Oct. 23, 1962 E. H. WRIGHT 3,060,406

HIGHWAY WARNING DEVICE

Filed April 12, 1960 2 Sheets-Sheet 1

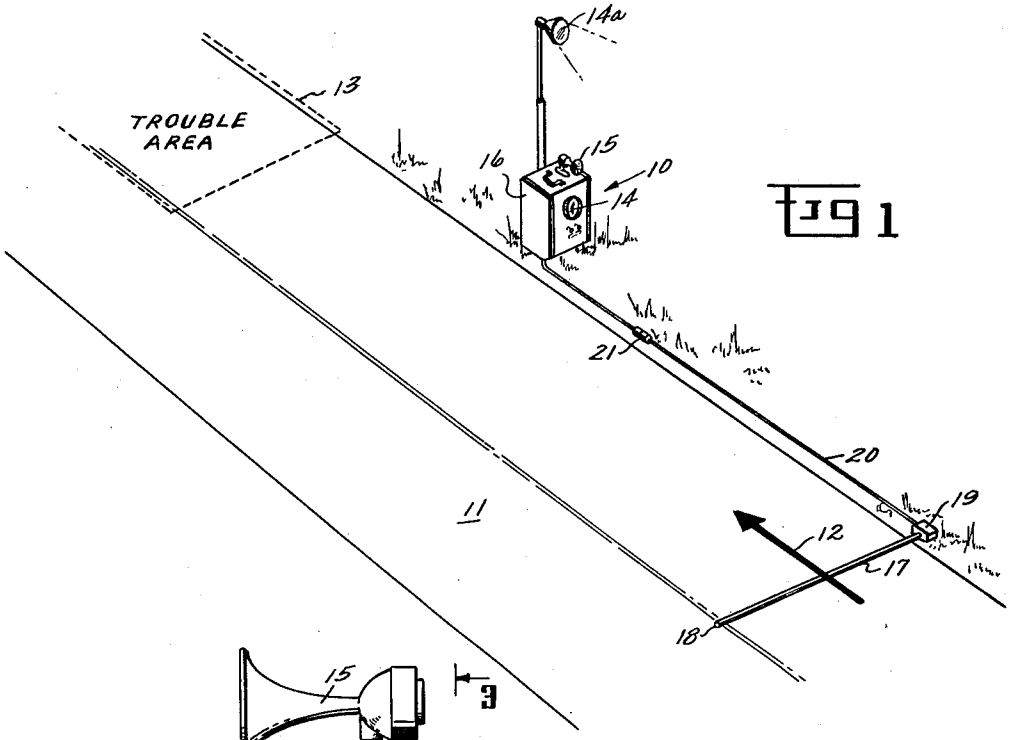


Fig 1

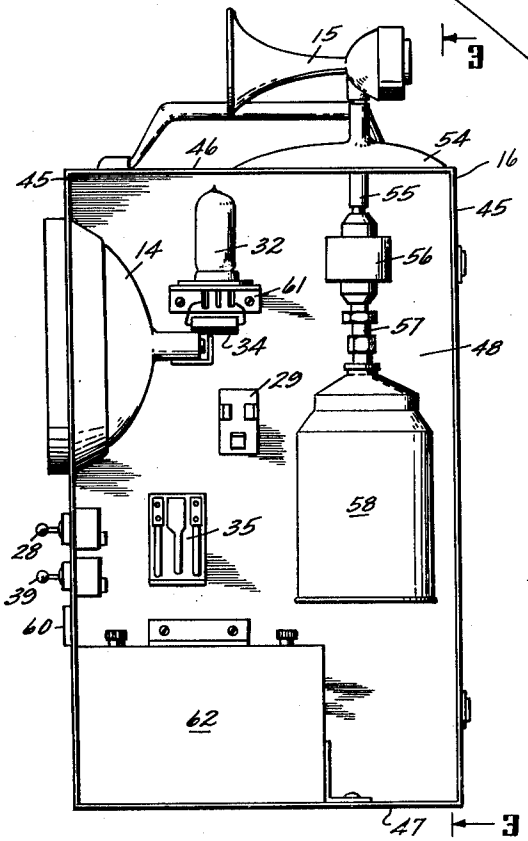


Fig 2

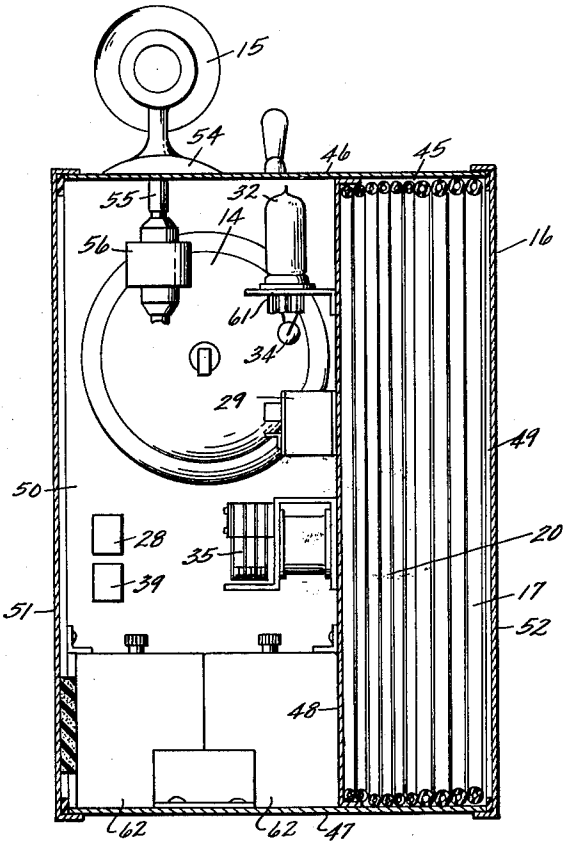
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Fig 3



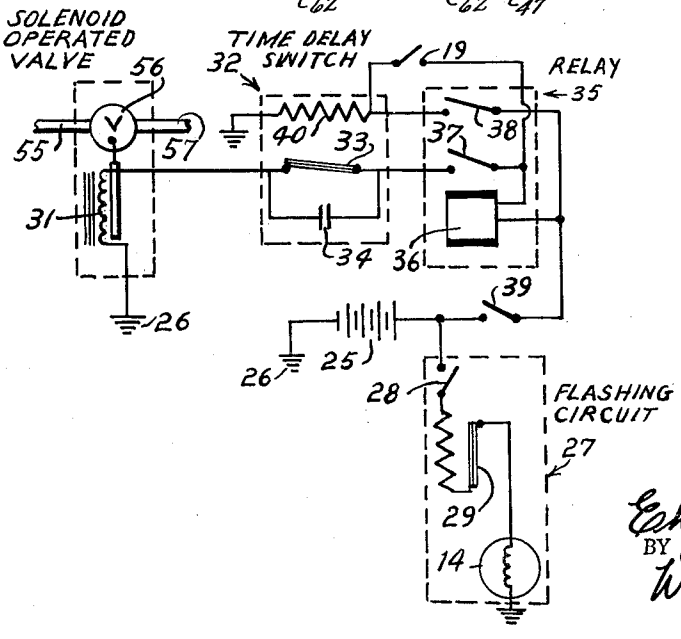


Fig 4

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3,060,406

HIGHWAY WARNING DEVICE

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6 Claims. (Cl. 340—31)

This invention relates to a highway warning device and more particularly this invention relates to a highway warning device having an audible signal triggered by a passing motorist and a visible signal which serves to identify the area protected by the warning device.

This invention is an improvement in the invention which is the subject matter of application, Serial No. 649,392, filed March 29, 1957, now Patent No. 2,966,877.

It has been an objective of the present invention to improve the general usefulness including the operating characteritsics and the reliability of the warning device described in the application referred to above.

