April 17, 1934. C. D. GEER ET AL 1,954,992

TRAFFIC CONTROL SYSTEM

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Fig. 1.

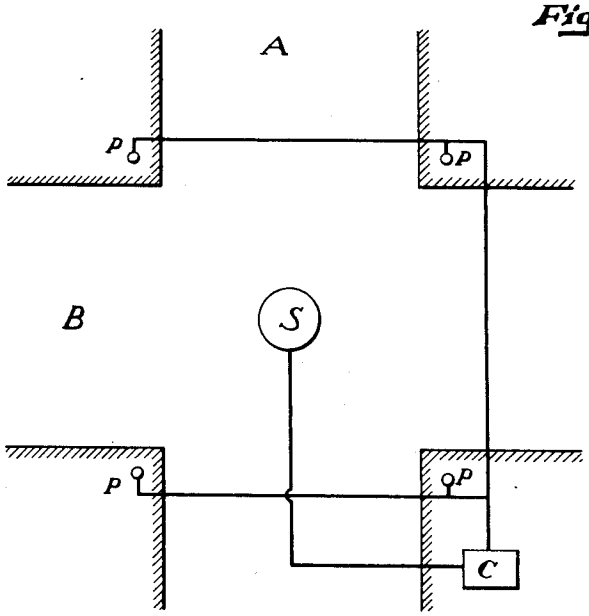

Fig. 2.

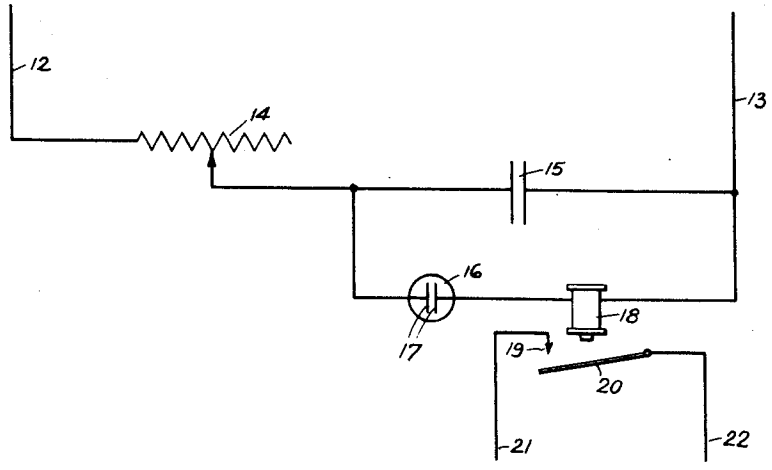

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Fig. 3.

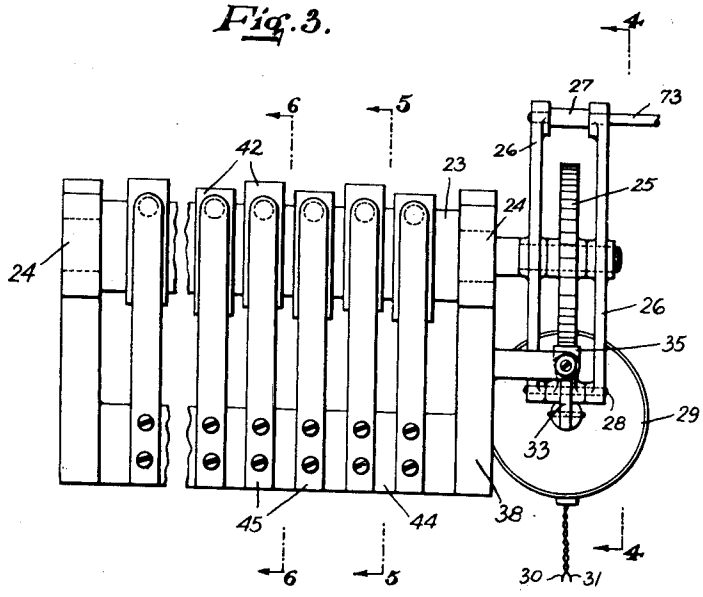

Fig. 4.

