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PORTABLE TRAFFIC SIGNAL SYSTEM

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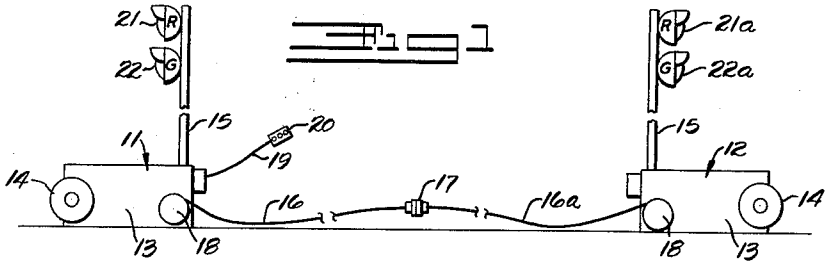


FIG. 1

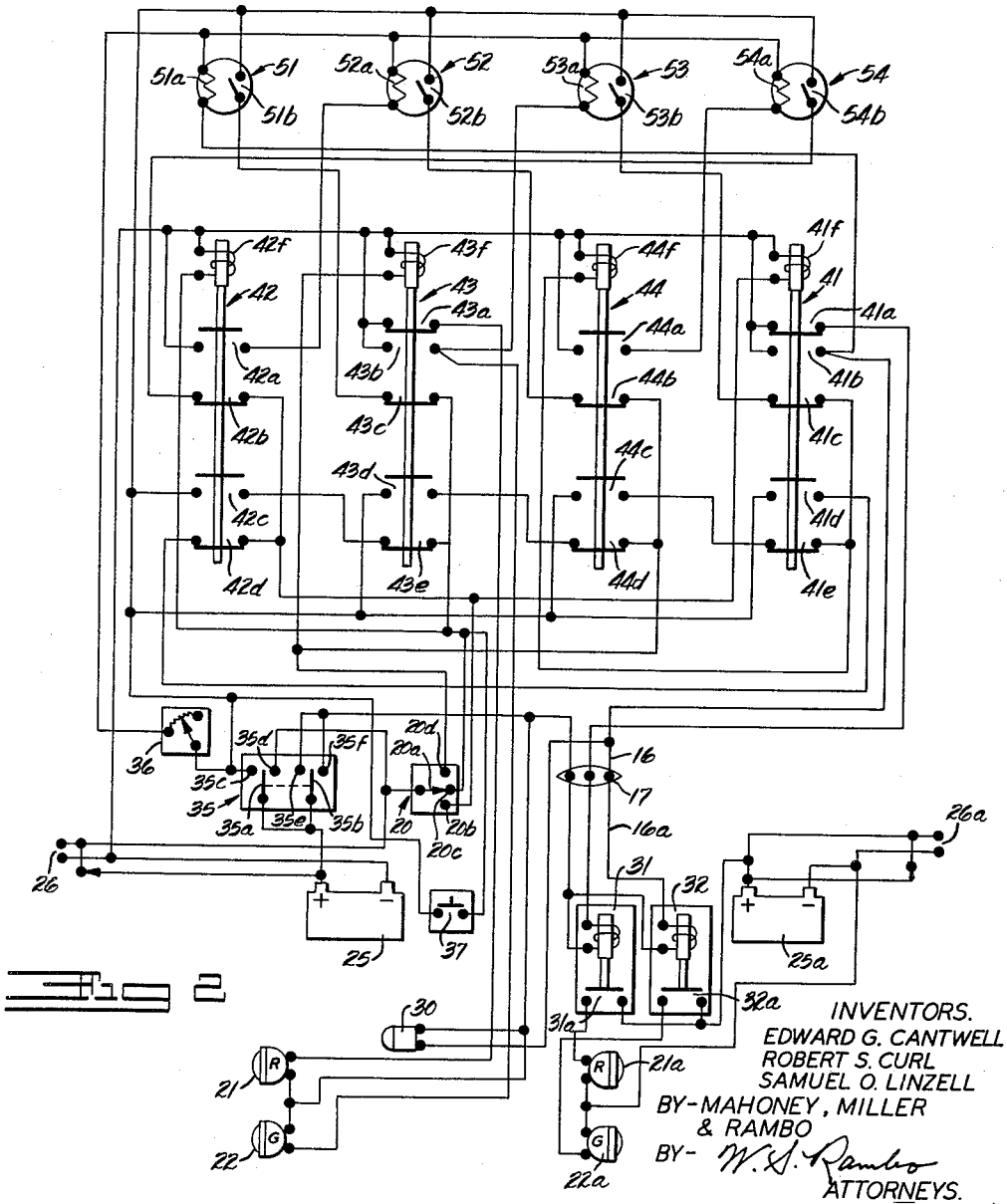


FIG. 2

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PORTABLE TRAFFIC SIGNAL SYSTEM

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This invention relates to a portable traffic signal system. It has to do, more particularly, with portable signal apparatus for controlling vehicular or pedestrian traffic or both which can be operated automatically or manually.

As an example of the use of this system, it can be used in either the automatic or manual control of the flow of vehicular traffic adjacent highway construction areas or at otherwise uncontrolled traffic intersections. For example, when a given section of highway is under construction with the result that traffic must be reduced to single lane traffic, it becomes necessary to momentarily halt the flow of traffic in one direction to permit a number of vehicles to move in the opposite direction, and vice versa, and this traffic is ordinarily regulated by signalmen located at opposite ends of the section of the highway under construction. The use of the system of this invention eliminates anywhere from two to three signalmen, and serves automatically to permit the flow of traffic in one direction for a controlled time period and then to permit the flow of traffic in the opposite direction for a controlled period of time, with repetition of this cycle. However, as indicated, the system can be actuated manually as desired.

The system of this invention provides a low cost, completely self-contained traffic light system for regulating one-way, two-way, and intermitent stop and go traffic. The system is completely portable and consists mainly of two electrical units, which in use are electrically connected together by a control cable, but which can be separated and carried from location to location in a truck or similar vehicle. Each unit is self-contained and portable. Each unit is composed of standard electrical parts. Parts which would wear out after normal use, such as lamps and batteries, can be replaced with easily obtainable equivalent standard automotive parts.

The accompanying drawing illustrates the preferred embodiment of this invention and in this drawing:

