

June 30, 1953

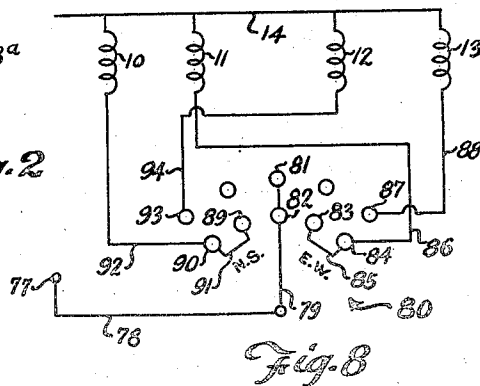
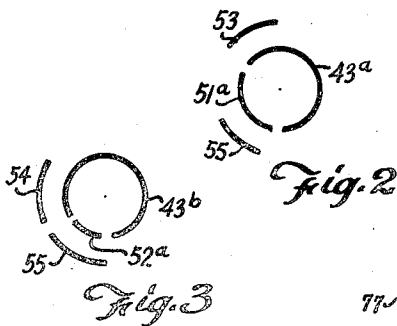
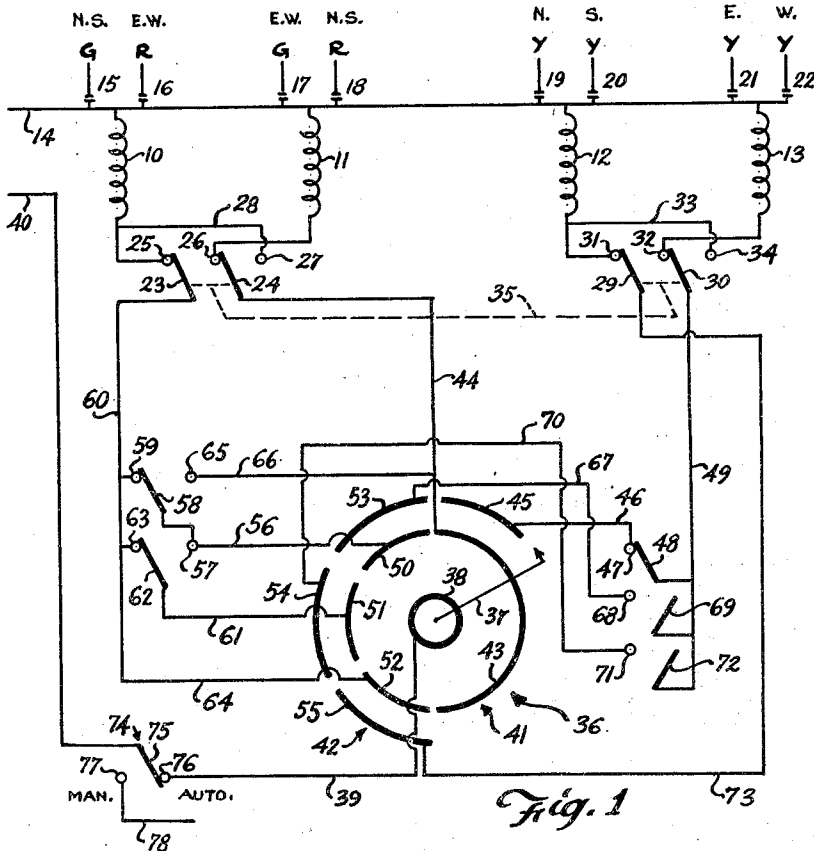
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2,644,147

