May 27, 1941. P. P. HORNI 2,243,341

DIRECTIONAL TRAFFIC CONTROL SYSTEM

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Fig. 1.

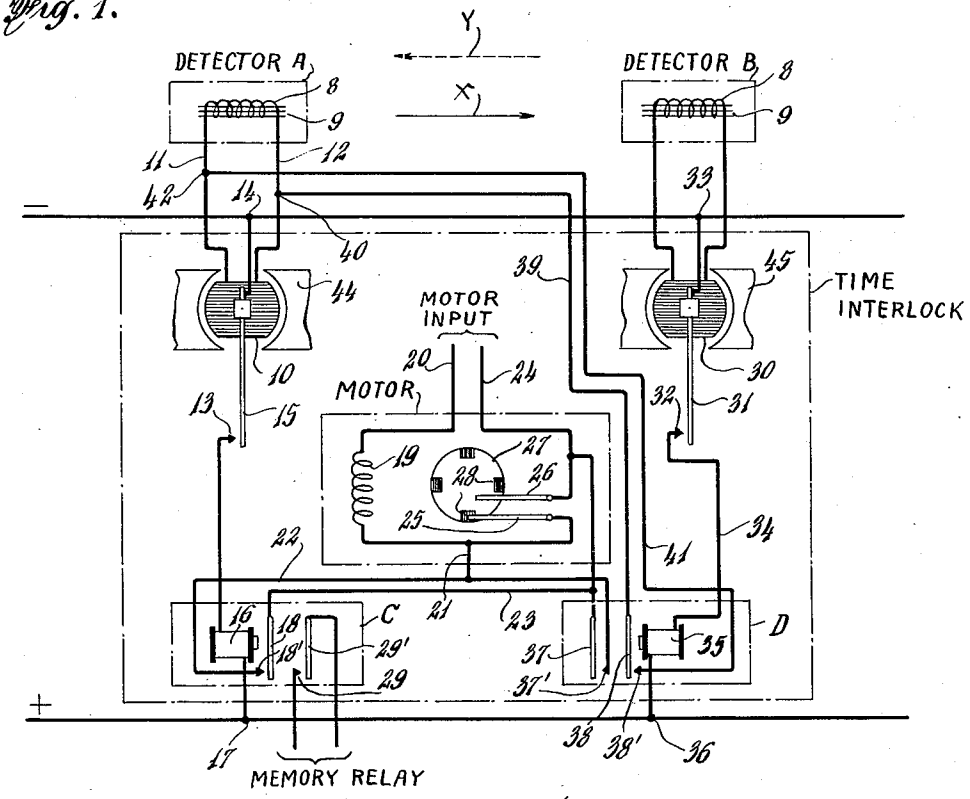

Fig. 2.

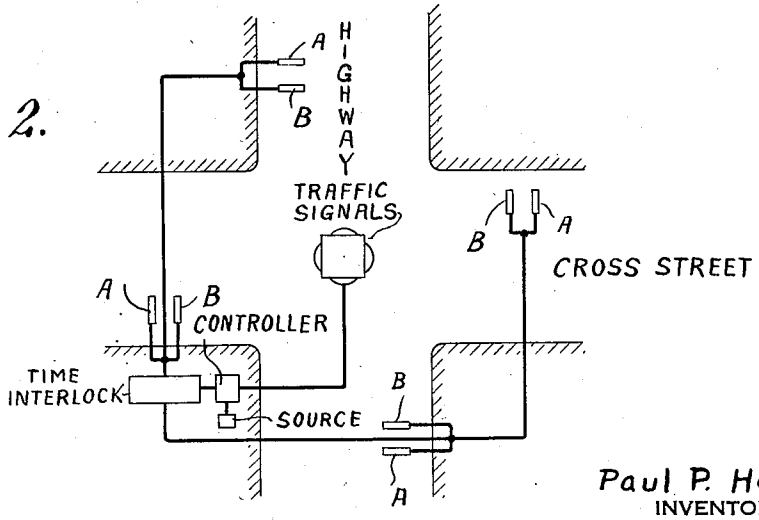

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Fig. 3.

