Dec. 12, 1933. R. W. CONN 1,939,436

TRAFFIC CONTROL SYSTEM

Filed Jan. 10, 1929

Fig.1.

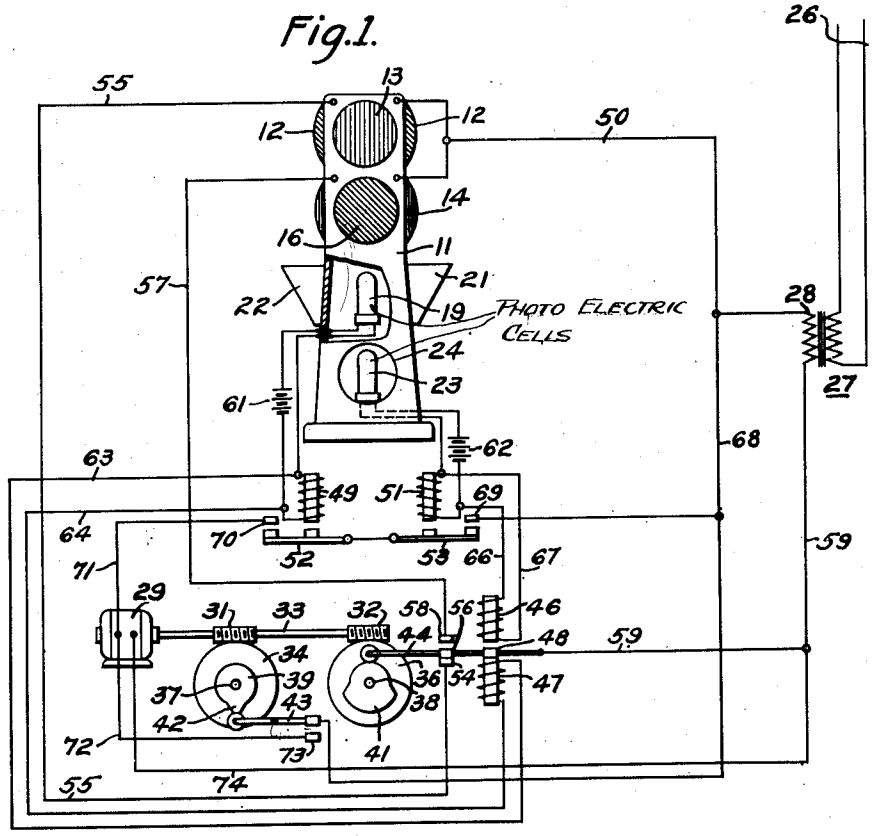


Fig.2.

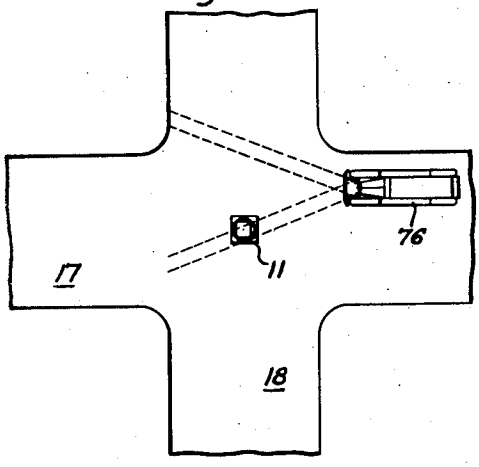
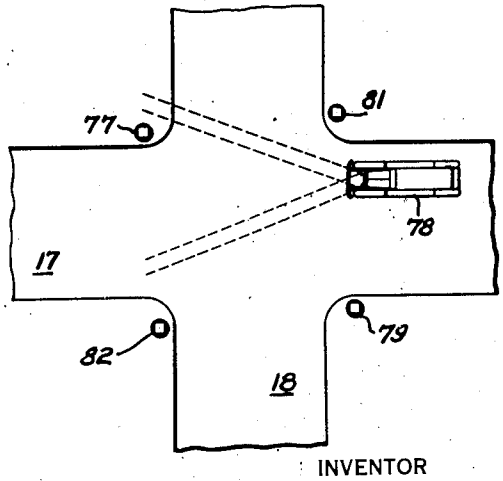


Fig.3.