ELECTRIC SIGNAL SYSTEM FOR TRAFFIC LIGHTS

Filed March 4, 1949

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

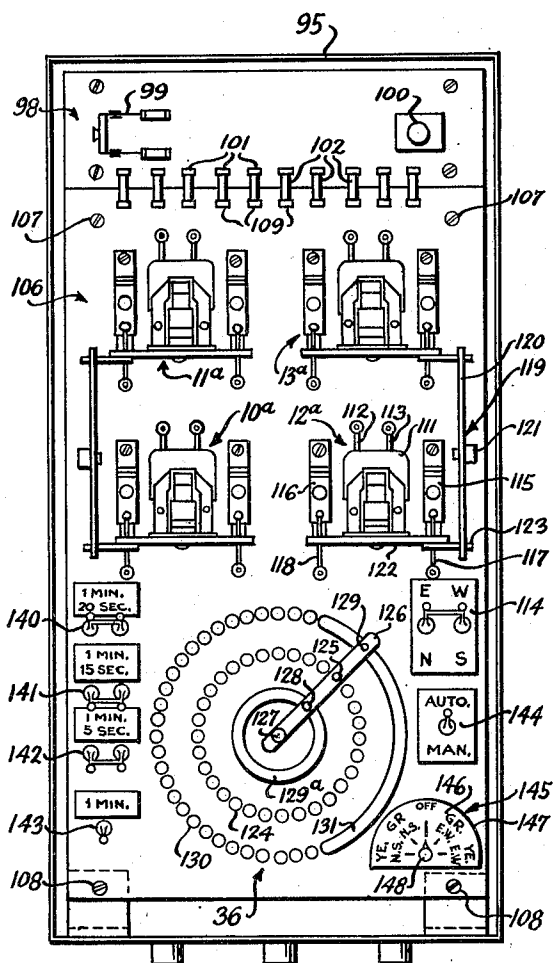


Fig. 4

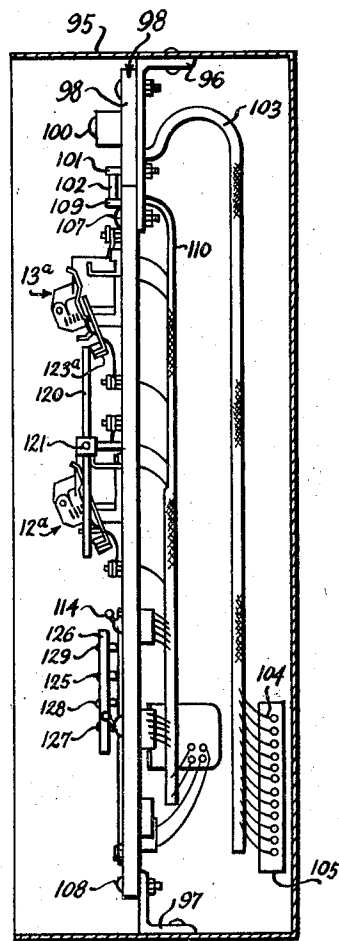


Fig. 5

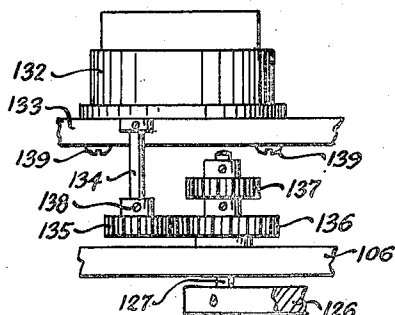


Fig. 6

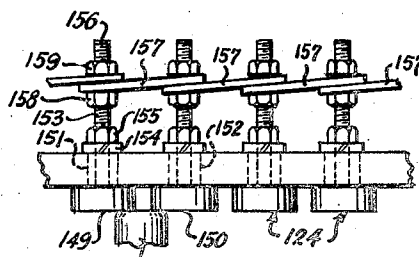


Fig. 7

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UNITED STATES PATENT OFFICE

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Rostoker, Toronto, Ontario, CanadaApplication March 4, 1949, Serial No. 79,582
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4 Claims. (Cl. 340—41)

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This invention relates to an electrical circuit arrangement for traffic signal lights and a control box therefor.

An object of the invention is to provide an electrical circuit arrangement for traffic signal systems which includes a low current control device whereby long life of the mechanism comprising certain of the component parts is insured.

Another object of the invention is to provide in an electrical circuit arrangement for traffic signal systems a rotary contact device, hereinafter referred to as armature means, serving as a switching means for electrical relay mechanisms governing the actuation of the traffic lights at a plurality of street intersections.

A further object of the invention is to provide armature means as before designed to actuate said relays to provide a cycle of operation in the lighting system in an installation at an intersection wherein the armature is divided into switching segments whereby the lights are caused to be actuated in one color arrangement for part of said cycle and in another color arrangement for the remainder of said cycle.

A still further object of the invention is to provide armature means as before wherein the rate of rotation of said armature, that is to say the cyclic period thereof, is adjustable by adjusting the gear device ratio for the same and the time period represented by the switching segments thereof is selectable by the operator whereby various proportions of the complete cyclic time may be chosen to decrease or increase the time period for one color of light for a particular street of a traffic intersection.

A still further object of the invention is to provide switch means in said electrical circuit arrangement whereby the light colors may instantaneously be reversed as between corners and intersections.

A still further object of the invention is to provide a switch control box for traffic signal systems which is controllable by simple positive switch means rather than complicated dial systems and wherein a wiring service by a technician at the installation is eliminated by virtue of a simple contact bar means reversibly connecting the mounting panel for the components comprising the circuit arrangement of the present invention in the control box.