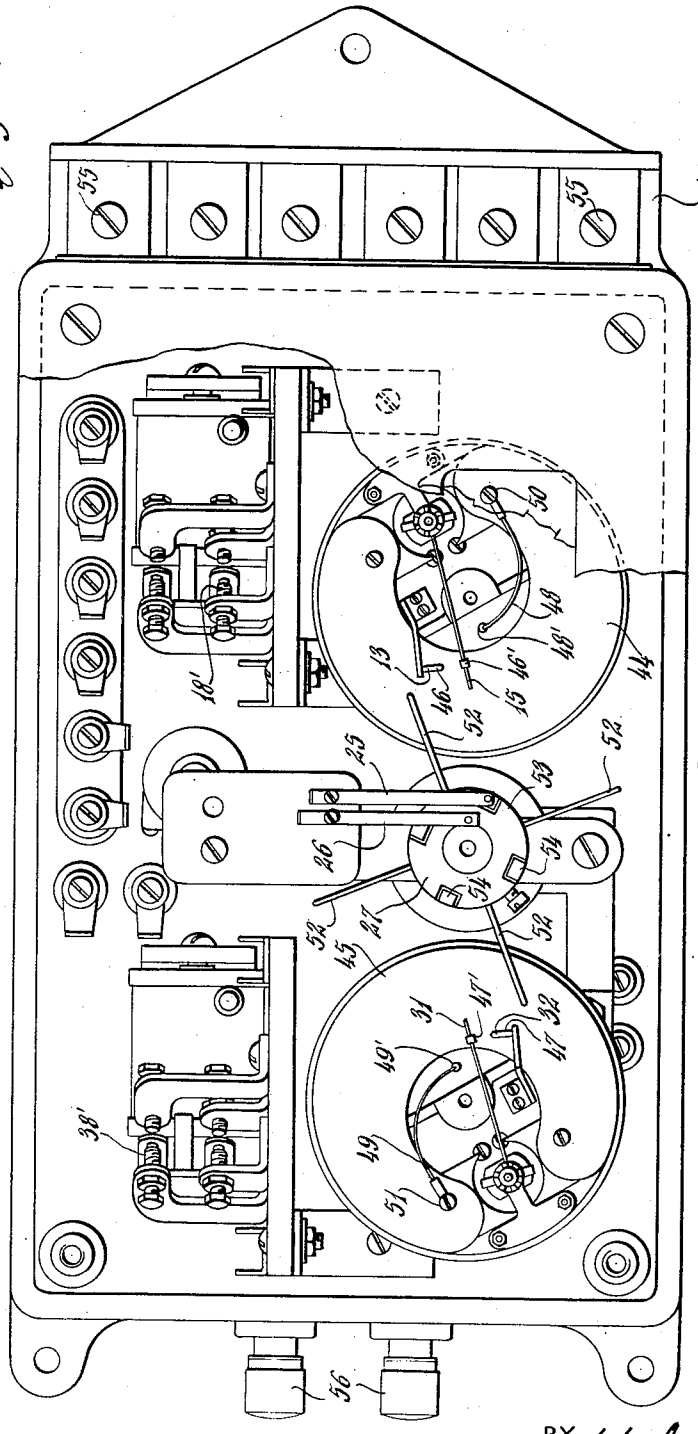
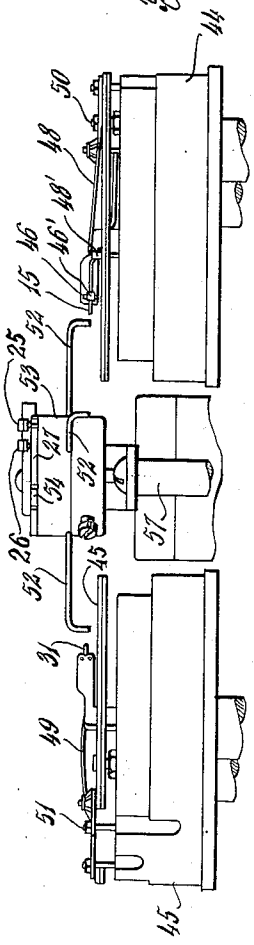


Fig. 4.



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DIRECTIONAL TRAFFIC CONTROL SYSTEM

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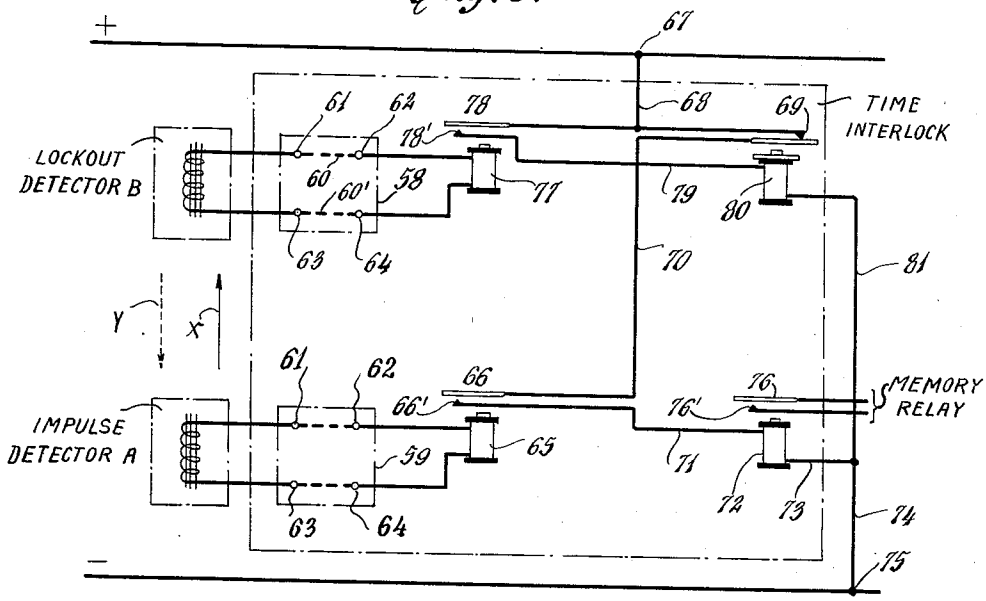
Fig. 5.



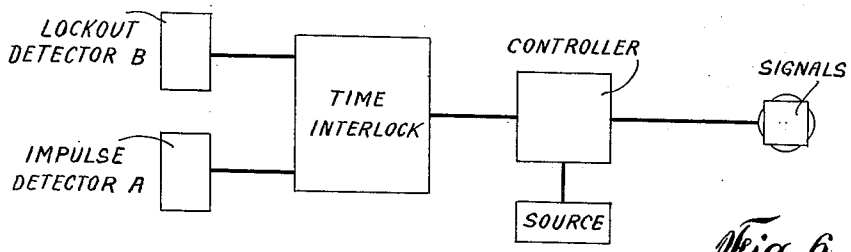


Fig. 6.