FIGURE 1 is a diagrammatic view in elevation illustrating the two electrical units which form the system of this invention and which are shown connected by a partable electric cable.

FIGURE 2 is a diagram of the circuit of the system and including the portions of the circuit in both units.

With reference to the drawing, the traffic control system of this invention comprises a master control signal unit 11 and a remote signal unit 12. Each unit 11 or 12 includes a heavy base in the form of a box 13, which contains the circuit elements of that unit, and which is provided with a pair of wheels 14 at one end. The wheels are ordinarily out of contact with the ground or road surface but the box 13 can be tilted so that it is supported by the wheels for movement to a new location. Each box 13 has upstanding therefrom a removable or retractable lamp post 15 which carries red and green signal lamps, which are designated respectively by the letters R and G. In addition, the red and green lamps of the unit 11 are designated by the numerals 21 and 22 and the corresponding lamps of the unit 12 are designated by the numerals 21*a* and 22*a*. The units 11 and 12 are coupled together electrically by control cable sections 16 and 16*a*, respectively, which can be connected or disconnected at the usual plug or coupling 17. Each cable 16 or 16*a* is carried in the usual manner by a reel 18 on its respective

unit which may be of the handcrank or spring re-wind type. The unit 11 also has the manual control switch 20 conected on a cable 19.

As previously indicated, the system can be adjusted to operate automatically or manually. The automatic operation of the signalling system provides timed cycles of operation for the flow of traffic between the signal units first in one direction, and then in the opposite direction, with intermediate periods during which the flow of traffic is halted at each signal unit to permit clearance of vehicles or pedestrians from between the signal units prior to the signalling of a reversal in the direction of traffic flow between the signal units. The present signalling system also provides means to adjust the time cycles of automatic operation thereof. The manual operation of the signalling system permits any selection of stop and go signals desired for any combination of both stop or alternate flow of traffic.