A still further object is to provide a control box as before which may be serviced by removing the control unit embodying the circuit arrangement of the invention and replacing the

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same within a few minutes without disturbing the control unit wiring to the lights at the intersection.

A still further object of the invention is to provide in an electrical circuit arrangement for traffic signal systems relays governed in operation by rotary armature switching means as before wherein the switching segments of the latter constitute low current time contacts only which are separate from the main current supply system feeding the traffic light, but only govern the actuation of relay switches for actuating these lights and wherein the said relays are mechanically interlocked so that actuation of the same is impossible under electrical current failure.

With these and other objects in view, the invention concerns the provision of low current armature switching means as described governing actuation of relay mechanisms which in turn govern actuation of traffic signal lights at a traffic intersection. The armature switching means is in the form of a radially sweeping switching bar which rotates 360 degrees within a period of time determined by the drive ratio of the particular driving mechanism. Switching segments are concentrically arranged relatively to the mounting of the switch bar, the inner ring of segments being electrically connected to control the actuation of relays governing green and red lights at an intersection. Switch means are provided whereby the first interval or portion of the complete cyclic period can be chosen for a selectable period of time whereby the lights remain at a fixed switching during this period or interval. The remainder of the cyclic period is devoted to an opposite lighting arrangement, that is to say green instead of red on opposite corners north and south by virtue of the electrical connection of the remaining segments to a relaying controlling this opposite operation.

The invention also concerns the provision of a reversing switch mechanism interposed between the relays and the armature means whereby the switching control affected by the armature means is switched over on to opposite relays to cause a direct reversal or change to opposite lighting. Manual switch means are also provided whereby the operator upon electrical failure of the armature means may cause actuation of the lights until a replacement can be made.

Other objects of the invention will be appreciated by a study of the following specification taken in conjunction with the accompanying drawings.

Figure 1 is an illustrative schematic of the

electrical circuit arrangement according to the invention carrying out the objects thereof.

Figure 2 is a diagrammatic illustration of the switching segments of Figure 1 employed by virtue of actuating the switches in that figure for a period of time longer than one-half cycle, say for instance a thirty unit one-half cycle plus ten units.

Figure 3 is similar to Figure 2 but represents the electrical circuit arrangement by virtue of switching actuation of Figure 1 for an initial period of thirty units one-half cycle plus twenty units.

Figure 4 is a front elevation of a complete control unit for a traffic signal system at an intersection illustrating the novel assembly of the components.

Figure 5 is a side elevation of the unit of Figure 4 with the side casing removed.

Figure 6 is a partial view showing the drive motor for the armature of Figure 4 and the gear mechanism therefor.

Figure 7 is a partial view of the components provided for building up any switching segments by interconnecting the contact buttons shown in the preferred form of the armature switching means in Figure 4.

Figure 8 is a schematic view of a manual switching arrangement by which the operator may cause manual actuation of the traffic signal lights in the event of failure of the automatic system embodying the armature switching means of the invention.

Referring to the drawings, and particularly to Figure 1, the relay coils 10, 11, 12 and 13 are connected at one end thereof to the line 14 of a conventional electrical current supply. The relay coil 10 governs actuation of the contacts 15 and 16. The contacts 15 governing actuation by conventional electrical circuit arrangement of the green lights at say north and south of an intersection. The contacts 16 govern actuation of the red lights as the east and west light installation when the coil 10 is energized. Coil 11 actuates contacts 17 and 18, the contact 17 providing actuation of the green lights at the east and west, the contact 18 actuating the red lights at north and south.

The yellow or orange lights are actuated by the coils 12 and 13 governing the contacts 19, 20, 21 and 22 corresponding respectively to north, south, east and west lights.

In the description which follows, for simplification the actuation of contacts 15 and 17 for effecting operation of the green lights will only be discussed since it will be obvious that if the contact 15 is closed actuating the green lights at north and south then the red lights at east and west will be actuated by virtue of closure of contact 16.

Instantaneous reversal switching means are included which comprise, in the simple illustration shown, the switch arms 23 and 24 engaging the switch contacts 25 and 26. The coil 10 is connected to contact 25 and the coil 11 to contact 26. The coil 10 also being connected to contact 27 by line 28 so that the switch arms 23 and 24 may engage contacts 26 and 27 in the alternate position. Obviously, therefore, if the green lights were east and west as governed by coil 11 in the disposition of the switch arms 23 and 24 as shown and assuming that current was being supplied only through the switch arms 24 to energize the coil 11 but not through the switch arm 23 so that the coil 10 will not be energized, then if the switch

arms are moved to position engaging contacts 26 and 27 respectively the green light will be switched to north and south instantaneously.