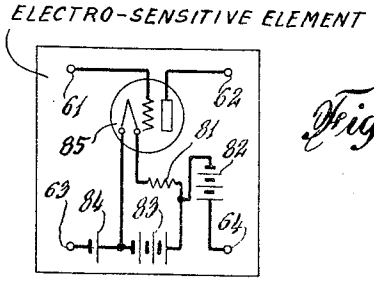


Fig. 7.

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Fig. 8.

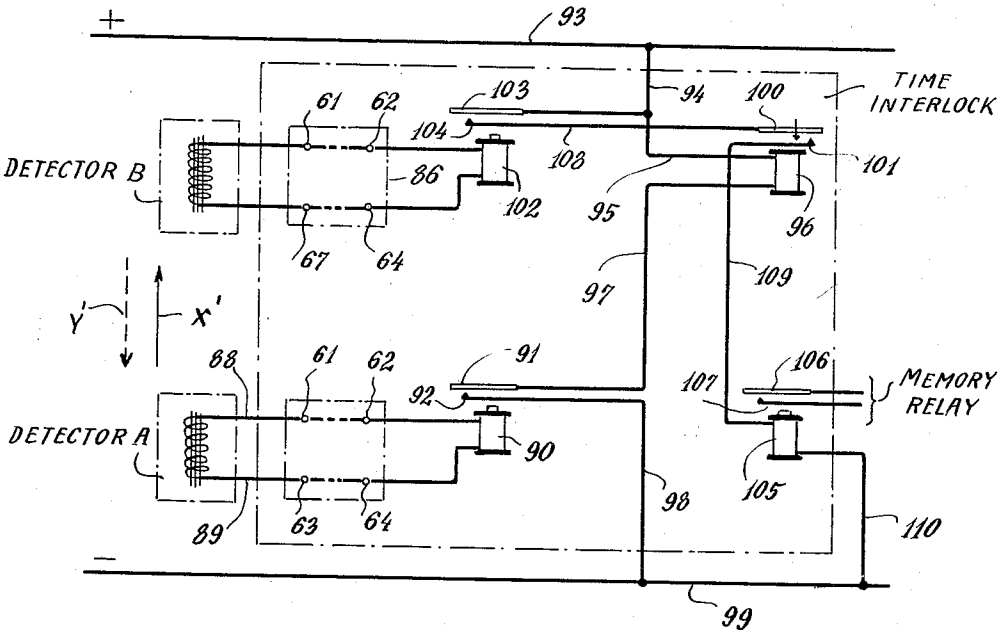
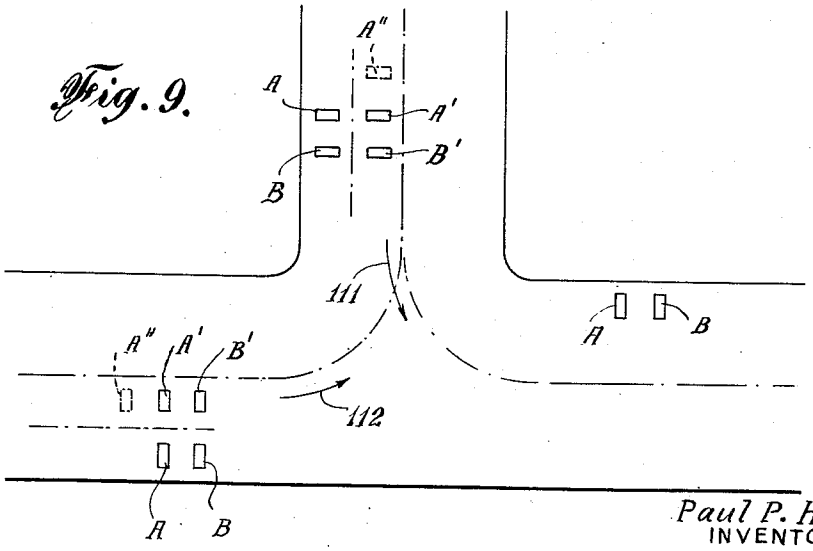


Fig. 9.



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Patented May 27, 1941

2,243,341

UNITED STATES PATENT OFFICE

2,243,341

DIRECTIONAL TRAFFIC CONTROL SYSTEM

Paul P. Horni, Newark, N. J.

Application August 26, 1938, Serial No. 226,863

2 Claims. (Cl. 177—337)

This invention relates to signal control systems and more particularly to means for controlling a circuit in response to the variations of an electrical factor such as may be measured by a highly sensitive instrument.

An example of the utility of this invention may be best shown by reference to a concrete problem, for instance, the utilization of vehicle actuable magnetic detectors arranged in a system to provide a time interlock so that an object, such as a vehicle, moving in a given direction will actuate a traffic signal controller which in turn operates a traffic signal, while a vehicle moving in an opposite direction will have no effect on the traffic signal.

Generally, perhaps, the invention might best be referred to as a vehicle actuable directional traffic control system. This application is not to be confused with the copending application, Serial #181,138, referring to a signalling system. The present application deals with purely a mechanical means for controlling the traffic signal by vehicles moving in given directions. However, in both the present application and the application mentioned supra, the magnetic detectors are fundamentally substantially identical in construction.

The co-pending application, Serial #177,701, while it deals with the directional control of traffic, it is pointed out that the problem particularly handled pertains to the movement of traffic on highways at different elevations, the traffic movement on said highways being generally within the effective or near-effective range of the detectors.