The control system, when conditioned for automatic operation, depends upon the cycling of a plurality of thermally-responsive timing devices associated with an assembly of relays. The master control unit 11 includes these timing devices and relay assemblies which will, in turn, control the operation of a set of relays in the remote unit 12 by means of direct-current supplied thereto at properly timed intervals. Each of the units 11 and 12 is provided with its own D.C. power source such as the batteries 25 and 25*a*, carried in the boxes 13 of the respective units. However, the circuit portions of the units are also provided with plugs or couplings 26 and 26*a*, respectively, which may, if desired, be electrically connected with an alternate source of electrical power, such as the electrical system of an automobile, truck or similar vehicle.

The portion of the circuit associated with the remote signal unit 12 is very simple and includes the battery 25*a*, as a primary source of power and the plug 26*a*, previously mentioned, which may be connected to an alternate source of power. Connected in the remote signal portion of the circuit are also the red and green lamps 21*a* and 22*a*, previously mentioned. The supply of power from the battery 25*a* to the respective lamps 21*a* and 22*a*, is controlled by the contacts of the respective relays 31 and 32. These relays are normally open so that both red and green lights 21*a* and 22*a* are off but when the contacts 31*a* of the relay 31 are closed, the red light 21*a* is on and when the contacts 32*a* of the relay 32 are closed, the green light 22*a* is on. The relays 31 and 32 receive energizing current through the control cable section 16*a* which is arranged for detachable connection with the cable section 16 by means of the coupling 17.

The portion of the circuit associated with the master unit 11 includes the battery 25 as a source of power and the plug 26, previously mentioned, which may connect to an alternate source of power. This portion of the circuit also includes the red and green lamps 21 and 22, previously mentioned. A pilot light 30 is provided at the master unit 11 and is arranged to be connected in parallel with the coil of the relay 32, which controls the green light 22*a*, so as to indicate at the master unit 11 that the green light of the remote signal unit 12 is energized. A double pole, double throw selector switch 35 is provided in the master control circuit for setting the signal system for automatic operation or for manual operation by the switch 20. The switch 35 is shown in the off position but if its contact arms are moved to the left, the circuit will be set for automatic operation and if moved to the right, the circuit will be set for manual operation by the switch 20.

The master control portion of the circuit includes a series of relays having sets of contacts connected to control the energization of the lamps 21, 22, and the relays

31 and 32 which actuate the remote unit lights 21*a* and 22*a*. For this purpose, four relays 41, 42, 43 and 44 are connected in the circuit, each of these relays being of the solenoid actuated, multiple contact type. Associated with the relays 41, 42, 43 and 44, as indicated, are a like number of timers 51, 52, 53 and 54. Each of these timers is of the type known as a thermal time delay switch and each includes a set of normally open contacts arranged to be closed at a predetermined interval of time by a movable bimetallic switch element which is responsive to heat generated by an electrical resistor associated with the movable switch element. The time delay factor of each timer is predetermined by its particular type. For example, the timers 51 and 53 may be of the sixty second delay type and the timers 52 and 54 may be of the thirty second delay type. The time delay intervals for all timers may be simultaneously varied in proportion by means of a variable resistance rheostat 36 which is connected in series with the resistor elements of the various timers 51, 52, 53 and 54 to vary the flow of current thereto. A starter switch 37 of the momentary contact pushbutton type is also connected in the circuit between the selector switch 35 and the relay 42, as indicated.

The power line in which the rheostat is connected supplies power to the resistance heater elements 51*a*, 52*a*, 53*a* and 54*a* of the timers 51, 52, 53 and 54, respectively. Each of these timers includes the normally open contacts 51*b*, 52*b*, 53*b* and 54*b*, respectively, which are closed following energization of their respective heater elements for the predetermined interval for which each is set.