Instantaneously reversing switching means are also provided governing the yellow or orange lights, that is to say, the coil 12 and 13, thus the switch arms 29 and 30 are shown engaging the contacts 31 and 32 connected to the coils 12 and 13 respectively. The coil 12, however, also connects by the line 33 to the contact 34 so that in a reversing switching position the switch arms 29 and 30 may engage the contacts 32 and 34 respectively. In the arrangement shown, if it is assumed that only the switch arm 30 is carrying electrical current but that the switch arm 29 is not, then the east and west yellow lights may be actuated at the appropriate time after the green lights at east and west have been showing for a predetermined period. Obviously in such instance, therefore, if the switch arms 29 and 30 reversed to engage the contacts 32 and 34 the yellow lights will show at north and south. In order to provide a common function the switch arms 23, 24, 29 and 30 are operatively ganged together as indicated by the chain lines and numeral 35. Therefore, the operator may instantaneously cause a change in the lighting by merely actuating a gang switching mechanism. For the switching mechanism in practical form, I prefer to use double pole double throw toggle switches, but obviously any other suitable switching arrangement which will carry out the necessary functions above outlined will serve.

According to the invention, rotary armature switching mechanism 36 is provided which is illustrated in diagrammatic form only in Figure 1 in the form shown. The contact bar 37 extends from electrical connection to the ring 38 which is in turn connected by the line 39 to the other line 40 of the current supply source, to contact the concentric switching rings 41 and 42 which are in the form of a plurality of segments. The contact bar 37 is caused to rotate in this illustration in a counter-clockwise manner at a predetermined cyclic rate, hereinafter referred to as a cyclic period. According to the invention a portion of this cyclic period is used to actuate say the coil 11, causing the east and west green lights to be actuated. The remainder of the cyclic period is apportioned to the relay coil 10 so that the north and south green lights will be actuated for the remainder of the period.

The above function is accomplished by providing switching segments in the inner and outer rings 41 and 42. The inner ring 41 is designed to govern the actuation of green and red lights only, whereas the outer ring is designed to govern actuation of the yellow or orange light only, that is to say the caution light.

As shown, the arrangement in Figure 1 illustrates the actuation of the green light by the coil 11 at east and west for one-half the cyclic period of the contact bar 37. Thus the switching segment 43 extends about 180 degrees in an arcuate manner as illustrated and is connected at some point to the line 44 which extends for connection to the switch bar or arm 24 as illustrated. Thus, when the contact bar 37 is passing around this portion of its cyclic period the coil 11 will be energized causing the green light to show at east and west and the red lights to show at north and south. After a certain period of time the yellow or caution light must be actuated at east and west for the remainder of the green light period at these stations. There-

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fore, the switching segment 45 is positioned at the end of the electrical connecting period of the segment 43 and connects by line 46 through contact 47 switch arm 48 and common line 49 to the switch arm 30 for energization of the coil 13 and actuation of the caution lights at east and west.

After the contact bar 37 passes the ends of the switching segments 43 and 45 it will engage the inner ring switching segments 50, 51 and 52 in turn feeding current to the same. It will also engage the outer ring switching segments 53, 54 and 55 in turn. The segment 50 is connected by line 56 through contact 57 and switch arm 58 (as shown) to contact 59 and the line 60 connects to the arm 23. The segment 51 is connected by the line 61 to the switch arm 62 and through contact 63 (as shown) to the line 60. The last switching segment 52 is connected by the line 64 to the line 60 as illustrated.

It will be apparent, therefore, that as the contact bar passes the end of the inner ring switching segment 43 it will feed current by way of segments 50, 51 and 52 through lines 56, 61 and 64 consecutively to the line 60 and switch arm 23 to energize the coil 10 and cause the lights to show green at north and south during this second half cyclic period.

If, however, it is desired that the period of the switching segment 43 be prolonged, then the switch arm 58 may be caused to move to a position engaging the contact 65 which in connection by line 66 to line 44 and switch arm 24. Obviously, therefore, in such instance the green light would be continued in its actuation by the coil 11 until the contact bar 37 has passed the end of the segment 50 and then the remainder of the cycle would be apportioned to contacting the segments 51 and 52 actuating the green light at the north and south.

Further, the switch arm 62 may be moved to engage the contact 57 as well as arm 58 engaging the contact 65 in which case the period of actuation of the coil 10 would correspond only to the arcuate length of the switching segment 52 and the time period of the actuation of green lights at east and west would be a further segment unit longer.