Keeping in mind the co-pending applications herein mentioned, this invention provides for the utilization of two vehicle detectors, the sequential operation of which will determine the operation or non-operation of a traffic signal, the impulses from the detectors being received and communicated to the traffic signal controller through a time interlock. Heretofore, traffic signals which employed detectors, either of the mechanical or magnetic type, could receive impulses from a moving vehicle, which impulses would be received by certain apparatus to cause the operation of a traffic signal. This simple type of control system would receive an impulse from a vehicle and actuate the traffic signal ultimately regardless of the direction of movement of the vehicle. Because of the multiplicity of poles which are carried by a moving vehicle, it is practically impossible to depend upon polarity alone for consideration in the operation of directional control traffic systems. The inability to utilize simple polarity methods may be best pointed out by showing that a vehicle when traced by a magnetic compass will indicate many variations in polarity and frequently four or more changes in the magnetic detector will be presented by a single vehicle. Consequently, the individual polarities cannot all be reckoned with individually as regards operation of the time interlock, yet a resultant actuation is present from each vehicle so that that vehicle in passing a detector will also actuate the second detector which it passes with a similar resultant. That is, if a vehicle passes a first detector A and actuates a needle of the D'Arsonval type galvanometer so that it moves to the left on its first action the needle of a similar galvanometer when actuated by a second detector to which it is connected, will move the needle of the second galvanometer in the same direction. It will thus be seen that regardless of the general polarity of a vehicle, its effect on two similar detectors will have a similar effect on the respective corresponding electro-sensitive element.

The present invention contemplates the utilization of a plurality of detectors so electrically connected to a time interlock that a vehicle moving in one direction only will cause actuation of a memory relay which stores up the impulse or immediately utilizes it dependent on the circumstances, or totally ignores the impulse as far as the memory relay and the ultimate operation of the signal is concerned.

The present invention further contemplates the utilization of a plurality of detectors and electro-sensitive elements substantially similar to those previously described in conjunction with equipment adapted to provide traffic signals for vehicles making left turns when said vehicles are traveling within certain speed limits.

Heretofore, no provisions have been made in traffic signals and equipment therefor wherein the speed of a vehicle was definitely provided for as an element in operation of traffic signals. Naturally, all equipment has certain mechanical or electrical limitations which control the latitude of operation of the apparatus by the mere inherent details of said apparatus. The present invention definitely provides apparatus designed solely for the purpose of controlling the flow of traffic making left turns when said traffic is moving within a certain speed range.

The equipment provided herein for vehicles positioned for making a left turn consists of a time interlock having relays or other equivalent

means which cause the memory relay to function dependent primarily on several factors, namely, the speed of the vehicle, the distance between the detectors, and the inherent characteristics of the operating equipment and circuit therefor.

With these thoughts in mind, an objective of this novel invention is to provide an electro-mechanical device which will cause the operation of a traffic signal depending on the directional movement of said vehicle.

A further object of the invention is to provide an electro-mechanical means for distinguishing the movement of an object in one direction from the movement of an object in an opposing direction.

A further object is to provide a system employing a plurality of detectors connected to a time interlock, which time interlock may or may not actuate a memory relay depending on the directional movement of the impulse initiating mobile device, namely, in the present example, the vehicle.

A further object is to provide a plurality of vehicle detectors having electro-sensitive means connected therewith and responsive thereto, which means may be connected by one or more of the dectors, and means for restoring the apparatus to normal periodically preparatory to receiving further impulses from the detectors.

A further object of the invention is to provide, in a vehicle actuable directional traffic control, means for determining the minimum and maximum time of the instrument closures which results in an actuation of the memory relay.

A further object of the invention is to provide means for vehicles in the approach traffic lane of an intersection to make left turns.

A further object of the invention is to provide a time interlock in left turn traffic equipment, said time interlock having means for a minimum and maximum time interval electrically connected with the detectors so that vehicles traveling at an excessive rate of speed will be penalized by not receiving the "go" signal after passing over the proper detectors.

A still further object is to provide, in a traffic controlling device, means for sequentially operating devices in a time interlock to cause actuation of a memory relay, or a control circuit to effect operation of a traffic signal.

A further object is to provide a vehicle actuable traffic control means which is electro-mechanically operated, being more comprehensive and effective in its operation than any means heretofore provided.

Further and other objects may become apparent to those skilled in the art by a perusal of the specifications and drawings presented herewith.

For a better understanding of the present invention reference may be had to the drawings in which:

Fig. 1 is a schematic representation of the detectors electrically connected to the electro-mechanical time interlock.

Fig. 2 indicates a street intersection in the general layout of the parts concerned in this invention as actually employed.

Fig. 3 is a plan view, partly in section, of the time interlock.

Fig. 4 is a side view, partly broken away, of certain of the elements shown in Fig. 3 to create a more pictorial view to facilitate comprehension thereof.

Fig. 5 is a modification of the invention which employs electro-sensitive elements and relays in the time interlock in lieu of the D'Arsonval type galvanometer.

Fig. 6 is a showing in block form of the various elements presented in Fig. 2.

Fig. 7 is a schematic presentation of a conventional electro-sensitive element which may be used with the apparatus shown in Fig. 5.

Fig. 8 is a schematic representation of the equipment for the left turn time interlock.

Fig. 9 is a diagram of a T street intersection showing placements of the detectors for "through" and "left turn" traffic.