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TRAFFIC CONTROL SYSTEM

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7 Claims. (Cl. 177—339)

My invention relates to control systems and particularly to traffic-control systems.

An object of my invention is to provide a traffic-control system that shall be relatively simple and easily installed and that shall be particularly applicable to intersecting main and auxiliary traffic lanes.

Another object of my invention is to provide a traffic-control system that shall embody light-sensitive cells actuable by daylight or natural illumination or by the headlights of motor vehicles.

Another object of my invention is to provide a traffic-control system that shall cooperate with a program controller to effect continuous operation of the latter so long as there is a stress of motor vehicles on both traffic lanes and that shall maintain a "go" signal on the main traffic lane in the absence of traffic on both lanes.

In practicing my invention, I provide, in combination with a program controller and "stop" and "go" signals controlled thereby for both intersecting traffic lanes, a plurality of light-sensitive cells actuable by the headlights of motor vehicles moving in the respective traffic lanes or by natural illumination, and electromagnetic means cooperating with, and controlled by, the respective light-sensitive cells for causing a "go" signal on the main traffic lane to be reversed and, simultaneously, to show a "go" signal on the other lane when demanded by traffic thereon.

By the term "natural illumination" above I mean either daylight illumination or such illumination as is provided by street lamps. In certain localities street lamps are maintained energized up to a certain hour at night and are extinguished after this hour. The period during which the street lamps are maintained illuminated corresponds approximately to the period during which traffic on the highways in these localities is of the same character as during the daytime. In the preferred practice of my invention the control system responds in the same manner to street lamp illumination in these localities as it does to daylight.

In accordance with my invention when the light sensitive cells are subjected to the influence of natural illumination traffic is alternately permitted to pass and restrained on the highways for which my system provides the control. However, in the absence of natural illumination traffic is normally restrained on one highway as long as the light sensitive device associated with the highway remains in inoperative condition. The light sensitive device is adapted to be rendered operative by the light from the headlight of vehicles moving on the highway and when this situation occurs traffic is permitted to pass on the highway.

It is to be noted that one of the advantages of my system resides in the fact that as long as the light sensitive device remains deenergized a traffic on the highway associated with it is restrained. If the light sensitive device should for any reason become defective and fail to respond to light or if the control circuit should be broken as by a break in a connecting conductor, the traffic on the highway would continue to be restrained. The danger which arises from permitting traffic to pass along a highway by reason of a defect in the control apparatus is thus avoided.

In the single sheet of drawings;

Figure 1 is a diagram of connections embodying my system, certain devices being shown more or less schematically,

Fig. 2 is a top plan view of intersecting traffic lanes showing one location of light-sensitive cells, and

Fig. 3 is a top plan view of intersecting traffic lanes showing another location of the light-sensitive cells.

A pedestal 11 may be located in the intersection of the center lines of two intersecting traffic lanes, as shown more particularly in Fig. 2 of the drawing, and may embody a plurality of incandescent lamps located one above another (not shown in the drawing), which lamps are operable to illuminate "go" signals 12 and "stop" signals 13 for the upper lamp and "stop" signals 14 and "go" signals 16 for the lower lamp. The location of the pedestal, or, more particularly, of the "go" and "stop" signals, is such that the "go" signals 12 controls the traffic lane designated as 17 in Fig. 2, while the "go" signal 16 controls the traffic lane designated as 18 in that figure of the drawing.

The traffic lane 17 may be considered the major or main traffic lane on which there is a relatively large volume of traffic throughout the twenty-four hours, and traffic lane 18 may be considered an auxiliary or minor traffic lane on which there is much less traffic, particularly so at certain periods, such as evenings and nights. In a case of this kind, it is highly desirable that the main or major traffic lane be protected by a "go" signal to permit the relatively heavy traffic to move over the lane, particularly so when there is no traffic on the auxiliary lane.