The arrangement of the concentric switching rings for the operation discussed with regard to switch arm 58 engaging contact 65 is illustrated in Figure 2 wherein a continuous segment 43a is illustrated corresponding to the segment 50 added to the segment 43. The segment 51a illustrates the tying together of the segments 51 and 52 illustrating the apportionment of the time periods within a cyclic period to actuation of the green lights at east and west and at north and south respectively.

Figure 3 illustrates the switching segments 43b of extended length corresponding to engagement of the arm 58 with contact 65 and the arm 62 with contact 57. Segment 52a is illustrative of the remaining period provided for the green lights at north and south.

The outer switching ring 42 is provided for actuating the caution lights and is divided into similar segments to correspond with the time period functions in the inner ring. Thus the segment 53 is connected by the line 67 to contact 68 which is designed to be engaged by the switch arm 69 connected to line 49. The segment 54 is connected by line 70 to contact 71 designed to be engaged by switch arm 72 connected to the line 49 as shown. Thus for the

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operation illustrated in Figure 2 and previously described with regard to the green lights only, it is desired that the segment 53 be utilized only for the caution light for the period corresponding to the continuous segment 43a. In this connection, therefore, the switch arm 48 must be moved out of engagement with contact 47 to provide an open circuit therefor. Thus the contact bar will not cause actuation of the yellow light at east and west when passing over the segment 45 but will only do so when it engages the segment 53 which must in this instance have its contact 68 engaged by switch arm 69. After the contact bar passes the segments 53 and 50 the green light will be actuated at north and south and at the end of the cyclic period the segment 55 will be engaged, the latter being directly connected by the line 73 to the switch arm 29 as illustrated. Thus, at this point the coil 12 will be energized causing the caution light to show at north and south.

Referring to Figure 3 the operation is substantially similar to that previously discussed except that the initial period for the coil 11 is longer, as illustrated by the segment 43b. In this case, therefore, both the switch arms 48 and the switch arms 69 must be away from and in open circuit relation to the contacts 47 and 68, but the switch arm 72 is in engagement with the contact 71, thus the caution light will show toward the end of the period of the segment 43 at east and west and will show apparently for the full period of the segment 52a to give a caution light at north and south. This last illustration is not really practical but, nevertheless, illustrates the limits of the principle involved.

In conventional traffic signal systems if a breakdown in a part of the mechanism occurs it is necessary for a traffic director to enter into the intersection and direct the traffic by hand signal. At a congested intersection this is dangerous to the traffic director as well as involving all the other disadvantages of handling traffic in this manner as compared with an automatic system, thus according to the invention manual actuating means are provided whereby upon failure of the armature means described, should this unlikely event occur, the traffic director need merely actuate simple manual switching means while adjacent to the control box. In this connection the traffic director or operator may allow any period of time he desires for a particular signal on one street. Thus it may be desirable at times for the operator in any case to switch to manual operation to take care of particular conditions arising in the congestion of traffic at an intersection.

The manual switching means which are provided are illustrated in Figure 8 in diagrammatic form. Reference is also made to Figure 1 wherein a control switch means 74 are comprised of the switch arm 75 connecting to the line 40 and normally engaging the contact 76 of the line 39 for automatic operation with the armature mechanism previously described. In the manual position the arm 75 engages the contact 77 which connects by the line 78 to the rotary switch arm 79 of the rotary manual switch means 80.

The switch arm 79 is shown in the normal off position or intermediate position and engaging the contacts 81 and 82 which are not connected to any certain components. The contacts 83 and 84 are tied together as indicated by the line 85 and are connected by line 86 to the coil 11 as indicated thereby governing the green lights at

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east and west. The position of the switch arm 79 at the contact 83 corresponds to the green lights alone at east and west, whereas the position of this arm engaging contacts 84 and 87 corresponds to the green light together with the caution light at east and west since it will be noted that the contact 87 connects to the line 88 to the relay coil 13.

A similar arrangement is provided in the opposed portion of the switch wherein the contacts 89 and 90 are interconnected by the line 91. The contact 90 connects by the line 92 to the coil 10. The contact 93 governing the caution light connects by the line 94 to the coil 12. It will be apparent therefore that the operator after insuring that the manual switch means are closed need merely rotate the rotary switch manually to the four positions illustrated to cause the desired operations in the control of traffic. The switch arm 79 may be moved first to the right to cause the green light to show at east and west and then after a suitable length of time switch to engage the contacts 84 and 87 to give a caution signal at the east and west lighting groups. After sufficient caution signal has been given the operator moves the switch arm in the counter-clockwise direction until it engages the contact 89 causing the green light to show at north and south and after a sufficient period of time moves the arm 79 further to engage the contacts 90 and 93 to give a caution signal. Operation continues thereafter in the same manner until manual operation is no longer desired at which time the operator may switch the arm 79 to the mutual off position illustrated. Certain features attend the mounting of the component parts found in the circuit arrangement above described. All of the components are of conventional and well known construction but the novel arrangement which I have devised leads to many advantages in maintenance of a traffic signal control box unit.