Referring to the drawings and particularly to Fig. 1, two detectors, detector A and detector B, are shown as a dash block connected to a time interlock shown in a dash-dot block. The detectors A and B, as has been mentioned, are similar to those shown in the co-pending application mentioned hereinbefore. Each of these detectors is connected to an individual D'Arsonval galvanometer, each having a contact to engage the needle which is normally balanced so that the contact needle is out of engagement with its associated contact. The needle is normally balanced away from its contact but is responsive to a highly sensitive galvanometer element or coil which is connected to its respective detector by a suitable circuit. A motor means is shown in a dash-dot block within the time interlock block, the purpose of the motor being to rotate a plurality of re-set arms which periodically engage the needles of the respective galvanometers so that an impulse once having been received to close a circuit will have the needle move away from its respective contact, which restores the needle to normal preparatory for another actuation by a following vehicle.

A relay shown in a dash-dot block C, has a pair of contacts which are connected to a memory relay of a traffic signal controller, the relay itself being operable by the closure of the galvanometer needle contact set, responsive to detector A. A relay is shown in dash-dot block D, which relay is responsive to the closure of the galvanometer needle contact set responsive to detector B. One of the contact sets which operates in relay block D is connected across the detector A so that if a vehicle passes in one direction so that it engages detector A prior to detector B, an impulse will be received to operate the memory relay. But if the vehicle travels in a direction so that it engages detector B before it engages detector A, a short circuit will be placed across detector A, so that when the vehicle engages detector A its effectiveness will not be realized on the galvanometer to cause operation of the relay in block C and the consequent operation of the memory relay which eventually controls the traffic signal operation.

Briefly, it may be set forth that the detectors constitute a coil of wire 8 with a core 9. When a magnetic body such as a vehicle engages the detector A, the flux emanating from the moving vehicle will pass through the detector and there will be a relative cutting of the lines of force emanating from the vehicle, by the conductors 8 of the detector. A small current will be generated in the detector which is connected to a galvanometer coil such as 10. In operation, a vehicle passing in the direction of arrow X will cause a current to be generated in detector A which is connected through conductors 11 and 12 to the galvanometer coil 10. Assuming that the coil moves to the left so that its needle engages contact 13, we will notice that the circuit is closed so that negative battery, indicated by the minus

sign, is fed from terminal 14, through the needle 15, through the contact 13, to the relay 16, terminal 17, back to the positive side of the line. The energization of relay 16 will cause the armature 18 to engage its respective contact 18' so that a circuit is closed to start the motor by energizing its winding 19. A circuit, therefore, may be traced from conductor 20 of the motor input through the motor winding 19, over conductors 21, 22, contact 18', armature 18, conductor 23, conductor 24, back to the motor input. It will be seen, therefore, that the closures of contact set 18—18' will start the motor in operation. The operation of this motor is only for a brief interval of time as controlled by the contact set 18—18', but it will be noted that a pair of brushes 25 and 26 which engage conductors 21 and 24, are electrically connected in parallel with the contact set 18—18'. The initial movement of the motor will cause the contact brush 25 to engage the metallic surface 27 so that the brushes 25 and 26 both engage 27 and, therefore, complete a circuit which was initially closed by the contact set 18—18'. The closure of the motor circuit by brushes 25 and 26 on the metallic surface 27 continues to cause rotation of the motor until the contact arm 25 engages an insulated section such as 28, which insulation will cause the circuit of the motor to be interrupted since the contact set 18—18' is no longer closed, it being only momentarily closed under normal conditions, said closure being sufficient only to permit the contacts 25 and 26 to maintain the operation of the motor.

Since this diagram is only schematic, it is pointed out that the re-set arms, which will be more fully described in reference to Figs. 3 and 4, are not shown in this view. Suffice it to state that the operation of the motor will cause the re-set arms to periodically engage the needle 15 so that the needle is periodically moved away from the contact 13, thereby causing the relay 16 to again be deenergized.

With the present arrangement of parts, it will be noted that the energization of the relay 16 will endure so long as the contact set 13—15 is closed. This contact set 13—15 will be closed until one of the re-set arms of the motor opens the contact set by actually engaging needle 15. It will, therefore, be seen that the placement of the re-set arms in relation to the motor will control the period of time which the relay 16 is energized and the consequent endurance of the closure of contact set 18—18'.

The endurance of the period of energization of the relay 16 and the relay in block D is so controlled by the re-set arms, in the instant case, that the slowest vehicle will have passed out of the operating range of detector A, but otherwise as fast as possible. It will be obvious that the speed of the motor will determine the period of energization of the relays in blocks C and D. Consequently, it will be likewise obvious that the speed at which the motor is set to rotate will depend upon the speed of the traffic and other circumstances which the present invention may be called upon for utilization.

As soon as the relay 16 is energized, the contact 29 will be engaged by its respective armature 29', which contact set leads to the circuit to be controlled, in the present instance, a memory relay in a traffic controller.

As the vehicle has moved past detector A, it will be seen that the impulse received therefrom has caused the memory relay to be operated, which operation will eventually cause the traffic signal to be actuated through the operation of the controller. As the vehicle passes detector B, moving in the direction of the arrow X, a current will be set up in said detector so that the galvanometer coil 30 will be energized, thereby causing the needle 31 to engage contact 32. Closure of contact set 31—32 will permit a circuit to be traced from negative battery over terminal 33, through the needle 31, contact 32, conductor 34, relay 35, terminal 36, to positive battery. It will be seen that since a circuit is completed through the relay 35, said relay will be energized and draw in its associated armatures. The armature 37 and its associated contacts 37' is in parallel with contact 18—18', and likewise with brushes 25 and 26. It will be seen, then, that the closure of contact set 37—37' will also complete the motor circuit to energize winding 19 thereof, as has been previously explained.