It has been another objective of the invention to provide a wholly self-contained portable unit having a housing with two chambers, the first chamber containing most of the operating elements and the second chamber providing a storage space for electrical cable and a pressure sensing device such as a hose.

The present invention has arisen as a result of the early work of Mingle, the patentee in Patent No. 2,671,-212. Mingle taught the necessity of not only identifying by a visual signal an area on the highway to be protected, but also he taught the necessity of audibly alerting the motorist from the somewhat hypnotic state so that visual signal will be meaningful to the motorist.

To be universally applicable to all highway conditions, it is most important that the warning device provide a suitable warning for motorists traveling at high rates of speed, even up to 100 miles per hour. A motorist traveling at 100 miles per hour is covering almost 150 feet per second. At such a high rate of speed or even at 60 miles per hour, which is 88 feet per second, any audible warning to a motorist must be given well in advance of the motorist's location with respect to the visible signal. Thus, when a motorist is alerted by the audible signal he will have an instant to identify, through the visual signal, the area which is protected by the warning device. To this end, it has been an objective of the invention to provide a warning device having pressure sensing device such as a hose adapted to be thrown across the highway and an electrical cable connecting the pressure sensing device to the warning device housing. The pressure sensing device will trigger the audible signal well in advance of the motorist reaching the housing which contains the audible signal.

These and other objectives of the invention will become more readily apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a perspective view illustrating the operation of the invention.

FIG. 2 is a side elevational view partly in section of the housing and operating mechanism of the invention.

FIG. 3 is a cross-sectional view taken along lines 3—3 of FIG. 2 and

FIG. 4 is a circuit diagram of the invention.

The warning device of the invention indicated at **10** in FIG. 1 is adapted to be located alongside a highway **11** to warn motorists approaching in a direction of the arrow **12** of a trouble area indicated generally at **13**. The warning device has a visible signal **14** which preferably is a red flashing lamp beamed in the direction of the approaching motorist; and an audible signal **15** which is a gas operated horn of the type described in the copending application referred to above. The lamp **14** and horn **15** are mounted on a housing **16**.

The lamp preferably is set into operation merely by flipping a switch mounted on the housing as described below. The horn is triggered by a pressure sensitive member **17** such as a hose having a plug in its free end **18**. The end of the hose remote from the plug **18** is connected to a pressure sensitive normally open electrical switch **19** positioned alongside the highway. The switch **19** is connected to the housing by an elongated cable **20** which may be 100 feet or more in length. To adapt the cable **20** for all conditions of use, a disconnect jack **21** may be connected in series in the cable to permit the introduction of as many lengths of extension cable as are necessary to dispose the hose **17** a sufficient distance away from the housing **16**.

The manner in which the electrical elements, which are contained in the housing, cooperate to provide the desired result is illustrated in the circuit diagram of FIG. 4. The circuit is powered by one or more batteries **25** connected at one side to ground **26**. The flashing lamp circuit indicated generally at **27** comprises a series connection of a single pole, single throw toggle switch **28** mounted on the outside of the housing, a known commercially available bimetallic type flasher switch **29** and lamp **14**. One side of the lamp is connected to ground while the other side of the lamp is connected through the flasher switch **29** and toggle switch **28** to the battery **25**.

In the preferred embodiment, the horn is of a known commercially available vibrating diaphragm type operated by the flow of gas from a charge of CO_2 or Freon or the like. The gas charge is fed to the horn through a valve operated by a solenoid indicated at **31**. The solenoid coil is connected at one side to ground **26** and to the battery **25** through a series circuit comprising a time delay **32** (FIG. 2) having normally closed contacts **33** bridged by an arc suppressing condenser **34** and a relay **35** (FIG. 2) having a coil **36** and two sets of contacts, one being designated as **37**, and a single pole, single throw toggle switch **39** mounted on the housing **16**. The other contact **38** of relay **35** connects a heater **40** to the battery **25** through the switch **39**. The heater **40** is an element of the time delay tube **32**, which, in embodiment illustrated, is an amperite 6C2T thermal time delay relay.