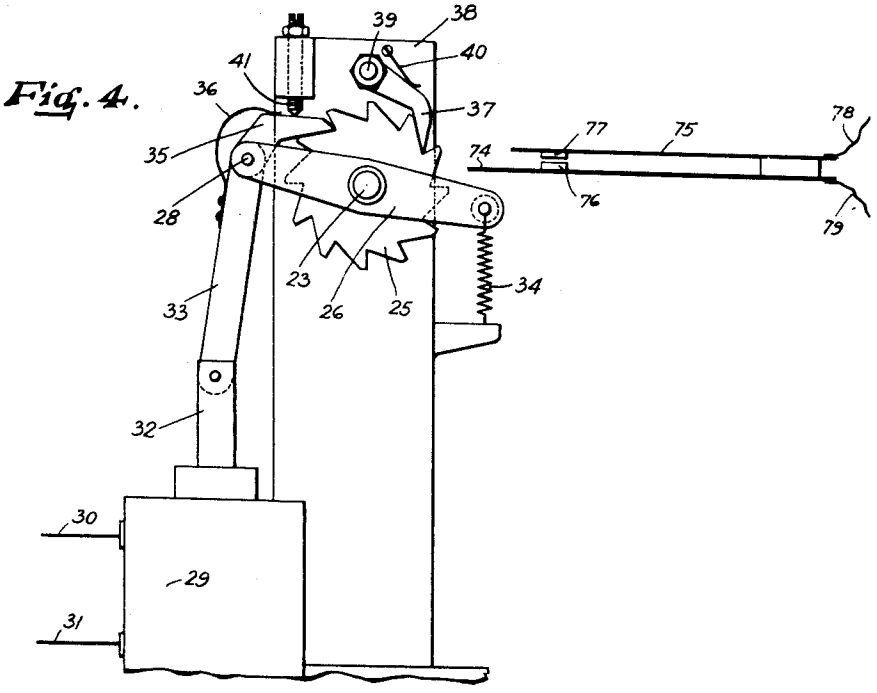

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Fig. 5.

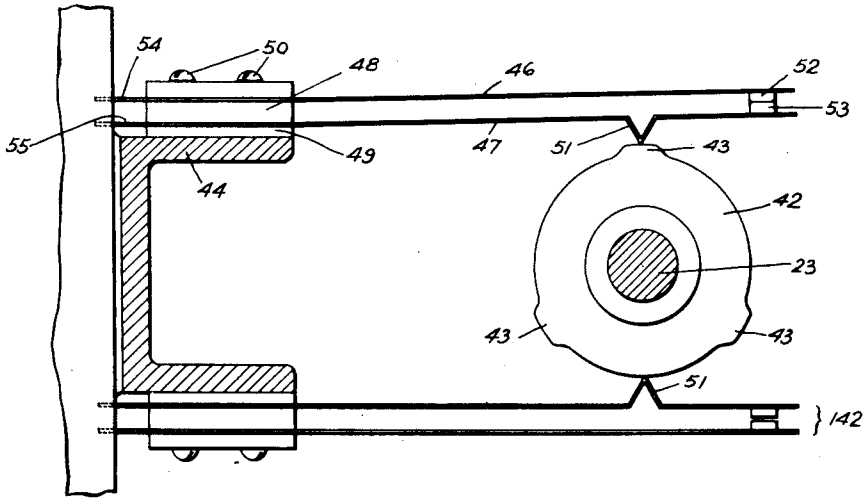

Fig. 6.

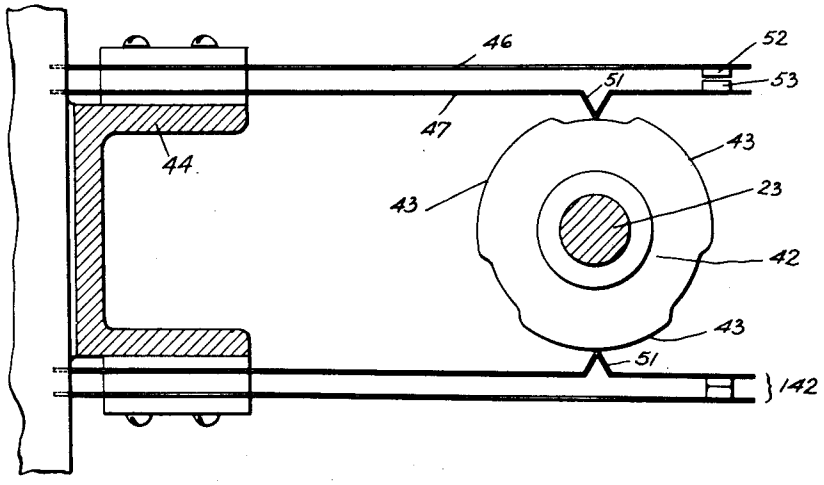

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Fig. 7.