Contact set 38—38' is associated with relay 35 and responsive thereto so that an impulse from detector B will cause armature 38 to be connected to conductor 39, to terminal 40, while the contact 38' is connected to the conductor 41 and the terminal 42. It will be noted that terminals 40 and 42 are connected on opposing sides of the conductors leading from the detector A to the galvanometer coil 10. The closure of contact set 38—38' will, therefore, short-circuit the detector A so that any impulse which would normally be received therefrom by a moving vehicle will be short-circuited through the contact set 38—38', with the result that said impulse will have no effect upon the galvanometer coil 10.

The converse operation is true in regard to the operation of the present invention. Assuming a vehicle was to move past detectors B and A in the direction indicated by the hatched arrow Y, no impulse would be received on the memory relay since the operation of detector B would cause the contact set 38—38' to short-circuit detector A, the duration of this short-circuit by the contact set 38—38' depending on the speed of the motor or other factors which are concerned with the opening of the galvanometer contact set 31—32.

The spacing between the detectors A and B is preferably as close as possible but not less than a spacing sufficient to give the devices in the time interlock sufficient time to function with respect to the fastest vehicle. The interlock time, generally, may be expressed as being related to vehicle speed and distance between detectors A and B. This interlock time is preferably as short as possible, but not less than the time required by the slowest moving vehicle under consideration to complete its influence upon detector A.

Normally, it may be said that there is a slight variation in the time of operation between the detectors A and B but the time is such that normally the detector which first engages the vehicle will operate before the second detector is engaged by the vehicle. Reference herein of the engagement of the detectors with the vehicle is to be understood as relative cutting of the flux emanating from the vehicle by the conductors of a detector. Therefore, an impulse from B suspends the impulse from A for a predetermined time. This predetermined time is the essence of the operation of the time interlock.

Referring to Fig. 2, we observe an intersection which has a highway and a cross street. In the center of the cross street we observe signals, which control the movement of traffic on the

various streets. In the approach of each street to the center of the intersection, we observe detectors A and B, which are similar to detectors A and B mentioned hereinbefcre. Each of these detector sets are electrically connected to an interlock which is shown by block properly labeled. The interlock connects to a controller which has the necessary apparatus of any conventional design suitable for handling the situation under consideration. This controller is shown as a block and is properly labeled. Leading to the controller we note another block which is labeled "source." The source in this case is the energy necessary for the proper operation of the devices concerned with herein. Connected to the controller is the signal group mentioned hereinbefore which are the individual signal lights which are presented for the purpose of controlling the flow of traffic.

Normally in operation, the memory relay is located in the controller and the purpose of it is to cause the signal to be properly operated. The unit shown in Fig. 1 may be duplicated for the various approaches on the highway and cross street. The number of units employed will naturally depend on the particular intersection, that is, whether or not it is a T intersection, and if traffic at a regular cross street is to be controlled it will depend on whether or not the signal is semi or fully actuable. The showing in Fig. 2 is for a fully actuated street.

Referring to Fig. 3, **43** is the housing for the time interlock. **15** on Fig. 3 corresponds to **15** on Fig. 1 as do the other parts numbered herein. **31** is the moving needle responsive to detector B. **44** and **45** are the permanent magnets used in conjunction with the galvanometer. In Fig. 3, we further point out that parts **46** and **47** are small permanent magnets each having its respective keeper **46'** and **47'** located on the needles **15** and **31** respectively. Spring **48** has an insulated member **48'** located thereon. Spring **49** has an insulated member **49'** located thereon. The purpose of these springs is, in each case, merely a limiting means for the movable galvanometer needles such as **15**. Said spring **48** is rigidly secured at **50** and said spring **49** is rigidly secured at **51**. The needles **15** and **31** are normally balanced substantially equidistant intermediate the small permanent magnet such as **46** and the insulating member such as **48'** located on spring **48**.

In Fig. 3, the positions shown represent substantially the normal positions of the needles, which needles are normally out of range of attraction by the small permanent magnet such as **46**. Sensitivity of the instrument is such that a very slight impulse on either detector A or detector B will cause the galvanometer needle **15** to be moved within the range of attraction of the small permanent magnet, such as **46**. As soon as this happens, the permanent magnet attracts its respective keeper such as **46'** which completes the closure of the circuit. The permanent magnet **46** in Fig. 3 is also indicated as **13** for the purpose of clarity to conform with the showing in Fig. 1. Likewise, **47** in Fig. 3, is indicated as **32** which is the contact that engages the needle **31**.

The re-set arms, of which there are four in number, are shown as **52**. These arms are secured to a spool **53**, the face of which is the metallic conductor **27** upon which rides the contact arms **25** and **26**. A small section **54** is shown set in the spool in different places, and are herein indicated as being solid or metallic but are insulated or spaced from the conductor face **27**. The parts **54** are made of metal for the purpose of resisting wear by the pressure of the contact arm **25**.

The contacts such as **18'** and **38'** are shown hereon but no mention is made of the specific ones as associated with certain contacts as represented in Fig. 1. Since Fig. 1 is merely representative of the general arrangement of the parts to present more graphically the showing of the apparatus, and since no wiring is shown on the figure it is believed unimportant and, consequently, no attempt is made to associate these contacts with identifying characters. Parts **55** are representative as terminals which connect to the various detectors and the input. Terminals **56** may be representative of the connectors for the memory relay.