Each of the relays 41, 42, 43 and 44 includes the coils 41*f*, 42*f*, 43*f*, and 44*f*, respectively, connected in the power supply lines, as indicated, and under the control of the selector switch 35 when it is moved to its automatic position at the left with reference to FIGURE 2. When the selector switch 35 is moved to its manual position at the right, the manual switch 20 can be used to selectively energize the coils 41*f*, 42*f* or 43*f* of the relays 41, 42 or 43. In order for the switch 35 to function in this manner, it is provided with a pair of movable contacts 35*a* and 35*b* ganged together for simultaneous movement. The contact 35*a* can be moved from the off position shown selectively into contact with the automatic selecting point 35*e* or with the manual selecting point 35*d*. Similarly, the contact 35*b* can be moved from the off position shown selectively into contact with the automatic selecting point 35*e* or with the manual selecting point 35*f*. The manual switch 20 includes the movable contact arm 20*a*, which can be moved selectively into contact with the points 20*b*, 20*c* or 20*d*. As will later appear, the contact point 20*c* is selected to cause simultaneous energization of both red lights 21 and 21*a*, the contact point 20*b* is selected to light the remote green light 22*a* and the master red light 21, and the contact point 20*d* is selected to light the master green light 22 and the remote red light 21*a*.

The relay 41 is provided with a set of normally closed contacts 41*a*, a set of normally open contacts 41*b*, a set of normally closed contacts 41*c*, a set of normally open contacts 41*d*, and a set of normally closed contacts 41*e*. The relay 42 is provided with a set of normally open contacts 42*a*, a set of normally closed contacts 42*b*, a set of normally open contacts 42*c*, and a set of normally closed contacts 42*d*. The relay 43 is provided with a set of normally closed contacts 43*a*, a set of normally open contacts 43*b*, a set of normally closed contacts 43*c*, a set of normally open contacts 43*d*, and a set of normally closed contacts 43*e*. The relay 44 is provided with a set of normally open contacts 44*a*, a set of normally closed contacts 44*b*, a set of normally open contacts 44*c*, and a set of normally closed contacts 44*d*.

Automatic Operation

For automatic operation the selector 35 is shifted to the left so that contact arms 35*a* and 35*b* engage the contact point 35*c* and 35*e*, respectively. Master red light 21 and remote red light 21*a* are energized, respectively, through the normally closed contacts 43*a* of the relay 43 and 41*a* of the relay 41.

The starter switch 37 is closed momentarily to energize the coil 42*f* of the relay 42. This causes the armature of the relay 42 to move downwardly, as viewed in FIG. 2, and closes contacts 42*a*, energizing the heater element 52*a* in the timer 52, opens the contacts 42*b*, breaking any possible circuit to the coil 41*f* of the relay 41, closes the contacts 42*c*, which establishes a hold in circuit for the coil 42*f* by way of the contacts 43*e*, and opens interlock contacts 42*d*. This condition remains for a time interval of approximately thirty seconds on the timer 52.

After the time interval for which the timer 52 is set, for example thirty seconds, during which the master red light 21 and the remote red light 21*a* both remain on, the contacts 52*b* of the timer closes. This energizes the coil 43*f* of the relay 43 by way of the normally closed contact 44*b* of the relay 44. Energization of the relay coil 43*f* are closed the contacts 43*b* and 43*d* and opens the contacts 43*a*, 43*c*, and 43*e*. Opening of the contacts 43*a* breaks the circuit for the master red light 21. Opening of the contacts 43*c* and 43*e* breaks the hold-in circuit for the relay coil 42*f* of the relay 42. De-energization of relay coil 42*f* opens contacts 42*a*, thus de-energizing the heater element 52*a* of the timer 52. Closing of the contacts 43*b* energizes the heater 53*a* of the timer 53 and also energizes the master green light 22. Closing of the contacts 43*d* creates a hold-in circuit for the coil 43*f* of the relay 43 by way of the normally closed contacts 44*d* of relay 44. Thus, at this time the timer 53 is energized and the hold-in circuit for the relay 43 is set up. Also at this time, the master green light 22 is on and the remote red light 21*a* is on.