The contacts **37** and **38** of relay **35** are normally open but are closed upon energization of relay coil **36**. The relay coil **36** is connected to the battery **25** on one side through switch **39** and on the other side through pressure switch **19** and heater **40**.

The operation of the circuit controlling the audible signal begins with the instantaneous closing and opening of pressure switch **19** when the hose **17** is passed over by a motorist. The closing of switch **19** (switch **39** having been closed when the device was set out on the highway) completes a series circuit including the battery **25**, relay coil **36** and heater **40**. Energization of coil **36** closes contacts **37** and **38**. Contact **38** is a holding circuit to maintain current to the heater **40** until the relay coil **36** is de-energized. Contact **37** closes the circuit through the time delay relay contacts **33** to the solenoid **31**, the energization of which operates the horn. The time delay relay holds the horn in operation for about one second at which time the heat developed in heater **40** causes the bimetal operated contacts **33** to open. When contacts **33** are open, the circuit to the relay coil **36** is open as well as the circuit to the solenoid **31**. With the de-energization of coil **31**, the valve to the horn closes and the audible signal ceases.

FIGS. 2 and 3 illustrate the manner in which the elements described above are physically oriented in the

housing 16. The housing 16 has two side walls 45, a top 46 and a bottom wall 47.

An intermediate wall 48 divides the housing into a storage chamber 49 for the hose and cable and a chamber 50 in which the operating elements are housed. A front cover 51 is hinged to the side wall to close chamber 50 and a back cover 52 is hinged to the side wall to close chamber 49.

The horn 15 is mounted on a bracket 54 secured to the top wall 46. A fitting 55 connects the horn through a valve 56, the valve 56 being operated by the solenoid 31 which is contained within the valve housing. A fitting 57 connects the valve to container 58 of the gas which operates the horn.

The lamp 14 is fixed in one side wall 45 on the upper portion thereof. It may be found preferable to mount the lamp 14 on a telescopic pole alongside or attached to the housing 16 so as to maintain the lamp at such an elevated position that it will not be obscured by passing or stationary vehicles. Such a modification is indicated at 14*a* in FIG. 1. Below the lamp 14 are fixed the two toggle switches 28 and 39 with suitable identifying plates 60 located adjacent the switches. The time delay tube 32 and its condenser 34 are mounted on a bracket 61 which is fixed to the intermediate wall. Two batteries 62 rest on the bottom wall 47 and form the power supply 25. The connections to the various elements have been left out of FIGS. 2 and 3 for clarity but reference may be had to FIG. 4 to show the manner in which the elements are connected.

In operation, a trouble spot on the highway is to be protected. It may be an accident which is being attended by the highway patrol, it may be road workers or linemen working on or adjacent the highway. The housing 16 will be positioned on the highway several feet away from the trouble spot in the direction of approaching motorists. The housing will be positioned so that the lamp 14 and the horn 15 are directed toward the approaching motorist. The cable 20 is strung along the ground with as many extensions employed as are necessary. The sensing hose is positioned across the highway well in advance of the housing 16 and switches 28 and 39 turned to "on" position. Thereafter, the warning device does not need attention. The lamp flasher circuit operates automatically to provide a regularly flashing red signal. The horn is triggered by every passing motorist and emits a blast of approximately one second.

I claim:

1. In a highway warning device, an electrical circuit for operating a gas operated horn having a supply of gas connected to said horn through a valve, and a solenoid connected at one side to ground for opening said valve upon energization of said solenoid, and an elongated hose adapted to be disposed across a highway for triggering said circuit, said circuit comprising, a power supply connected at one side to ground, a relay coil connected at one side through an "on-off" switch to the other side of said power supply, means including a series connection of a normally open pressure operated switch and a time delay heater connecting the other side of said coil to ground, said pressure operated switch being connected to said hose for closing said switch by pressure from said hose, a normally open holding contact operated by said coil and connected at one side between said heater and pressure operated switch and at the other side to said coil, and a second normally open contact operated by said coil and a normally closed, bimetal-controlled time delay contact connected in series between said solenoid and the other side of said coil, said heater being disposed adjacent said time delay contact, whereby upon closure of said pressure switch, said horn will operate and will be held in operation until the heat from said heater opens said time delay contact.