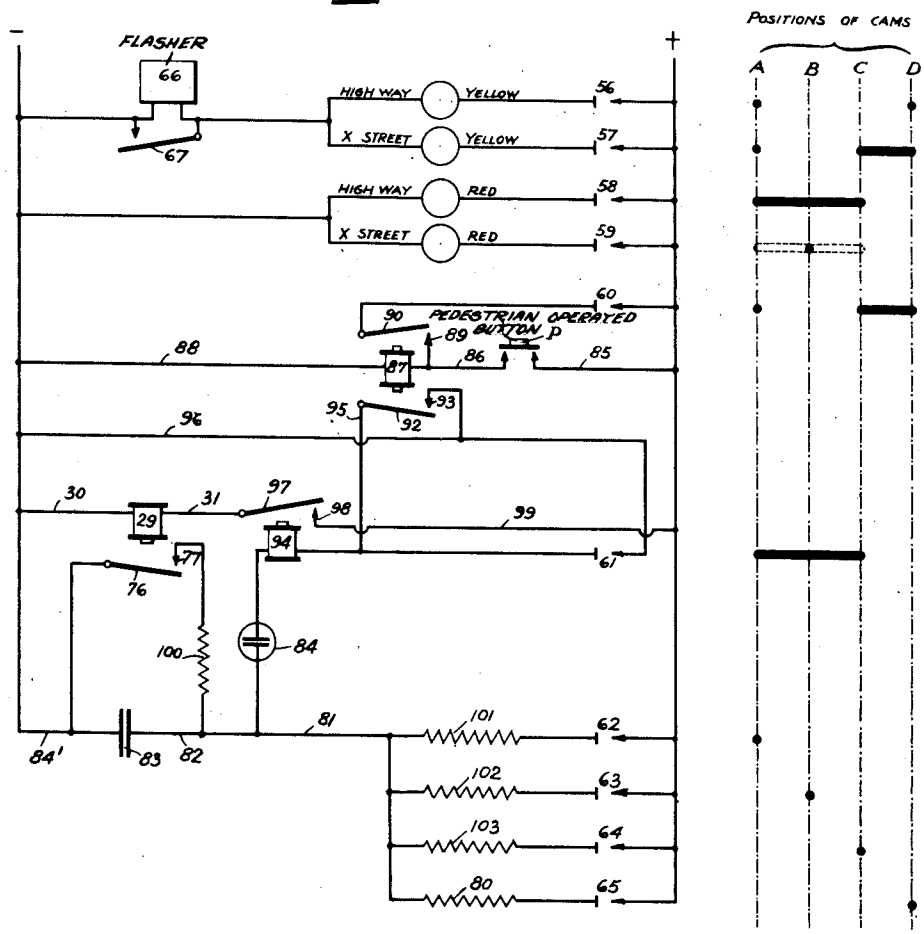
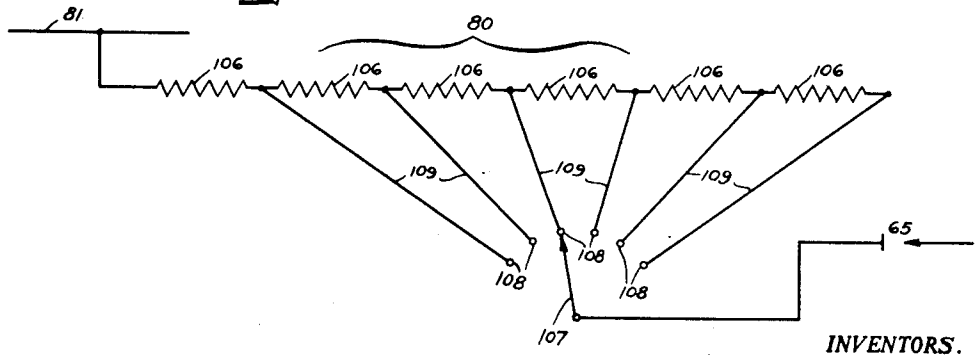


Fig. 8.



