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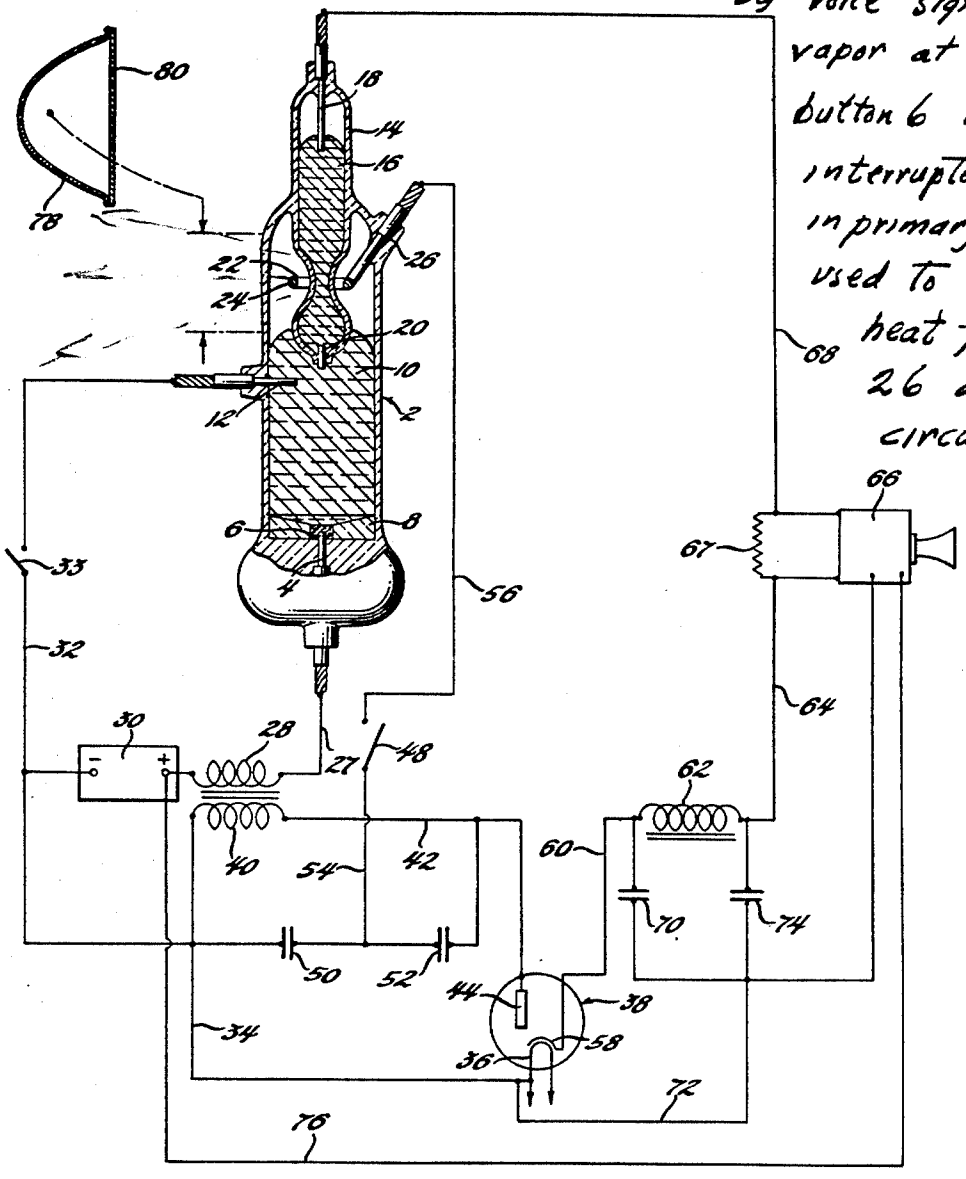
Examiner 51

May 7, 1946. L. M. WITTLINGER 2,399,715

SIGNAL SYSTEM

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Modulation of arc in interior necked portion by voice signals. Hg. vapor at carbon button 6 used as interrupter of d.c. in primary 28, secona used to start arc b heat from electrod 26 and modulati circuit.