In Fig. 4, **57** is the shaft which connects the reset arms to the motor. Since the schematic wiring diagram in Fig. 1 is sufficient for the purpose of explanation, it is deemed further reference to Figs. 3 and 4 in detail is unnecessary.

Fig. 5 shows a modification of Fig. 1, in which an electro-sensitive element is employed in lieu of the sensitive galvanometer instrument, and relays are used in lieu of the motor and other parts shown in Fig. 1. In Fig. 5, the two dash-dot blocks are shown similar to detectors A and B in Fig. 1 and are labeled as impulse detector A, and lockout detector B. An arrow X is shown between the detectors A and B and is representative of the direction of the traffic movement in order to initiate operation of the traffic signal. The hatched arrow Y indicates the direction of traffic movement which cannot cause operation of the traffic signal. The sequential operation of these two detectors is similar to that previously expressed herein.

It will be noted that in Fig. 5, detectors A and B are connected to a time interlock. The function of the time interlock in Fig. 5 is substantially similar to that of Fig. 1. Electro-sensitive elements **58** and **59** are similar to that shown in Fig. 7. The purpose of the utilization of such a sensitive element as shown in Fig. 7 is necessary, since it has been previously explained that the energy caused by a moving vehicle in either of the detectors is comparatively small. However, if the current generated by the magnetic detector is sufficient, it is understood that the lines shown dotted as **60—60'** in the element **58**, may be a solid connection between the terminals **61** and **62** and also between remaining corresponding terminals which are shown as **63** and **64** in Fig. 7. This same arrangement may be presented in element **59** if the condition so warrants.

If a vehicle engages detector A, an impulse will be set up to energize relay **65** which closes its contact set **66—66'**. A circuit may be then traced from positive battery to terminal **67**, through conductor **68**, through contact set **69**, conductor **70**, contact set **66—66'**, conductor **71**, relay **72**, conductor **73**, conductor **74**, terminal **75**, to negative battery. The closure of contact set **66—66'**, therefore, energizes relay **72** which in turn attracts armature **76** causing said armature to engage its respective contact **76'**. The closure of contact set **76—76'** will then cause the memory relay to be operated and thereby ultimately controls the operation of the traffic signal. As the vehicle continues in its movement in the direction indicated by arrow X, it will engage detector B which in turn energizes relay **77**. The en-

ergization of relay 77 will cause the contact set 78—78' to close. A circuit may then be traced from positive battery to terminal 67, through constact set 78—78', from conductor 79, through relay 80, from conductor 81, to terminal 75, and back to negative battery. The energization of relay 80 will attract the armature of contact set 69 causing said contact set to be opened. The opening of contact set 69 will have no effect upon the memory relay in the present case, since the memory relay has been already closed when the vehicle passed detector A in its direction of travel indicated by arrow X. It will be observed that the conventional symbol for a slow connecting relay is present on the relay 80. While it is indicated here as a conventional symbol to indicate a time delay relay, it is to be understood that any suitable means may be employed.

If a vehicle moves in a direction indicated by the hatched arrow Y, the energization of the lockout detector B will cause relay 77 to be energized, which in turn energizes relay 80. The relay 80 being slow connecting will cause the contact set 69 to be opened for a predetermined period of time, which permits the vehicle traveling in the direction of arrow Y to move past detector A without causing the resultant operation of relay 72 and the consequent operation of the memory relay through the closure of contact set 76—76'.

In Fig. 6, the block diagram indicates that the block diagram is a simple graphic presentation of the general arrangement of parts likened to that shown in Fig. 2. The impulse detector A and the lockout detector B are both shown connected to the time interlock. The time interlock is connected to the controller, which controller in turn is connected to the signals. A source of energy feeds the controller to permit normal operation of the signalling system.

No apparatus is presented herewith to show a controller nor are any traffic signals indicated in detail. It is believed that the block presentation is sufficient to clearly set forth the novelty of this invention, since any conventional controller may be used with any conventional set of signals. The combination of the various elements presented in Fig. 6 clearly shows the various devices as employed in a system utilizing the novel arrangement for directional traffic control in a vehicle actuable system.

Fig. 7 is a conventional signal for a three-element tube 85 and is representative of an electro-sensitive element which may be employed in lieu of the D'Arsonval type galvanometer. In Fig. 7, 81 is a conventional resistance and 82, 83, and 84 are representative of direct current energy sources suitable for the work in which they are utilized. While the three-element tube is used as an electro-sensitive element, it is understood that any electro-sensitive element may be employed which is the full equivalent of either the D'Arsonval galvanometer or the three-element tube.

It is to be understood that throughout the present disclosure, the memory relay mentioned is of the type that requires only a simple impulse to lock in the memory relay which in turn operates the traffic signal controller, such as a simple closure of contacts 76 and 76' as presented in Fig. 5.

Fig. 8 shows detectors A and B in conjunction with electro-sensitive elements 86 and 87, which electro-sensitive elements are in a time interlock circuit which control the memory relay dependent on the various factors mentioned hereinbefore.

Fig. 8 may be used in conjunction with Fig. 6 to show generally the arrangement of parts.