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Patented Apr. 17, 1934

1,954,992

UNITED STATES PATENT OFFICE

1,954,992

TRAFFIC CONTROL SYSTEM

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Application July 16, 1930, Serial No. 468,377

5 Claims. (Cl. 177—337)

This invention relates to a functionally and structurally improved traffic-control system, capable of use in numerous different associations, but primarily intended to be employed at points where pedestrians are to cross automobile highways.

It is an object of the invention to provide an apparatus of this character which may intelligently be employed by even an inexperienced person, and which, moreover, will embody relatively few parts, each individually simple and rugged in construction, these parts being capable of assemblage to furnish a unitary structure capable of being accommodated in a minimum amount of space and operating over long periods of time, with freedom from mechanical and electrical difficulties.

It is a further object of the invention to construct a traffic-control apparatus in which, when it is necessary to replace certain parts, this may be achieved readily by a person of ordinary skill with the expenditure of minimum effort and time.

A still further object resides in the construction of an apparatus providing a traffic-control system of primary utility in connection with pedestrian traffic and by means of which the flow of vehicular traffic will be interrupted to accord to pedestrian traffic right of way without danger of interrupting the movement of vehicular traffic too suddenly.

Another object is that of furnishing a traffic-control system of this nature in which the right of way accorded pedestrians will be—with ample margin of safety—adequate for the pedestrian to cross the vehicle lane.

Still another object resides in a system in which preferably automatically after the elapse of a period of time sufficient for the pedestrian to cross the highway, right of way will again and automatically be accorded to the vehicles traversing such lane.

An additional object is that of furnishing a traffic-control system in which pedestrians may not continuously interrupt right of way to the vehicles, but in which automatically and regardless of continuing pedestrians awaiting right of way the vehicles are permitted to move along the lane so that undue congestion will not result. However, by means of the present invention the presence of continuing pedestrians seeking to cross the vehicle lane will automatically be taken into account, and the system will become potentialized to accord right of way to the pedestrians after the expiration of a certain amount of time during which the vehicles have been given right of way over the lane.

With these and other objects in mind, reference is had to the attached sheets of drawings illustrating one practical embodiment of the invention and in which:

Fig. 1 illustrates diagrammatically a street intersection with an apparatus embodying the present system associated therewith,

Fig. 2 shows one unit of the timer apparatus,

Fig. 3 is a plan view of the timer or control apparatus,

Figs. 4, 5 and 6 are sectional views taken along the lines 4—4, 5—5 and 6—6 and in the direction of the arrows as represented in Fig. 3,

Fig. 7 is a somewhat diagrammatic view of the layout of apparatus and the wiring diagram therefor,

Fig. 8 is a similar view of one of the manual controls which make for a part of the timer.

Referring primarily to Fig. 1, streets have been indicated at A and B. As will hereinafter appear, the apparatus of the present invention need not necessarily be employed at the point of intersection of two steets, but may be advantageously used at a point simply where pedestrians ordinarily cross a highway. S represents the signal, hereinafter described in detail. C indicates the timer or control apparatus governing the operation of the signal and which is, in turn, controlled by the pedestrian actuated elements which have been indicated at P.

It will be understood that, in lieu of installing the apparatus of the present invention at the intersection of two or more vehicle lanes, it might simply be installed at a point along the highway where there is no intersection but where pedestrians normally seek to cross the same. Also, the signal as illustrated and as hereinafter described, simply involves embodying caution and stop signals as represented for example by amber and red, visual indications to the drivers of vehicles, and which indications are afforded by colored lamps, lenses, reflectors etc. Obviously, this signalling means is merely representative of any signalling means which might be employed. Additionally, while in the present embodiment the pedestrian actuated elements P are in the nature of push buttons or circuit closers of any design or conventional type, some especial form of circuit closers might be employed in lieu thereof.

