, the other end of which is connected via wire **30** to serially connected heaters **31** and **32** of tube **20**. The heater **32** is connected via wire **33** to switch **34**, the other side of which is connected via conductor **35** to the plug **23**, so that when the plug **23** is connected to a source of current the switch may be closed to complete the heater circuit.

The plates and grids of tube **20** are tied together to form an anode **36**. The cathodes **37** are tied together and connected via wire **38** to the choke **39**. The ends of the choke **39** are by-passed by filter condensers **40** and **41**, the positive terminals of the condensers being connected to the ends of the choke. The negative terminals of the condensers **40**, **41** are connected together and are connected via the wire **42** to the cathode **43** of the tube **21** and thence to the cathode **44** of the tube **22**. The cathode **44** is in turn connected to the conductor **24**.

The plate, screen grid and the suppressor grid of the tube **21** are tied together to form an anode **45** thereby forming of the tube 12SJ7 a low-mu triode. This anode is connected to the high voltage conductor **46** through a resistor **47**, by-passed by a condenser **48**. The anode **45** is also connected via a condenser **49** and a wire **50** to the control grid **51** of the tube **22**. The control grid **51** is also connected to a fixed resistance **53** which is in turn connected to the variable resistance **54**. An arm **55** engages the resistor **54**.

The grid **52** is connected to a fixed resistance **56** which is in turn connected to a variable resistor **57**. The arm **58** engages the resistance **57**. The arms **55** and **58** are connected together and to the cathodes **43** and **44** via wire **59**.

The variable resistances **54** and **57** in practice are incorporated in a "twin volume control" which may be generally designated by the numeral **75**, and the arms **55** and **58** move in unison so that the leak resistances between the grids and the cathodes are substantially equal throughout the range of movement.

The grid **52** is also connected via a wire **60** to the moving arm **61** of a double throw switch. The plate, the screen and the suppressor grid of the tube **22** are connected together to form an anode **62** thereby making the 12SJ7 tube a low-mu triode. This anode is connected via a wire **63** to one terminal of the actuating winding **64** of a relay. The other terminal of the actuating winding is connected via a wire **65** to a high voltage line **46**. The actuating winding **64** is by-passed by a suitable fixed resistor **66**.

A wire **67** has one end connected to the anode wire **63** and its other end commonly connected to capacitors **68** and **69**.

The capacitor **68** is connected to the terminal **70** of the double throw switch, and the capacitor **69** is connected to the other terminal **71** of the double throw switch. The movable arm **72** of the relay **64** is urged against the contact point **73** by spring means **74**, and when the relay is energized the arm **72** is attracted and brought into contact with the contact point **76**.

The arm **72** is connected via a wire **77** to an output terminal **78**, and a wire **79** connects the contact point **76** to output terminal **80**. A switch **81** has one conductor **82** connected to the wire **77** and a second conductor **83** connected to the wire **79** so that when desired, the switch **81** can be thrown to short circuit the output terminals **78** and **80**.

The resistor 66 across the relay winding 64 is provided for eliminating the inductive kick from the winding which kick would spoil the symmetry of the circuit. I have found that a resistance of 4000 ohms is suitable for this purpose. The plate load resistor 47 in the embodiment shown, is 5000 ohms resistance and the condenser 48 shunting this resistor is .004 microfarad capacity for the purpose of stopping high frequency parasites occurring when the key is open and which radiate into radio receivers.

Referring now to Figures 1 to 3, it will be noted that the base plate 84 supports the apparatus and this base plate is substantially the area of the base of any ordinary mechanical type "bug" key.

A front panel 85 is secured to the front end of the base 84 and forms a support for the switches 34 and 81, the twin volume control 75 and the paddle key 86. A knob 87 secured to the shaft of the twin volume control 75 is readily accessible for changing the transmitting speed and is provided with a pointer 88. The paddle key 86 is pivotally mounted on the panel 85 and is operatively connected to the movable arm 61 of the double throw switch.

A rear panel 89 is mounted on the base 84 and a suitable cover 90, Figure 5, for enclosing the mechanism, may be secured to the edges of the panels 85 and 89.

Spaced apart from the rear panel 89 is an upright wall 91 which forms a support for the tubes 20, 21, 22 and for one end of the resistor 29. The other end of the resistor 29 is supported by the panel 89. The condensers and resistors may be grouped between the sockets of the tubes 20, 21 and 22 and the other mechanism, as shown in Figures 1 and 2.

In Figure 5 it will be noted that the cover 90 has a plurality of ventilating holes 92 formed in the wall above the tubes and resistor 29, through which heat may pass and other holes 93 near the base through which cool air may enter the interior.

The base plate 84 may have rubber feet 94 mounted thereon so that the device will not skid while in use.

In the commercial form of the device a suitable connector cord carrying a plug 23 is provided, and a cable 95 extends outwardly from the terminals 78 and 80 for connection to the circuit to be controlled.

Operation

To operate my electronic "bug" key, the operator turns on the switch 34 and in a few seconds the heaters in all of the tubes are hot.