The pedestal 11 is provided also with a photo-

sensitive cell 19 located within it and between openings (not shown), so that it may be affected, not only by daylight, but, more particularly, by the rays of radiant energy from the headlights of motor vehicles travelling in either direction on traffic lane 17. In order to prevent action of stray beams of light from affecting the cell 19, visor members 21 and 22 of the kind usually employed in railway signals may be mounted on the opposite sides of the pedestal, which may have a rectangular horizontal section.

A second photo-electric cell 23 is provided within the pedestal 11 and is so located between openings (not shown in detail) as to be affected by the light from the headlights of motor vehicles on traffic lane 18. Visor members 24 (only one of which is visible in the drawing) are provided to prevent the action of stray light on the cell 23.

A source of supply of electric energy comprises supply-circuit conductors 26 energizing a transformer 27, having a primary winding 28 in addition to the other elements constituting a transformer, the voltage of the secondary winding 28 being suitable for operating the light sources hereinbefore mentioned, as well as for operating a program-controller motor 29.

The motor 29 may be located in any suitable or desired position, as, for instance, in the pedestal, and, as the details of construction of the motor and its location are not parts of my invention, I have elected to show the motor more or less schematically.

Worms 31 and 32 are properly located on an extension 33 of the motor shaft to engage, respectively, worm gear wheels 34 and 36 which are mounted, respectively, on shafts 37 and 38. A cam 39 is mounted on shaft 37 and a cam 41 is mounted on shaft 38. The mechanical details of the program contactor, embodying the motor, the worms, the worm gear wheels, the cams and certain contact levers controlled thereby, are shown schematically only, the details of the supporting structures being omitted for the sake of clearness and for the further reason that they do not constitute parts of my present invention.

The cam 39 has a substantially continuous annular surface, except for a single projecting lug 42, while the cam 41 has two annularly curved surfaces, each extending over substantially one hundred eighty mechanical degrees, the radius of one of these surfaces being larger than the radius of the other surface.

A contact lever 43 is pivotally mounted intermediate its ends and is controlled by the cam 39. A contact lever 44 is pivotally mounted at one of its ends and its position is controlled by the cam 41, one end of the lever resting on the cam surface.

Superposed electromagnets 46 and 47 are provided, each having an energizing winding and cooperating with a magnetizable member or portion 48 on the lever 44.

Relays 49 and 51, embodying suitable cores and energizing windings, are respectively provided with contact levers 52 and 53, the adjacent ends of which are pivotally supported and are connected by an electric conductor, in order that they may be traversed by current under certain conditions of operation.

One terminal of the secondary winding 28 of the transformer 27 is connected to one terminal of each of the signal lamps in the top of the pedestal, by a conductor 50. The upper signal lamp has its other terminal connected, by a conductor 55, to a contact member 54 which is engaged by a contact member 56 on the lever 44 when the cam 41 is in substantially the position shown in Fig. 1 of the drawing. The other terminal of the lower signal lamp, cooperating with the lenses 14 and 16, is connected, by a conductor 57, to a second contact terminal 58, which may be engaged by the contact member 56 under certain conditions of operation of the system, to be hereinafter set forth in detail. The pivot point of the lever 44 is connected, by a conductor 59, to the other terminal of secondary winding 28.

Secondary sources of electric energy 61 and 62 are provided for the respective light-sensitive cells 19 and 23, and are connected in series circuit with the respective cells 19 and 23 and the energizing windings of relays 49 and 51.

The terminals of the energizing winding of relay 49 are connected, by conductors 63 and 64, to the terminals of the energizing winding of electromagnet 47 so that the two windings are connected in parallel-circuit relation. The terminals of the energizing winding of the relay 51 are connected, by conductors 66 and 67, to the terminals of the energizing winding of electromagnet 46 so that the two windings are connected in parallel-circuit relation.