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Examine

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SIGNAL SYSTEM

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5 Claims. (Cl. 250—7)

This invention relates to signaling means and more specifically to means for transmitting intelligence by means of ultraviolet rays which are substantially invisible.

There are many instances in which it would be desirable to be able to transmit signals or other intelligence over ultraviolet rays instead of using light rays or radio communication; the first being open to the objection of detection by unauthorized or enemy sources, and the second involving much more intricate and expensive equipment.

It is therefore an object of my invention to provide means for signaling by using ultraviolet rays.

It is a further object of my invention to provide means for transmitting rays having an audible frequency over ultraviolet rays.

It is a still further object of my invention to provide a communication system at voice frequencies using ultraviolet rays as a carrier.

With these and other objects in view which will become apparent as the specification proceeds, the embodiments of my invention are best understood by reference to the following specification and claims and the illustrations in the accompanying drawing, in which:

The figure of the drawing is a schematic diagram showing the transmitting system of my communication system.

Referring now more specifically thereto, there is shown an insulating envelope 2 into one end of which is sealed an electrode 4 which is rigidly connected to a small carbon disc 6, the latter being held in place by a ceramic disc 8 supported in the base of the tube 2. This tube 2 is partially filled with mercury 10 and carries at an intermediate point a second electrode 12 which projects into the body of mercury. A second and smaller insulating tube 14 is supported in the upper end of the main tube 2 and projects down into the latter for a substantial distance. This tube 14 also carries a substantial body of mercury 16 and at its upper end has sealed thereinto an electrode 18 which projects down into contact with the mercury 16. The lower end of the tube 14 carries a contact member 20 which interconnects the mercury pool 10 on the outside of the tube 14 with the mercury pool 16 within the tube, forming a conductive path between the two mercury pools. The tube 14 also has a restricted or necked portion 22 to reduce the cross section of the mercury therein for a purpose to be described. Adjacent this necked portion is a circular electrode 24 which extends therearound and is supported at 26 in the side of the tube 2.

The electrode 4 is connected by line 27 to the transformer primary 28, the opposite side of which is connected to the positive pole of a battery 30. The negative pole of said battery is connected through line 32 and switch 33 to the electrode 12 and also to an interconnecting line 34 which extends between the filament 36 of a rectifier tube 38 and one terminal of a secondary 40 of the transformer. The opposite terminal of the secondary is connected through line 42 to the plate 44 of said tube 38. A pair of condensers 50 and 52 are connected in series across the secondary 40 and a line 54 connects the common point between the two condensers to switch 48 in turn connected to line 56 extending to the circular electrode 24.

The cathode element 58 of the tube 38 is connected through line 60 to one side of a choke coil 62, the opposite side of which is connected to line 64 to the operating coil of a microphone and amplifier or modulator 66. A further line 68 connected to said coil extends to the electrode 18 of the generating tube and a current limiting resistor 67 is connected across the microphone coil. A filter condenser 70 is connected between line 60 and ground which in this case is represented by line 72 which is connected to the filaments, line 34 and the negative terminal of the battery. A second filter condenser 74 is connected to the opposite end of the choke coil 62 and ground. The power circuit for the microphone 66 is provided by line 76 which interconnects the positive pole of the battery with the microphone and line 72 which provides the return or ground circuit.

The tube per se is adapted to be installed in a suitable reflector such as diagrammatically shown at 78, and the particular point between the two arrows shown in the upper left hand corner of the figure, namely, the necked portion of the smaller tube 14, is adapted to lie at the focal point of said reflector. A suitable filter glass 80 is supported on the face of the reflector to permit only the desired radiation from emanating from the housing.