After the time interval for which the timer 53 is set, for example sixty seconds, during which the master green light 22 is on and the remote red light 21*a* is on, the contacts 53*b* of the timer are closed. This establishes an energizing circuit for the relay coil 44*f* of the relay 44 by way of the normally closed contacts 41*c* of the relay 41. Energization of the relay coil 44*f* closes the contacts 44*a* and 44*c* and opens the contacts 44*b* and 44*d*. Closing of the contacts 44*a* energizes the heater 54*a* of the timer 54. Closing of the contacts 44*c* establishes a hold-in circuit for the coil 44*f* of the relay 44 by way of the normally closed contacts 41*e* of the relay 41. Opening of the contacts 44*d* breaks the hold-in circuit for the coil 43*f* of the relay 43 and de-energizes it. De-energization of the coil 43*f* of the relay 43 closes the contacts 43*a* to turn on the master red light 21, and simultaneously opens the contacts 43*b* to de-energize the heater 53*a* of the timer 53 and the master green light 22, opens the contacts 43*d* and closes the contacts 43*c* and 43*e*. Thus, during this cycle of operation, the master red light 21 is on and the remote red light 21*a* is still on.

After the time interval for which the timer 54 is set, say thirty seconds, during which both the master red light 21 and the remote red light 21*a* are on, the timer contacts 54*b* are closed to establish an energizing circuit for the coil 41*f* of the relay 41 by way of the normally closed contacts 42*b* of the relay 42. This closes contact 41*b*, and energizes the heating element 51*a* of the timer 51 as well as the relay 32. Energization of relay 32 closes contacts 32*a* to thus energize the remote green light 22*a*. Pilot light 30 is also energized simultaneously upon energization of relay 32. At the same time, relay contact points 41*a*, 41*c* and 41*e* are opened whereas contact points 41*d* are closed. The latter establish a hold-in circuit for the relay coil 41*f* by way of the normally closed contacts 42*d* of the relay 42. At the same time, the master red light remains energized through the normally closed contact 43*a* of the relay 43.

After the time interval for which the timer 51 is set, for example sixty seconds, during which the master red light 21 remains on and the remote green light 22*a* is on,

the contacts **51***b* of the timer are closed so as to re-energize the relay coil **42***f* of the relay **42** through the contacts **43***c* of the relay **43**, at which time the operating cycles are repeated until the switch **35** is opened to cease automatic operation of the signalling system.

As described above, a complete cycle of operation consists in first having the master red and the remote red signals on for a starting period, then having the master red and the remote green signal lights on for a selected interval to permit flow of traffic in one direction for a selected interval, then having both the master red and the remote red signal lights on for a selected interval to permit clearing of the traffic moving in the one direction, next having the master green and the remote red signal lights on for a selected interval to permit movement of traffic in the opposite direction, and finally again having both the master red and the remote red signal lights on to permit clearing of the traffic in this opposite direction.

Manual Operation

For manual operation, the selector switch **35** is shifted from the off position shown in FIGURE 2, when all the lights **21**, **22**, **21***a* and **22***a* will be off, to the manual position when contact arms **35***a* and **35***b* will be in engagement with the contact points **35***d* and **35***f*, respectively. At this time, the remote red light actuating relay **31** will be energized to light the light **21***a* by way of the normally closed contacts **41***a* of the relay **41**. The master red light **21** will be energized through the contacts **43***a* of the relay **43**. Thus, both master red light **21** and remote red light **21***a* will be on.

Assuming the contact arm **20***a* of the switch **20** is now moved into contact with the contact point **20***b*, the remote green light **22***a* is energized and the master red light **21** remains energized. The circuit to the master red light **21** is still through the relay contacts **43***a*. The coil **41***f* of the relay **41** is energized by the setting of the arm **20***a* in contact with the point **22***b* and this opens the contacts **41***a*, breaking the circuit to remote red relay **31**. At the same time, the contacts **41***b* are closed to complete the circuit to the remote green relay **32**. Thus, at this time the remote green light **22***a* is on and the master red light **21** is on.

If the contact arm **20***a* of the switch **20** is now shifted to the point **20***d*, the relay coil **41***f* of the relay **41** is deenergized and the relay coil **43***f* of the relay **43** is energized. Deenergizing the relay **41** breaks the circuit to the remote green light relay **32** at the relay contacts **41***b* and makes it to the remote red relay **31** through the relay contacts **41***a*. Energizing the relay **43** breaks the circuit to the master red light **21** at the relay contacts **43***a* and makes it to the master green light at the contacts **43***b*. Thus, the master green light **21** is on and the remote red light **21***a* is on.