With reference to the timer, it will be observed from the drawings that the same embodies several timing mechanisms. One embodiment of

such timing mechanism is shown schematically in Fig. 2. When a source of voltage supply is connected between wires 12 and 13, current flows through adjustable resistance 14 and condenser 15. Thus the voltage of the supply is applied to condenser 15 through resistance 14, and the voltage of the condenser begins to build up at a definite rate determined by the size of the condenser, the resistance 14 and the voltage of the supply. Shunting condenser 15 is a circuit including a glow tube 16 and a relay 18. The glow tube comprises a bulb containing a suitable gas into which electrodes 17 extend. This tube has such a characteristic that it is normally non-conducting, but when the voltage across its terminals reaches a certain critical or threshold value the gas ionizes and becomes a good electrical conductor and will not become non-conducting again until the voltage across its terminals has dropped considerably below the critical ionizing voltage. The voltage of the supply is greater than the critical voltage of tube 16. When the voltage across the condenser is built up to the critical voltage of the tube, the tube suddenly becomes conducting, causing current to flow momentarily from condenser 15 through tube 16 and relay 18, causing relay 18 to operate momentarily. This effects a momentary contact between armature 20 and contact 19 and thus momentarily closes circuit between wires 21 and 22.

The interval elapsing between the application of the supply voltage to wires 12 and 13, and the operating of relay 18, is the period timed by the mechanism. By suitable adjustment of resistance 14, any desired interval may be obtained. The above description shows only the fundamental of the timing mechanism and the details may be varied considerably as will be explained later. In addition, while relay 18 has been shown as closing one circuit, it may obviously close several circuits, or open circuits.

Before describing the details of the time control mechanism, one portion of it, as shown in Figs. 3, 4 and 5, will be reviewed. Referring to Fig. 3, there is shown a shaft 23 rotatively mounted in bearings 24. Keyed to shaft 23 is the toothed wheel 25. Referring to Fig. 4, there is shown the toothed wheel mounted on the shaft 23. Also mounted on the shaft 23, and freely movable with respect thereto, are members 26, one on each side of wheel 25. The ends of the two members 26 are connected together as at 27 and 28. Magnet 29, the terminals of its winding being indicated by wires 30 and 31, attracts core 32 when energized. By means of link 33, core 32 is connected to members 26. It will thus be appreciated that, whenever magnet 29 is energized, the two members 26 are rotated in a counter-clockwise direction. Spring 34 is attached to rivet 27, and consequently, whenever magnet 29 is de-energized, the two members 26 are rotated in a clockwise direction. The connecting pin 28 also carries live pawl 35, which is forced against toothed wheel 25 by springs 36. Dead pawl 37, mounted on the frame 38 at 39, also is forced against the toothed wheel 25 by a spring 40. The pawl 37 prevents any counter-clockwise motion of toothed wheel 25, and therefore, whenever magnet 29 is energized, the rotation of members 26 causes live pawl 35 to slip past wheel 25. Motion of members 26 would be adjusted so that pawl 35 moves past and engages with the next tooth of wheel 25. When magnet 29 becomes de-energized, spring 34 rotates members 26 in a clockwise direction, and pawl 35, being in engagement with wheel 25, rotates wheel 25 in a clockwise direction. An adjustable set screw 41 limits the clockwise motion of members 26 as to the amount of one tooth of wheel 25. As wheel 25 moves in a clockwise direction, pawl 37 slips past the next tooth of wheel 25 and at the end of the motion engages this next tooth. The mechanism is returned to the position shown in Fig. 4, except that wheel 25 has been rotated through the angle subtended by one tooth. It will thus be appreciated that the successive energizing and de-energizing of magnet 29 causes a notching motion of wheel 25. Since shaft 23 is keyed to wheel 25, shaft 23 rotates in synchronism with wheel 25. In this particular embodiment there is shown a wheel 25 having 12 teeth.