One terminal of the secondary winding 28 is connected, by a conductor 68, to a contact terminal 69 which cooperates with the movable end of contact lever 53, as well as to the contact lever 43 which is controlled by the cam 39. A contact terminal 70 is so located as to be engaged by, or be disengaged from, the movable end of contact arm 52 and is connected by a conductor 71, to one terminal of the energizing winding of motor 29, which terminal is connected, by a conductor 72, to a contact terminal 73 which may be engaged by, or be disengaged from, the movable end of contact lever 43. The other terminal of the energizing winding of motor 29 is connected, by a conductor 74, to the other terminal of secondary winding 28 and, as shown in Fig. 1 of the drawing, it may be connected to conductor 59.

As hereinbefore stated, Fig. 2 of the drawing shows a pedestal 11 located at the intersection of two traffic lanes so that the light-sensitive cells hereinbefore described may be affected or energized by the light rays from the headlights of motor vehicles, such as the motor vehicle 76 in Fig. 2 of the drawing.

Under certain conditions, it may be desirable to provide a slightly different location of the light-sensitive cells, and reference may be had to Fig. 3 of the drawing, in which a light-sensitive cell 77 is so located as to be actuable by the light from a vehicle 78 moving from right to left on traffic line 17. A cell 79 is located at the opposite corner where it may be actuated by the light from motor vehicles moving in the opposite direction on traffic lane 17. A cell 81 is so located as to be affected by the lights of motor vehicles moving upwardly on traffic lane 18, and another cell 82 is located in the opposite corner where it will be affected by the lights of motor vehicles on lane 18 moving downwardly in the plane of the drawing.

It is to be understood, of course, that, where two light-sensitive cells are provided for each traffic lane, they will be connected in parallel-circuit relation by suitable conductors, not shown in the drawing, in order that the energization of either one will effect control of the system.

No signals are shown in Fig. 3 of the drawing, and it is to be understood that substantially the

same "stop" and "go" signals are to be provided as are shown in Figs. 1 and 2 of the drawing.

As was hereinbefore stated, it is highly desirable, in the case of intersecting traffic lanes, where there is an appreciable reduction in the traffic on one of the lanes, say during the hours of the evening or for the night, that the "go" signals shall be displayed for the main traffic lane and "stop" signals for the auxiliary traffic lane, and that provision shall be made to permit a vehicle approaching on the auxiliary lane and desiring either to cross it or to enter thereon, to do so, after which the "go" signal shall be again displayed on the main lane and the "stop" signal be displayed on the auxiliary lane.

Let it be assumed that the time of day be such that there is not enough illumination on either of the cells 19 and 23 to energize them. In this case, the parts of the system and the respective mechanisms will remain in the positions shown in Fig. 1 of the drawing. In this case, a circuit may be traced from one terminal of the secondary winding 28, through conductor 59, to contact members 56 and 54, conductor 55, the signal light associated with lenses 12 and 13, and back, through conductor 52, to the other terminal of secondary winding 28. This will provide a "go" signal on traffic lane 17 and a "stop" signal on traffic lane 18.

Let it now be assumed that a motor vehicle (not shown), moving in traffic lane 18 desires to either cross lane 17 or to enter therein. As it approaches the intersection of the traffic lanes, light-sensitive cell 23 in Fig. 2 of the drawing, and either cell 81 or cell 82 in Fig. 3 of the drawing, will be energized by the beam of radiant energy from the headlight of the vehicle, the cell will become conducting and energize not only the winding of electromagnet 46 but also the winding of relay 51. The energization of electromagnet 46 will cause an upward movement of the free end of lever 44, so that contact member 56 will engage contact member 58. This interrupts the circuit heretofore existing through the signal lamp associated with the lenses 12 and 13, whereby the "go" signal on traffic lane 17 and the "stop" signal on traffic lane 18 are extinguished.

The engagement of contact members 56 and 58 establishes a circuit from the secondary winding 28 through conductor 59, contact members 56 and 58, conductor 57, the lower signal light and back, through conductor 52, to the secondary winding 28. This energizes the "go" signal on traffic lane 18 and the "stop" signal on the traffic lane 17. This will permit the motor vehicle to either cross the intersection or to move on to the main traffic lane, and, as soon as the cell 23 has been deenergized, by reason of the movement of the motor vehicle, the control system will return to the condition shown in Fig. 1 of the drawing.