When the operator presses the paddle 86 to the right with his thumb, as stated before, a succession of dots is produced and when the paddle 86 is pressed to the left a series of dashes is produced.

Referring to Figure 4, it is assumed that when the paddle is moved to the right the lever 61 is moved into contact with the point 70. The capacity of the condenser 68 is .1 microfarad.

When the lever 61 contacts 70 and the anode 62 of the tube 22 is capacitively coupled to the grid 52 of the tube 21. The grid 51 of the tube 22 is permanently coupled to the anode 45 of the tube 21 through the condenser 49, the capacity of which, for example, may also be .1 microfarad.

When the key is thrown to the "dotting" position the lever 61 contacts the contact 70 thereby coupling the grid 52 to the plate 62, and the condensers 68 and 49 being of the same capacity the multi-vibrator produces symmetrical oscillations.

Now, when the paddle is moved to the left and the lever 61 is brought into contact with 71, the condenser 69, which, for example, may have a capacity three times as great as that of the condenser 68, causes the peaks of the oscillations to be approximately three times the duration of the peaks produced when the key is in the "dotting" position. The spaces between the peaks are the same as the spaces between the peaks when dots are produced. The relay connected to the output of the multi-vibrator operates slower and thereby causes dashes in the external circuit connected to the cable 95.

As pointed out above, the intervals between the dots, and also the intervals between the dashes are substantially equal to the life of a dot, and the intervals of the dashes is substantially equal to the life of three dots. A dash plus a following space is equal to two dots plus their following spaces.

From the above it can be seen that an operator who is used to the mechanical type of "bug" key can very quickly learn to use my electronic key and can, with my key, transmit rapidly, accurately and uniformly, and by means of the knob 87 he can set the device to transmit at any speed from 8 words per minute to a maximum of 100 or more words per minute.

Although I have herein shown and described, by way of example, one embodiment of the invention which is understandable to those skilled in the art, it must be understood that many changes may be made in the arrangement herein shown and described without departing from the spirit of the invention as set forth in the following claims.

What is claimed is:

1. In a keying device, a unitary structure comprising a base, a thermionic multi-vibrator mounted on said base for producing triggered impulses, a power pack on said base including a rectifier tube and a filter system, means for connecting said power pack to a source of current, keying means on said base, switching means controlled by said keying means, connections between said switching means and said multi-vibrator including constants to effect the production of impulses representing "dots" when said switching means is in one position and the production of impulses representing "dashes" when said switching means is in another position, a relay having its magnet winding connected to receive said triggered impulses, a second switching means on said relay controlled by said magnet and adapted in turn to be connected to an external circuit, a panel mounted on said base and forming a pivotal support for said keying means, the latter having its inner end conected to said first switching means and having its outer end projecting from said panel so as to be accessible to an operator, a casing secured to said base and said panel and embracing all of the above-mentioned parts except the projecting end of said keying means, a connector cord extending through said housing for connection to a source of current, and a second connector cord extending through said housing from said second switching means.

2. In a keying device, a unitary structure comprising a base, a thermionic multi-vibrator on said base for producing triggered impulses and

including a power pack and means for connecting the same to a source of current, switching means, connections between said switching means and said multi-vibrator including a capacitance of one value adapted to effect the production of triggered impulses of one periodicity when said switching means is in one position and a second capacitance of a different value adapted to effect the production of triggered impulses of a different periodicity when said switching means is in another position, a relay having its magnet winding connected to the output of said thermionic means, a second switching means on said relay controlled by flux generated in said magnet by said triggered impulses and adapted to be connected to an external circuit, a housing secured to said base and enclosing all said parts, and keying means projecting from said housing and connected to said switching means.

3. In a keying device, a unitary structure comprising a base, a thermionic multi-vibrator mounted on said base, a power pack on said base for supplying power to said multi-vibrator, switching means, connections between said switching means and said multi-vibrator including a capacitance adapted to cause said multi-vibrator to produce triggered impulses of a predetermined periodicity when said switching means is in one position, and a second capacitance adapted to effect the production of triggered impulses of a periodicity different from the periodicity of said first impulses when said switching means is in its other position, the spaces between both kinds of said impulses being substantially equal, a relay having its magnet winding connected to receive said impulses, contact means on said relay controlled by said magnet and adapted to be connected to a circuit external to said device, a control panel on said base, and a casing secured to said base and to said control panel and forming a housing enclosing all said parts, and keying means pivotally mounted on said panel and having its inner end connected to said switching means and having its outer end projecting outside of said housing.

4. A keying device according to claim 3 which includes a control knob on said panel adjacent to said keying means, and twin variable resistors movable by said knob and connected to the control grids of said multi-vibrator for conjointly changing the rate of said periodicity.

5. A keying device according to claim 3 in which said power pack includes a power circuit connectible to a source of current, switching means being provided on said panel for controlling the supply of energy to said circuit and in which a second switching means is mounted on said panel and adapted to short circuit said contact means.

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