Mounted upon shaft 23 are a series of spaced cams 42 keyed to shaft 23. Fig. 5 shows in detail a side elevation through one of the cams. It will be noticed that the cam is circular in shape, and carries three equally spaced projections 43. Mounted upon frame 38 is a member 44 carrying circuit makers 45. The details of these circuit makers are shown in Fig. 5. It will be noticed that this circuit maker may consist of two flat strips 46 and 47. The two strips are separated by an insulator 48, and they are separated from member 44 by an insulator 49. They are supported on member 44 by means of a screw 50. Member 47 has a V shaped projection 51, and each member 46 and 47 carries contact 52 and 53. Both member 46 and member 47 are preferably of springy material, and member 47 is tensed so that the edge of the V shaped projection 51 always rests against cam 42. When resting against the circular part of cam 42, member 47 is in a down position causing contacts 52 and 53 to separate. But when, during the cycle of revolution of cam 42, projection 43 moves under the projection 51, member 47 is raised bringing contacts 52 and 53 into contact. In this manner circuit between wires 54 and 55 is made during the time projection 51 rests upon projection 43. It will furthermore be noticed that circuit between wires 54 and 55 is made three times per revolution of cam 42. As described above, motion of cam 42 is not continuous but proceeds in a series of steps, twelve per revolution. The projection 43 can be so constructed that during one position of cam 42 contact between 52 and 53 is made, and during the next succeeding three positions contact between 52 and 53 is broken. Similarly, by making cam 43 subtend twice the portion of the surface of cam 42, as shown in Fig. 6, contact between 52 and 53 may be made during two positions and broken during the next succeeding two positions. Obviously, a similar change in construction would allow contact between 52 and 53 to be made in any desired positions.

At this time it is to be noted that, as shown in Fig. 7, a development of merely one-third of the cam surfaces of the timer has been illustrated. Actually, according to the present invention, it is found convenient to have the cams divided into three areas, each of which is a duplicate of the other. Accordingly, the ratchet 25 embodies twelve teeth, and after the shaft 23 rotates the cams through dispositions A—D, as diagrammatically indicated in Fig. 7, it will upon continuing rotation cause the cams to present an immediately succeeding similar series, at the end of which the first series will again be in operative position.

Now, again referring to Figs. 3 and 4, it will be noted that the pin 27 is extended in the form of a projection 73. Springs 74 and 75 are mounted so that just prior to the member 26 reaching its fully shifted position the projection engages the end of the spring 74 causing contacts 76 and 77 to engage, thus closing the circuit between wires 78 and 79. Of course, as the member 26 moves towards retracted or de-energized position, this circuit is interrupted.

The illustrated embodiment of the invention is visualized at the point of intersection of two streets, at which intersection merely a caution signal is displayed. As afore brought out, the embodiment of the present intersection is not restricted to the point of intersection of two streets, and additionally it will be obvious that if it is installed at such point of intersection the warning signal might be eliminated, or there might be substituted therefor a traffic-control or any other desired form of signal, by means of which right-of-way is transferred from one street to the other.

With the foregoing in mind, and referring to the illustrated embodiment of this invention, the normal condition of the signal may be a flashing amber light visible from highway and the cross street. As such, the signal not alone serves as a warning, but also permits traffic on both streets to move cautiously. Again referring to Fig. 7, the reference characters A—D present respectively the four positions of the cams and shaft, and through which the latter in one complete revolution passes three times. Position D is the normal position of the apparatus. And in this position switch 56 is closed, thereby energizing the amber or yellow highway signal. Current for both this signal as well as the corresponding cross street signal flows through the unit 66, which may be of any desired construction to provide a "flasher". However, this unit may be shunted by switch 67 if a steady amber light is desired. In position D switch 65 is also closed allowing the current to flow from the light and supply lead through this switch, thence through resistance 80, wires 81 and 82 and condenser 83 in the manner described in connection with the showing in Fig. 2. The discharge circuit or condenser 83 is open in this condition of the parts for the reason that switch 61 is open. Therefore, even though condenser 83 may be charged to critical voltage for tube 84, discharge cannot take place.

The several pedestrian controls indicated at P are all preferably arranged in parallel, and for the sake of avoiding undue illustration only one of them has been illustrated in Fig. 7. Thus, if a pedestrian wishes to cross the street he simply operates the push button allowing the current to flow from the right hand power lead from wire 85 to conductor 86, thence through relay 87 and lead 88. This operates the relay 87 which, by virtue of the contact 89, locks in through armature 90, lead 91 and switch 60. Relay 87 also operates armature 92 causing it to engage the contact 93, which completes the discharge circuit for condenser 83 through tube 84, relay 94, lead 95, armature 92, and thence through lead 96. The energy stored in the condenser discharges through the tube 84, thus operating relay 94. The operation of the latter causes armature 97 to engage contact 98, thus closing the circuit through magnet 29 by virtue of leads 31 and 30. The energization of magnet 29 causes the cam shaft 23 to be notched forward in the manner aforedescribed, and the cams now assume position A. In this position, both the switches 56 and 57 continue to be closed, thus causing a continuing display of the caution signals. However, additionally, by virtue of the fact that switch 58 will now be closed, the highway red or "Stop" signal is illuminated indicating to the highway traffic that it is about to lose right-of-way.