Thus, in Figures 4 to 7 the housing 95 has the bracket means 96 and 97 extending inwardly thereof. The upper brackets 96 mount the connecting panel 98 which carries the main control knife switch means 99 governing the operation of the complete unit. A pilot light 100 is preferably included to indicate when the unit is switched on. The connecting panel 98 carries a plurality of bracket means 101 similar to conventional fuse clips and near to the edge thereof in spaced apart relation to receive the contact bar means or lugs 102 which if desired may be fuses. The bracket means 101 are connected to wires which are bound within the cable 103 as illustrated in Figure 5 which extends down to present all of the leads to separate contacts 104 on the terminal mounting block 105 from which connection is made to the traffic lights at an intersection. The portion of the unit so far described is designed to be permanently installed.

A removable panel 106 is provided which is fastened to the brackets 96 and 97 by suitable screws or other fastening means 107 and 108. The plurality of contact bar sockets 109 are arranged along the upper edge of the panel 106 to receive the other ends of the contact bars 102 which are easily removable therefrom, the brackets 109 of the electric leads extending therefrom which are bound into the cable 110 and where these leads are required for the components of the electrical circuit arrangement they are led out as indicated in Figure 5 for connection at the back of the panel 106. Electrical relays 10a, 11a, 12a and 13a are mounted on the front face of

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the panel as shown. These relays may be of any suitable form but according to the invention should call for very low current drain, but the contacts thereof should be of sturdy construction. The form shown is a commercial form in which the coil 111 is connected by leads 112 and 113 to one side of the main current supply line and to the reversing switch means 114 according to the circuit arrangement shown in Figure 1. The contact arms 115 and 116 are connected by leads 117 and 118 to the caution lights at south and north respectively as illustrated with continuity with regard to the arrangement of Figure 1. It will be noted that the contact arms are of the pivotally mounted type pivoted substantially intermediate of the ends. I provide interlocking means 119 to ensure positive operation and security against faulty operation of relays so that for instance a red signal will not show simultaneously at both east and west and north and south. The interlocking means comprising the rocker arm 120 pivotally mounted on the bracket 121 the ends of which are extended to be engaged by the contact arms of the relays 12a and 13a and a similar arrangement is provided for the relays 10a and 11a. The contact arms 115 and 116 are rigidly connected at one end by the common bar 122 extending there between and a similar structure is in evidence in the other relays. The rocker arm is so positioned relative to the contact bars 123 that only one relay of each interlocked pair can be actuated at any one time. Thus, in Figure 5 either of the relays 13a or 12a may be actuated. Obviously if the contact arms of the relay 12a were rotated clockwise to the closed position the rocker arm would prevent the actuation of the other relay 13a by engagement with the contact bar 123a thereof thus preventing closing of the contacts of this relay.

The armature device 36 in this instance is comprised of the inner ring of contact buttons 124 which are designed to be engaged by a simple stud or brush 125 extending from the contact bar 126, this arm being mounted on the shaft 127 which causes rotation of the same in a counter-clockwise direction in the illustration shown. The bar 126 is preferably a solid bar of metal which is electrically insulated from the shaft 127 therefore providing electrical connection between the brushes 128 and 129 as well as the brush 125, brush 128 at all times engaging the surface of the contact ring 129a which corresponds to the contact ring 38 in Figure 1 and electrically connected in the manner illustrated there. The outer ring is comprised of a plurality of contact buttons 130 and has a portion thereof made up of the continuous segment 131 which is not connected electrically to any of the components in the circuit arrangement involved.

Referring to Figure 6, the contact bar 126 is driven preferably by a synchronous motor 132 mounted on a bracket 133 which extends from connection to the panel 106 and presents a rotating shaft 134 carrying the pinion 135 which drives the gear wheel 136 causing rotation of shaft 127. In order to provide for a different cyclic period of rotation of the bar 126 the gear 137 may be caused to be engaged by the pinion 135 instead of the gear 136 by moving the pinion 135 along shaft 134 and again fastening it with its screw 138 and moving the motor 132 transversely by first loosening the mounting bolts 139 until the pinion 135 is in engagement with the gear 137. By this simple arrangement therefore means are provided for changing the cyclic period

of the arm 126, that is to say the armature means.