In the operation of the device, upon closure of switch 33 a circuit is completed between the electrodes 6 and 12 to apply the battery potential thereacross, which causes a flow of current through the mercury 10 between these two. Since the current must pass from the mercury to the carbon disc 6 through a limited area, the concentration of current will be sufficient to cause

enough heating to vaporize the mercury at this point, and since the voltage is low, the current will be broken upon such vaporization. However, as soon as the current ceases to flow, the mercury will immediately recondense to complete the circuit again. Thus there will be an automatic intermittent interruption of the current through this circuit. Since the primary 28 is in this circuit just described, a higher voltage will be induced in its secondary by this intermittent current flow, which voltage will be applied to the circular electrode 24 when switch 48 is closed through an obvious circuit, which will tend to draw an arc from the meniscus of the lower mercury body 10 and heat and vaporize the mercury within the necked portion of the tube 14 to start an arc to form at that point from current flowing in the microphone circuit and generate a steady beam of ultraviolet rays to be transmitted from the reflector. The switch 48 is then opened.

If now sounds are projected into the microphone 66, the current flow in this circuit and therefore through the necked portion in the tube 14 will be varied, depending upon the frequencies and volume of sound so projected and thus vary the current flow in the mercury vapor at necked point 22. These variations in current through this internal arc will cause a variation or modulation of the light beam being projected and thus the voice frequencies will be transformed into variations in intensity of ultraviolet rays projected from the tube. Since the vacuum tube 38 controls the current flow in the microphone circuit, it is connected so that with no sound waves being projected into the microphone the current flow through the circuit including the tube 38 and the electrode 18 is a minimum, or just enough to maintain the arc, but when the microphone is excited or spoken into, the current increases and therefore the arc intensity increases simultaneously. This would provide for economic operation and reduce current consumption during nonuse periods. This variation in intensity of the projected rays can be readily picked up by suitable photoelectric cell equipment, such as that disclosed in my copending application Serial No. 450,827, entitled "Signaling apparatus," and filed July 13, 1942, and it will therefore be seen that I have provided herein a comparatively simple system for modulating radiating ultraviolet rays whereby the latter act as a carrier for voice frequencies.

I claim:

1. In a signaling system, a hollow tube divided into two sections, a separate quantity of mercury in each section, a plurality of contacts carried by the tube and engaging the mercury in each section, a low voltage D. C. power supply connected to the elcetrodes of one section to provide an interrupter supplying pulsating current, a transformer having a primary and a secondary winding, the primary winding being connected into the low voltage circuit, means connecting the secondary winding to the electrodes of the second section whereby a higher voltage is applied to this section and a mercury arc produced, and modulating means connected into the high voltage circuit.

2. In a signaling system, a dual function tube having an interrupter section and an arc section, a low voltage D. C. source connected to the interrupter section to provide pulsating current, transformer means having a primary and secondary coil, the former being connected in the low voltage circuit, circuit means connecting the secondary coil to the arc section of the tube to create an arc, means for modulating the secondary current at voice frequencies to in turn modulate the arc and thermionic means for controlling the flow of secondary current.

3. In a signaling system, a hollow tube, a mercury pool partially filling said tube, a second hollow tube of smaller cross section projecting into and carried by one end of the first-named tube, said second-named tube having a restricted portion, a second mercury pool partially filling said second tube and an electrode mounted in juxtaposition to the restricted portion of the second tube and spaced above the mercury meniscus in the first tube so that when power is applied thereto an arc may be produced between the mercury meniscus in the larger tube and the electrode to heat the mercury at the restricted portion of the smaller tube.

4. In a signaling system, a pair of concentric cylindrical tubes, one extending part way into the other, mercury pools partially filling each, a restricted portion in that part of the inner tube within the outer and an electrode mounted in the outer tube adjacent the reduced section of the inner tube and above the mercury meniscus in the outer tube so that when power is applied to the electrode an arc will be formed with the mercury meniscus and heat the mercury in the restricted portion of the inner tube.

5. In a signaling system, a dual function tube having an interrupter section and an arc section, a low voltage D. C. source connected to the interrupter section to provide pulsating current, transformer means having a primary and secondary coil, the former being connected in the low voltage circuit, circuit means connecting the secondary coil to the arc section of the tube so that high voltage may be applied thereto, and a starting and heating electrode mounted adjacent the arc section connected to the secondary circuit to initiate the arc.

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