During the notching forward or shifting of the cam shaft 23, the member 26 again causes contacts 76 and 77 to touch. This shunts a small resistance 100 across the terminals of condenser 83, completely discharging the latter. In position A switch 65 is open; but switch 62 is closed, allowing a charge to build up on condenser through resistance 101. The latter may be so adjusted that the time necessary for the condenser to reach the critical voltage for tube 84 may be, for example, five seconds. At the end of this time the tube flashes and the notching operation repeats itself, shifting the cam shaft to position. Before considering the latter, it will of course be understood that the actuating portions of the cam for switch 59 might be extended to position A, and also, as will hereafter appear, to position C. This would be the case particularly if two streets of equal traffic density will be involved. If this actuating portion extended to position A, it would be appreciated that, in addition to warning being given on the first street the same warning would be given on the second street incident to the illumination or display of the red signal along the latter.

In position B switches 56 and 57 are open. Accordingly, the amber or yellow lights are extinguished; but due to the fact that switches 58 and 59 are closed, red or "Stop" signals will be displayed in both streets and the pedestrian may now seek to cross the intersection. At the same time switch 63 is closed, so that condenser 83 receives a charge through resistance 102, which may be adjusted to require the continuation of discharging for ten seconds before the condenser reaches the critical voltage. This time might of course be varied, but usually such a period is adequate for the pedestrian to negotiate the intersection. With the tube again operated, the notching function or partial rotation of the cam shaft is repeated and the cams shift to position C. In such position the highway "Stop" signal continues to be energized, but the amber or yellow cross street signal reappears, since in this embodiment the highway traffic would normally be dominated, and accordingly it is preferable that the pedestrians have an additional time interval in which safely to cross the highway. Of course, by eliminating the cam portion extending into position C and which actuates the switch 57, this condition could be changed, and by extending the cam portion actuating the switch 59— as afore brought out—continuation of the "Stop" signal in the second street would be obtained. It is deemed unnecessary to further exemplify the manner in which the cam portions might be modified to change the cycle according to the conditions encountered in the installation.

However, as shown in position C, the charging of condenser 83 proceeds through switch 64 and the resistance 103 may be set for a period of five seconds. At the end of this time the notching operation again occurs and the cam shaft is shifted to position D to establish the originally existing condition of the parts.

Resistance 80 may be set to, for example, such a position that thirty seconds are required for

the condenser to reach the critical voltage. Accordingly, if during this period a pedestrian actuates one of the switches P, all signals remain in the condition outlined for position D. However, the operation of the member P results in the relay 87 locking in. At the end of the thirty second period provided by the resistance 80, the discharge circuit for the condenser being completed with armature 92 and contact 93, the cycle of operation afore described repeats itself. Of course, if the pedestrian control is not operated until after the elapse of thirty seconds, a transfer of right-of-way from the vehicle lanes in favor of the pedestrian will occur in the manner afore outlined. In this connection, it will be borne in mind that the locking circuit for relay 87 was interrupted in position B, and accordingly the relay became de-energized, thus interrupting the discharge circuit of condenser for the reason that armature 92 separated from contact 93. However, the discharge circuit was completed through the switch 61 and accordingly the further shifting of the cam shaft was visible until position D was reached, when incident to the opening of switch 61 further discharging was prevented.

Finally, referring to Fig. 8, where the resistance 80 has been schematically shown, it will be observed that this resistance, as well as the other elements of this nature included in the apparatus, may comprise, for example, a series of resistances arranged and coupled one with the other and from each of which a lead 109 extends terminating in contacts 108, with which a contact arm 107 cooperates. By simply swinging the arm, the value of the resistance may readily and accurately be varied as desired.

From the foregoing it will be appreciated that the present invention provides a traffic-control system which, as illustrated, may permit traffic from all approaches to proceed cautiously. If pedestrians desiring to cross the intersection operate one of the several conveniently located actuating elements, then after an ample warning period vehicular traffic will be stopped and the pedestrian will be given an adequate period of time to cross the street. Also, warning will be given both to the pedestrian and the operators of the vehicles that right-of-way is about to be transferred to the latter, and after such right-of-way has been given it cannot again be interrupted for a period of time such that there will be no danger of traffic becoming congested.