As above stated, the relay 51 was also energized, and the contact lever 53 will, therefore, engage contact terminal 69, but this will not result in any further or other action of the control system for the reason that lever 52 is not in engagement with contact terminal 70.

Let it be assumed that a plurality of motor vehicles arrive simultaneously at the intersection of the traffic lanes so that either both cells 19 and 23 or cells 77, 79, 81 and 82 are simultaneously energized. In this case, both relays 49 and 51 will be energized, as well as the electromagnets 46 and 47. As both of the electromagnets 46 and 47 are simultaneously energized, no change in the position of lever 44 will be effected initially. However, contact lever 53 will be moved upwardly to engage contact terminal 69, and contact lever 52 will be moved to engage contact terminal 70. This establishes a circuit through the motor which may be traced as follows: from one terminal of secondary winding 28, through conductor 68, levers 53 and 52, conductors 71, winding of motor 29 and back, through conductors 74 and 59, to the other terminal of secondary winding 28.

This energizes the motor, irrespective of the position of the lever 43, and the motor will rotate, causing movement of the worm gears 34 and 36 and of the cams 39 and 41. Within a few moments after the beginning of the rotative movement of cam 39, the outer end of lever 43 will engage contact terminal 73, and a circuit will be thereby established through the motor winding, beginning with conductor 68 and extending to lever 43, terminal 73, conductor 72, winding of motor 29 and back, through conductors 74 and 59, to the secondary winding 28. This means that the motor will be rotated for a period of time dependent upon certain external conditions, as follows: if the stream of traffic is substantially continuous on both traffic lanes, relays 49 and 51 will remain energized, and the circuit through the contact levers of these relays will continue and the motor will rotate, whereby timed successions of "stop" and "go" signals are displayed on the respective traffic lanes. It is, of course, understood that the length of time a "stop" and a "go" signal are displayed may be varied by means well known in the art in connection with program controllers.

If, however, the stream of traffic is interrupted, say on the auxiliary lane, relay 51 is deenergized, and the circuit through the contact lever 53 is interrupted so that the circuit through contact terminal 73 and lever 43 is the one now in control of the motor. As soon as the lug 42 on the cam surface 39 reaches the position shown in Fig. 1 of the drawing, the motor circuit will again be interrupted, so that the "go" signal will be displayed on the main traffic lane and the "stop" signal will be displayed on the auxiliary traffic lane.

It may be noted that the cam surface of cam 41 having the smaller radius end, more particularly, the intermediate portion thereof is in operative engagement with a roller mounted on the end of lever 44 and that, therefore, even though program control, as hereinbefore set forth, be initiated, the "go" signal will be displayed on the main traffic lane for one quarter of a revolution of the cam surface 41. This is effective to permit the leading vehicle or vehicles on traffic lane 17 to move over the intersection before being blocked by the "stop" signal energized by the raising of the lever 44 by the cam 41, effecting engagement of contact member 56 with terminal 58.

All of the discussion hereinbefore given as to the operation of the system has been on the assumption that there is not enough natural light, as in daytime, to energize either or both of the cells 19 and 23 in Fig. 1 of the drawing. If, however, there is sufficient daylight, both cells will be energized, and relays 49 and 51 will be continuously energized, so that, irrespective of the amount of traffic on the auxiliary traffic lane, program control of the "stop" and "go" signals will continue. This condition will last or continue as long as there is sufficient daylight, and, consequently, presumably some volume of traffic on the two intersecting traffic lanes. As soon as darkness comes on, the "go" signal will be dis-

played on the main traffic lane and the "stop" signal on the auxiliary traffic lane, to be changed only in accordance with traffic on the auxiliary traffic lane.

It may be noted that the system embodying my invention is relatively simple, in that it embodies relatively few parts and it may also be noted that the locations of the light-sensitive cells and the signals are not specifically limited.

The system embodying my invention is operative to provide program control during the daylight and changes automatically to selective control upon the approach of darkness. The main traffic lane is kept open by the "go" signal, and traffic on the auxiliary lane must ask for and receive permission to cross or enter into the main traffic lane before doing so with safety.