Interconnected toggle switches 140, 141, and 142 are arranged for changing the portion of the cyclic period allotted to either east and west lights or north and south lights. It will be realized that the switches 142 say correspond to the switch arms 69 and 58 of the circuit diagram of Figure 1. Obviously the function to be accomplished by this combination could be provided in a double pole double throw switch mechanism if desired. The single switch means 143 correspond to the single switch arm 48 governing the actuation of the first caution light segment 45, see Figure 1. The switch means 144 correspond to the automatic and manual switch illustrated in Figure 1 and designated by numeral 74. The manual switching arrangement indicated by numeral 145 is arranged conveniently on the panel and is preferably comprised of a two gang rotary switch arrangement satisfying the functional requirements discussed with reference to Figure 8 previously. Appropriate legend 146 are placed on the dial plate 147 in conjunction with the indicating knob 148 so that the operator can see clearly what operation is expected from each position of the switch knob.

In the previous discussion concerning Figure 1 the apportionment of parts of the cyclic period the armature means was discussed with reference to the provision of segments in the form of parts of concentric rings. The buttons 124 and 138 are an equivalent of this simplified arrangement since as desired the buttons may be interconnected. This is provided by the simple means illustrated in Figure 7 where as an example a series of the buttons 124 are shown mounted in the panel 106, the heads 149 and 150 of the studs 151 and 152 being of sufficient diameter that the brush 125 smoothly engages the next before it leaves the last in its path of movement thereover. Each buttonhead 124 is made similar to the studs 151 which has a shaft 153 which is passed through a hole in the panel 106 and is fastened to the latter by means of the washer 154 and nut 155 on the threaded shank portion 156 thereof. Connecting links 157 are placed over the shafts of adjacent buttons to be connected together and supported by suitable nuts 158 and fastened thereto by the overlying nuts 159. If it is desired to separate adjacent contacts electrically a connecting link may be removed from between the same thus it is possible by simply removing the panel to adjust the lengths of the segments desired in the inner and outer rings so that the initial period may be one minute for the green light at east and west when the contact bar 125 is traveling up the right-hand side of the armature arrangement as illustrated, this adjustment being made on the contact buttons 124. After this adjustment the other adjustments may be made in a similar manner so that the switch means 140, 141 and 142 will give the added portion of the time of the green light east and west for the arrangement shown. In this illustration it will be obvious that the cyclic period of the armature means is two minutes, with segments being formed in the inner and outer rings by appropriate arrangement of the connecting links 157 to give additional five second intervals which may be selected by the operator.

It will be apparent that if for any reason the device described fails to operate satisfactorily then a service man may be called who may bring a substitute panel and install the same without materially interfering with the operation of traf-

fic even at a busy intersection. The service man is merely required to remove the contact bar members 102 after opening the switch 99 and then loosening the bolts 107 and 108 to remove the complete panel from the housing. The substituted panel may be immediately placed in, bolted down and the contact bars inserted. During the short interval of time required for this operation the traffic director may enter into the intersection to direct the traffic by hand signals.

The provision of a low current control system consisting of the armature mechanisms described to govern the relays actuating the lights avoids the serious disadvantages of having a plurality of switching contacts burn out due to arcing and pitting. By virtue of the low current drain required by the coils of the relays no arcing is experienced in the passing of the contact brushes of the arm 125 over the contact buttons. The life of this mechanism is therefore substantially only limited by the life of the drive motor or the mechanical mechanism driving the same.

It will be apparent that I have provided a particularly simple and effective electrical circuit arrangement and control unit for traffic light signal systems which attains the objects outlined and which includes the most advantageous features of an instantaneous reversing switch. The operation of the device requires a minimum of supervision by the operator in the event that the traffic times need to be changed which is a distinct advantage where crowded traffic conditions require the supervision of the traffic director without requiring his attention to the signal light system except for brief moments for slight adjustments in time periods. The manual switch means provided is a distinct improvement which allows the traffic director to carry on in the unlikely event that the relays or the armature mechanism breaks down.

The circuit diagrams illustrated herein are particularly simplified as compared to conventional circuit diagrams of traffic signal systems. It will be appreciated, however, that many modifications will be apparent to skilled persons not only in the circuit arrangements embodying the principal set-up, but also in the particular components chosen for carrying out the functions desired. It is not intended therefore that the illustrations herein should be interpreted in any sense which would limit the use of various types of switching mechanisms and relays or the specific structure of the armature arrangement. It is intended therefore that the present disclosure should not be construed in any limiting sense other than that indicated by the scope of the following claims.