Thus, among others, the several objects of the invention as specifically enumerated are achieved. It will be appreciated that numerous changes of construction and rearrangement of the parts with regard to the mode of installation, construction of the timer and point of installation etc., might be resorted to without departing from the spirit of the invention as defined by the claims.

Having described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A traffic control system to be installed at the intersection of a pedestrian lane and a plurality of vehicular lanes of travel including a signalling means normally indicating no interruption of right of way to the vehicular lanes, a pedestrian operated controlier, a timer connected to said signalling means and pedestrian operated controller for causing said signalling means to indicate "Stop" to vehicular traffic in all lanes in response to operations of said controller, said timer including means for automatically restoring the normal vehicular signal indications.

2. A traffic control system to be installed at the intersection of vehicular traffic lanes and a pedestrian lane, said system including signalling means, means forming a part of said signalling means whereby a cautionary indication may be displayed to the intersecting lanes, further means also forming a part of said signalling means whereby there may be displayed an indication interrupting right of way of vehicular traffic in all lanes, a timer connected to said signalling means to cause the same to normally display such cautionary indication, said timer being adapted to operate through a cycle, means forming a part of said timer and connected to said signalling means whereby said timer in operating will cause the right of way interrupting means of said signalling means to function, and a pedestrian actuated controller connected to said timer whereby, in response to a functioning of said controller, said timer will operate through one cycle.

3. A traffic control system to be installed at the intersection of vehicular traffic lanes and a pedestrian lane, said system including signalling means, means forming a part of said signalling means whereby a cautionary indication may be displayed to the intersecting lanes, further means also forming a part of said signalling means whereby there may be displayed an indication interrupting right of way of vehicular traffic in all lanes, a timer connected to said signalling means to cause the same to normally display such cautionary indication, said timer being adapted to operate through a cycle, means forming a part of said timer and connected to said signalling means whereby said timer in operating will cause the right of way interrupting means of said signalling means to function, a pedestrian actuated controller connected to said timer whereby, in response to a functioning of said controller, said timer will operate through one cycle, and means forming a part of said system for preventing said timer from operating through a further cycle and in response to controller actuation until the normal cautionary indication has been displayed for a certain interval of time.

4. A traffic control system to be installed at the intersection of vehicular traffic lanes and a pedestrian lane, said system including signalling means, means forming a part of said signalling means whereby a cautionary indication may be displayed to the intersecting lanes, further means also forming a part of said signalling means whereby there may be displayed an indication interrupting right of way of vehicular traffic in all lanes, a timer connected to said signalling means to cause the same to normally display such cautionary indication, said timer being adapted to operate through a cycle, means forming a part of said timer and connected to said signalling means whereby said timer in operating will cause the right of way interrupting means of said signalling means to function, a pedestrian actuated controller connected to said timer whereby, in response to a functioning of said controller, said timer will operate through one cycle, means forming a part of said system for preventing said timer from operating through a further cycle and in response to controller actuation until the normal cautionary indication has been displayed for a certain interval of time, and means whereby operation of said timer will be initiated upon the elapse of such interval of time and in response to a controller actuation received during such interval.

5. A traffic control system to be installed at the intersection of vehicular traffic lanes and a pedestrian lane, said system including signalling means, means forming a part of said signalling means whereby a cautionary indication may be displayed to the intersecting lanes, further means also forming a part of said signalling means whereby there may be displayed an indication interrupting right of way of vehicular traffic in all lanes, a timer connected to said signalling means to cause the same to normally display such cautionary indication, said timer being adapted to operate through a cycle, means forming a part of said timer and connected to said signalling means whereby said timer in operating will cause the right of way interrupting means of said signalling means to function, and a pedestrian actuated controller connected to said timer whereby, in response to a functioning of said controller, said timer will operate through one cycle to cause said signalling means to simultaneously display cautionary indications and interruptions to right of way in all lanes, said timer thereupon operating said signalling means to indicate solely interruption to right of way to all lanes and said timer terminating said cycle by finally causing said signalling means to continuously display the normal cautionary indication.

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