Various modifications may be made in the system embodying my invention without departing from the spirit and the scope thereof and I desire, therefore, that only such limitations shall be placed thereon as are imposed by the prior art or are set forth in the appended claims.

I claim as my invention:

1. A traffic control system for a plurality of intersecting lanes, comprising a device adapted to normally display a "go" signal for one of said lanes and a "stop" signal for another of said lanes, a light-sensitive device adapted to respond to light coming from traffic on the last mentioned lane and also to natural illumination, means adapted to coact with said light-sensitive device to cause a "go" signal to be displayed for said last mentioned lane and a "stop" signal to be displayed for said first mentioned lane, a light-sensitive device adapted to respond to light coming from traffic on the first mentioned lane, and also to natural illumination, and means, associated with said light-sensitive devices, and capable of responding to the excitation of both thereof by actuating said signalling system to display, in alternating sequence, "stop" and "go" signals for said lanes.

2. A traffic control system for a plurality of intersecting lanes, comprising a device adapted to normally permit traffic to go on one of said lanes and to restrain traffic on another of said lanes, a light-sensitive device, means adapted to respond to light coming on said light-sensitive device from traffic on the lane on which traffic is restrained to cause the first said device to permit traffic to go on said lane on which it is normally restrained and to restrain traffic on said lane on which it is normally permitted to go and means responsive to natural illumination on both said light-sensitive devices to permit traffic to go and to restrain traffic alternately on said lanes.

3. In a traffic control system for an intersection having signals adapted to control the movement of traffic through said intersection, a device responsive to light, means for controlling the display of said signals, when illumination from a vehicle shines on said device, and means for sequentially displaying said signals for routine control of traffic when natural illumination shines on said device and to the exclusion of operation by the first said means.

4. Traffic control apparatus for a plurality of highways comprising a device adapted to permit traffic to move and to restrain traffic on said highways, a light-sensitive device on each of said highways adapted to be rendered operative by the light from the headlights of vehicles moving on said highways or by natural illumination, and means to be actuated by said light-sensitive devices when both are simultaneously rendered operative by the light from the headlight of vehicles or by natural illumination to cause the first said device to alternately permit traffic to move and to restrain traffic on said highways.

5. Traffic control apparatus for a plurality of highways comprising a device adapted to normally permit traffic to move on one of said highways and to restrain traffic on another of said highways, a light-sensitive device normally inoperative and adapted to be rendered operative by light from the headlights of vehicles moving on the highway on which traffic is restrained, and means to be actuated by said light-sensitive device, when it is rendered operative, to cause the first said device to permit traffic to move on the highway on which it is normally restrained and to restrain traffic on the highway on which it is normally permitted to move.

6. Traffic control apparatus for a highway comprising a device adapted to permit traffic to move and to restrain traffic on said highway, said device being normally so adjusted as to restrain traffic on said highway, a light-sensitive device, normally inoperative, and adapted to be rendered operative by light from the headlights of vehicles moving on said highway, and means to be actuated by said light-sensitive device when operative to cause the first said device to permit traffic to move on said highway.

7. A traffic-control apparatus for a plurality of highways comprising a signal device adapted to permit traffic to move and to restrain traffic on said highways, said device being normally so adjusted as to permit traffic to move on one of said highways and to restrain traffic on another of said highways, a light-sensitive device, normally inoperative, and adapted to be rendered operative by the light from the headlights of vehicles on the highway on which traffic is restrained, means to be actuated by said light-sensitive device when it is rendered operative to cause the first said device to permit traffic to move on the highway on which it is normally restrained and to restrain traffic on the highway on which it is normally permitted to move, another light-sensitive device adapted to be rendered operative by the light from the headlights of vehicles moving on the highway on which traffic is normally permitted to move, and means to be actuated by said first-named light-sensitive device and by said last-named light-sensitive device when they are both simultaneously rendered operative to alternately permit traffic to move and to restrain traffic on both said highways.

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