What we claim as our invention is:

1. In an electrical signal system for traffic lights including a plurality of relays governing the actuation of said lights and electrically arranged so that one relay is designed to actuate the green lights at east and west and the red lights at north and south, a second relay is designed to actuate green lights at north and south and red lights at east and west, a third relay is designed to actuate caution lights at north and south, and a fourth relay is designed to actuate caution lights at east and west; a control electrical circuit arrangement for actuating the relays comprising; electrical control armature means, means rotating said armature in one direction only at a predetermined speed and providing a fixed cyclic period therefor, means ap-

portioning part of said cyclic period by electrical connection to said second relay, means for apportioning the remainder of said cyclic period by electrical connection to said first relay, said armature means being connected to one side of a current supply line and distributing current therefrom according to said apportionment, said relays being commonly connected to the other side of said current supply line, and means feeding electrical current to said third relay during the last portion of the portion of the cyclic period apportioned to said second relay and means feeding electrical current to said fourth relay at the end portion of said cyclic period.

2. In an electrical signal system for traffic lights including a plurality of relays governing the actuation of said lights and electrically arranged so that one relay is designed to actuate the green lights at east and west and the red lights at north and south, a second relay is designed to actuate green lights at north and south and red lights at east and west, a third relay is designed to actuate caution lights at north and south, and a fourth relay is designed to actuate caution lights at east and west; a control electrical circuit arrangement for actuating the relays comprising; a contact bar, means for sweeping said contact bar radially in one direction only to provide a predetermined fixed cyclic period therefor, said contact bar being electrically connected to one side of a current supply line, said relays being connected to the other side of said current supply line, a switch segment engageable by said contact bar and electrically connected to said first relay to complete the electrical circuit thereof, another switching segment designed to be engaged by said contact bar after engagement of the first switching segment thereby and normally electrically connected to said second relay for completion of the electrical circuit thereof when engaged by said contact bar, and time period switch means interposed between said other switching segment and said first relay whereby the circuit to said relay may be opened and said first switching segment placed in closed circuit relation with said other switching segment.

3. In an electrical signal system for traffic lights including a plurality of relays governing the actuation of said lights and electrically arranged so that one relay is designed to actuate the green lights at east and west and the red lights at north and south, a second relay is designed to actuate green lights at north and south and red lights at east and west, a third relay is designed to actuate caution lights at north and south, and a fourth relay is designed to actuate caution lights at east and west; a control electrical circuit arrangement for actuating the relays comprising; a contact bar, means for sweeping said contact bar radially to provide a predetermined cyclic period therefor, said contact bar being electrically connected to one side of a current supply line, said relays being connected to the other side of said current supply line, a switch segment engageable by said contact bar and electrically connected to said first relay to complete the electrical circuit thereof, a second switching segment spaced from said first switching segment and designed to be engaged by said contact bar

during a portion of the period of its travel over said first switching segment, a third switching segment designed to be engaged by said contact bar after engagement of the first switching segment thereby and normally electrically connected to said second relay for completion of the electrical circuit thereof when engaged by said contact bar, and reversing switch means interposed between said relays and the electrical connections to said third switching segment, said first switching segment and said second switching segment whereby said first segment may be connected to said second relay, said second segment may be connected to said third relay and said third segment may be connected to said first relay.

4. In an electrical signal system for traffic lights including a plurality of relays governing the actuation of said lights and electrically arranged so that one relay is designed to actuate the green lights at east and west and the red lights at north and south, a second relay is designed to actuate green lights at north and south and red lights at east and west, a third relay is designed to actuate caution lights at north and south, and a fourth relay is designed to actuate caution lights at east and west; a control electrical circuit arrangement for actuating the relays comprising; electrical control armature means having a cyclic period, means apportioning part of said cyclic period by electrical connection to said second relay, means for apportioning the remainder of said cyclic period by electrical connection to said first relay, said armature means being connected to one side of a current supply line and distributing current therefrom according to said apportionment, said relays being commonly connected to the other side of said current supply line, and means feeding electrical current to said third relay during the last portion of the portion of the cyclic period apportioned to said second relay, means feeding electrical current to said fourth relay at the end portion of said cyclic period, and reversing switch means interposed electrically between said relays and said control circuit arrangement whereby the control initiated by said armature control means may be oppositely directed electrically to switch the electrical circuit arrangement of the control armature to serve initially the first and third relays and latterly the second and fourth relays within the cyclic period of said control armature.

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