It will be apparent that by shifting the switch arm **20***a* between the contact points **20***b*, **20***c*, and **20***d*, any desired combination of red and green can be obtained.

It will be understood from the above description that this invention provides a portable traffic signal system which can be manually controlled to obtain any desired combination of signals or which can be automatically controlled to obtain a predetermined cycle of signal operations. The system includes a master unit and a remote unit, both of which comprise relatively simple and standard electrical components arranged to be electrically coupled together by a flexible cable. Thus, this system operates independently of any relatively complex and delicate radio frequency transmission and receiving apparatus, such as has heretofore been proposed for use in the control of relatively remote traffic signalling units. The present system is much more reliable and positive in operation and is not affected by radio interference. Furthermore, this system represents a distinct improvement over that type of prior art traffic signal system which operates by means of synchronous timing motors. The present system is much more simple and less expensive, does not depend on a uniform alternating current power input, and uses standard electrical parts which can be obtained easily and cheaply both for the initial installation and for replacement if necessary. Furthermore, the present system is such that it can be actuated by relatively low voltage direct current which can be readily obtained from standard type storage batteries or the electrical system of a vehicle. This is particularly important in a portable system of this type, and makes possible its use at a location remote from normal power lines. Also, the units are compact and separable and are, therefore, readily portable.

Although the above description refers to red and green lights as the traffic signals, it is to be understood that equivalent electrically actuated signals may be used and they may be in forms other than lights.

According to the provisions of the patent statutes, the principles of this invention have been explained and have been illustrated and described in what is now considered to represent the best embodiment. However, it is to be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

Having thus described this invention, what is claimed is:

1. In a portable traffic signalling system; a plurality of physically separate, portable traffic signalling units for arrangement in relatively remote locations, each of said units comprising a plurality of electrically energizable, visual signals, a storage battery for supplying electrical energy to said signals and plural switching means having connections with said battery and said signals and operable to control the supply of electrical current from said battery to said signals; flexible cable means arranged to extend between said signalling units for electrically connecting the switching means of each of said units, the switching means of one of said units including a plurality of relays sequentially energizable to cause energization of the visual signals of both of said units in a given sequence, a thermally-responsive time delay switch for each of said relays operable to control energization thereof, each of said time delay switches having an electrical heating element responsive to the energization of another of said relays for closing an operating circuit for its associated relay following a given interval of time, and a starter switch connected with one of said relays for initiating energization thereof.

2. A portable traffic signalling system as defined in claim 1, wherein said last-named signalling unit includes a manually controlled, multiple pole switch having connections with said relays and operable to control energization of said relays independently of said time delay switches.

3. In a portable traffic signalling system; a portable, master signalling unit including a plurality of electrically energizable visual signals, a storage battery for supplying electrical energy to said signals and plural switching means having connections with said battery and said signals and operable to control the supply of electrical current from the battery to the signals; a portable, remote signalling unit adapted to be positioned in a location remote from said master signalling unit and also including a plurality of electrically energizable visual signals, a storage battery and switching means to control the supply of electrical energy from the battery to the signals; flexible cable means extending between and electrically connecting the switching means of said signalling units; the switching means associated with said master signalling unit including a plurality of electromagnetic relay switches energizable to control energization of the visual signals of said master signalling unit and the operation of the switching means of said remote signalling unit, a thermally-responsive time delay switch connected with each of said relay switches for controlling energization thereof, each of said time delay switches having an electrical heating element connected with another of said relay switches and responsive to the

energization of such other relay switch to close an operating circuit for its associated relay switch following a given interval of time; and starter switch means having connections with the battery of said master signalling unit and one of said relay switches and operable manually to initiate energization of said one of said relay switches.

4. A portable traffic signalling system as defined in claim 3, and wherein the switching means of said master signalling unit also includes a manually operable switch also connected with said relay switches for controlling energization thereof independently of said time delay switches.

5. A portable traffic signalling system as defined in claim 4, wherein the switching means of said master signalling unit further includes a selector switch having connections with said battery, said manually operable switch and said time delay switches and operable to render either said manually operable switch or said time delay switches ineffective.

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