2. A highway warning device comprising, a housing, an electrical power supply mounted in said housing, a gas operated horn mounted on said housing, a supply of gas connected through a solenoid operated valve to said horn, a hose adapted to be disposed across a road, a plug in one end of said hose, a fluid pressure operated electrical switch connected to the other end of said hose and adapted to be closed upon application of pressure to said hose, an elongated electrical cable connecting said pressure operated switch between said power supply and said solenoid to operate said solenoid to open said valve when said pressure operated switch is closed, and an electrical time delay connected between said power supply and said solenoid to hold said solenoid in energized condition for a short time after said pressure operated switch is opened.

3. A highway warning device comprising, a housing, an electrical power supply mounted in said housing, a gas operated horn mounted on said housing, a supply of gas connected through a solenoid operated valve to said horn, a hose adapted to be disposed across a road, a plug in one end of said hose, a fluid pressure operated electrical switch connected to the other end of said hose and adapted to be closed upon application of pressure to said hose, an elongated electrical cable connecting said pressure operated switch between said power supply and said solenoid to operate said solenoid to open said valve when said pressure operated switch is closed, and an electrical time delay connected between power supply and said solenoid to hold said solenoid in energized condition for a short time after said pressure operated switch is opened.

4. A highway warning device comprising, a housing, an electrical supply mounted in said housing, a gas operated horn mounted on said housing, a supply of gas connected through a solenoid operated valve to said horn, a vehicle detecting device adapted to detect an approaching vehicle, a normally open electrical switch connected to said vehicle detecting device and adapted to be closed upon detection of an approaching vehicle, an elongated electrical cable connecting said electrical switch between said power supply and said solenoid to operate said solenoid to open said valve when said electrical switch is closed, and an electrical time delay connected between said power supply and said solenoid to hold said solenoid in energized condition for a short time after said electrical switch is opened.

5. A highway warning device comprising, a housing, an electrical power supply mounted in said housing, a lamp, electric circuit means, an "on-off" switch and a flasher switch connecting said lamp in series with said power supply, a gas operated horn mounted on said housing, a supply of gas connected through a solenoid operated valve to said horn, a hose adapted to be disposed across a road, a plug in one end of said hose, a normally open fluid pressure operated electrical switch connected to the other end of said hose and adapted to be closed upon application of pressure to said hose, an elongated electrical cable connecting said pressure operated switch between said power supply and said solenoid to operate said solenoid to open said valve when said pressure operated switch is closed, and an electrical time delay connected between said power supply and said solenoid to hold said solenoid in energized condition for a short time after said pressure operated switch is opened, said time delay including a pair of bimetal controlled contacts bridged by a condenser, and a heater adjacent said contacts, said heater being energized upon closing of said pressure operated switch.

6. In a highway warning device, an electrical circuit for operating a gas operated horn having a supply of gas connected to said horn through a valve, and a solenoid connected at one side to ground for opening said valve upon energization of said solenoid, and an elongated hose adapted to be disposed across a highway for triggering said circuit, said circuit comprising, a power supply connected at one side to ground, a relay coil connected at one side through an "on-off" switch to the other side of

said power supply, means including a series connection of a normally open pressure operated switch and a time delay heater connecting the other side of said coil to ground, said pressure operated switch being connected to said hose for closing said switch by pressure from said hose, a normally open holding contact operated by said coil and connected at one side between said heater and pressure operated switch and at the other side to said coil, a second normally open contact operated by said coil and normally closed bimetal-controlled time delay contacts connected in series between said solenoid and the other side of said coil, said heater being disposed adjacent said time delay contact, whereby upon closure of said pressure switch, said horn will operate and will be held in operation until the heat from said heater opens said time delay contact, and an arc suppressing condenser bridging said time delay contacts.

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