In operation, when a vehicle is traveling in the direction of arrow X' and passing over detectors A and B in that order, an impulse will be received in detector A and transmitted over conductors 88 and 89 to the relay 90. A closure of the contact set 91—92 in response to the energization of relay 90 will cause a circuit to be traced from the positive conductor 93 over the conductor 94, conductor 95, through the timing relay 96 over conductor 97, contact set 91—92, conductor 98, to the negative side of battery 99. As this circuit is complete the relay 96 will be energized. Since the arrow on the armature 100 indicates that relay 96 is a slow operating relay, the contact set 91—92 must be closed long enough for the relay 96 to completely attract the armature 100 to close the contact set 100—101. As the vehicle continues over detector B in the direction of arrow X', the impulse from detector B through the electro-sensitive element 86 will cause the relay 102 to operate, thereby closing contact set 103—104.

If the speed of the vehicle is such that the contact set 100—101 is still closed when the contact set 103—104 is closed, then the circuit is complete to energize the control relay 105 which operates contact set 106—107, which last mentioned contact set leads to the memory relay.

When relay 102 is energized and the contact set 103—104 is closed as is the contact set 100—101, then a circuit may be traced from positive battery 93 over conductor 94, contact set 103—104, conductor 108, contact set 100—101, conductor 109, control relay 105, conductor 110, back to the negative side of battery 99.

The completion of this last mentioned circuit will cause control relay 105 to be energized thereby closing the contact set 106—107, which contact closure operates the memory relay.

Assuming a car travels in the direction opposite to the arrow X', that is, in the direction of arrow Y', then the impulse from detector B will energize relay 102. Since the contact set 100—101 of relay 96 is open, the closure of contact set 103—104 by the relay 102 will have no effect whatsoever upon the ultimate operation of the controller.

If the relay 96 is of the quick release type, then contact set 103—104 and contact set 100—101 must be closed during some part of the same time, to effect operation, that is, the circuit to the relay 105 must be complete in order to effect operation of the memory relay. In this case, the spacing of the detectors may be closer, such as shown by detectors A' and B' in Fig. 9.

In Fig. 9 it is pointed out that the detectors A' and B' in two of the approach lanes have arrows 111 and 112 which indicate the left turn path of the vehicle. The detectors A—B are shown in each of the three streets in an approach lane to the intersection.

If a slow-release relay is utilized for relay 96, then the spacing between the left turn detectors may be increased so that the effect of a vehicle passing over said detectors may perhaps not affect both detectors simultaneously. The slow-release relay is presented as an alternative arrangement which may be utilized dependent upon circumstances for which equipment must be provided to properly handle a given traffic problem.

The dash-dot blocks A'' shown on the inside approach lane to the intersection represents the approach detectors spaced at a greater distance from detectors B' than are the detectors A'.

From the foregoing description of Figs. 8 and 9, it should be clear that traffic moving over the detectors A and B in Fig. 8 will have to move at a speed dependent on the operation of the equipment and the speed of the vehicle in order to enable said vehicle to obtain a Go signal when making a left turn. If the vehicle fails to travel at the proper speed after the operating equipment and detectors are effective, then the operating vehicle will therefore be penalized and will be unable to obtain the left turn signal.

While specific details of the invention have been herein shown and described, the invention is not necessarily confined thereto as changes may be and may become apparent to those skilled in the art without departing from the spirit thereof as defined by the appended claims

Having thus described the invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a traffic signaling system of the vehicle actuatable type for the directional discrimination of traffic control, a first vehicle responsive electric detector adapted to produce an electrical impulse when a vehicle acts thereon, a second vehicle responsive electric detector, said detectors being positioned in a highway traffic lane in spaced relation with said second detector positioned subsequent to said first detector in the normal direction of traffic in said lane, a first and a second electrodynamic actuator unit respectively connected to and adapted for actuation by said detectors, each of said actuator units comprising a displaceable element and further comprising contact sets and means actuatable by displacement of said element for closing said contact sets, a rotatable vane unit comprising a hub and a set of vanes radially mounted thereon, said vane unit being positioned for engagement of said vanes with said displaceable elements respectively as said vane unit rotates, a variable speed electric motor driving said vane unit, a traffic signal control circuit connected to one contact set of said first actuator unit, connections to one contact set of said second actuator unit for short-circuiting the connection of said first detector to said first actuator unit, the second contact sets of said actuator units being connected for closing the supply circuit of said motor, said vane unit comprising means for retaining closed for a short predetermined interval the supply circuit of said motor after a starting impulse has been applied thereto by a said second contact set, whereby a vehicle travelling in the normal direction of traffic actuates said control circuit, but a vehicle travelling against the normal direction of traffic above a minimum predetermined speed has no effect on said control circuit.

2. In a traffic signaling system of the vehicle actuatable type for the minimum speed discrimination of traffic control, a first vehicle responsive electric detector adapted to produce an electrical impulse when a vehicle acts thereon, a second vehicle responsive electric detector, said detectors being positioned in a highway traffic lane in spaced relation with said second detector positioned subsequent to said first detector in the normal direction of traffic in said lane, a first and a second primary electrodynamic actuator respectively connected to and adapted for actuation by said detectors, each of said primary actuators comprising a displaceable element adapted when displaced to close a contact set, a secondary electrodynamic actuator comprising a displaceable element adapted when displaced to close a contact set and having its actuating winding connected to the contact set of said first primary actuator, said secondary actuator having a determinable extended period of release corresponding to the travel time between said detectors at a minimum desired speed, a traffic signal control circuit, the contact sets of said second primary actuator and said secondary actuator being connected in series with each other and with said control circuit, whereby a vehicle passing in the normal direction of traffic at at least said minimum desired speed will actuate said traffic signal control circuit.

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