

Aug. 4, 1942.

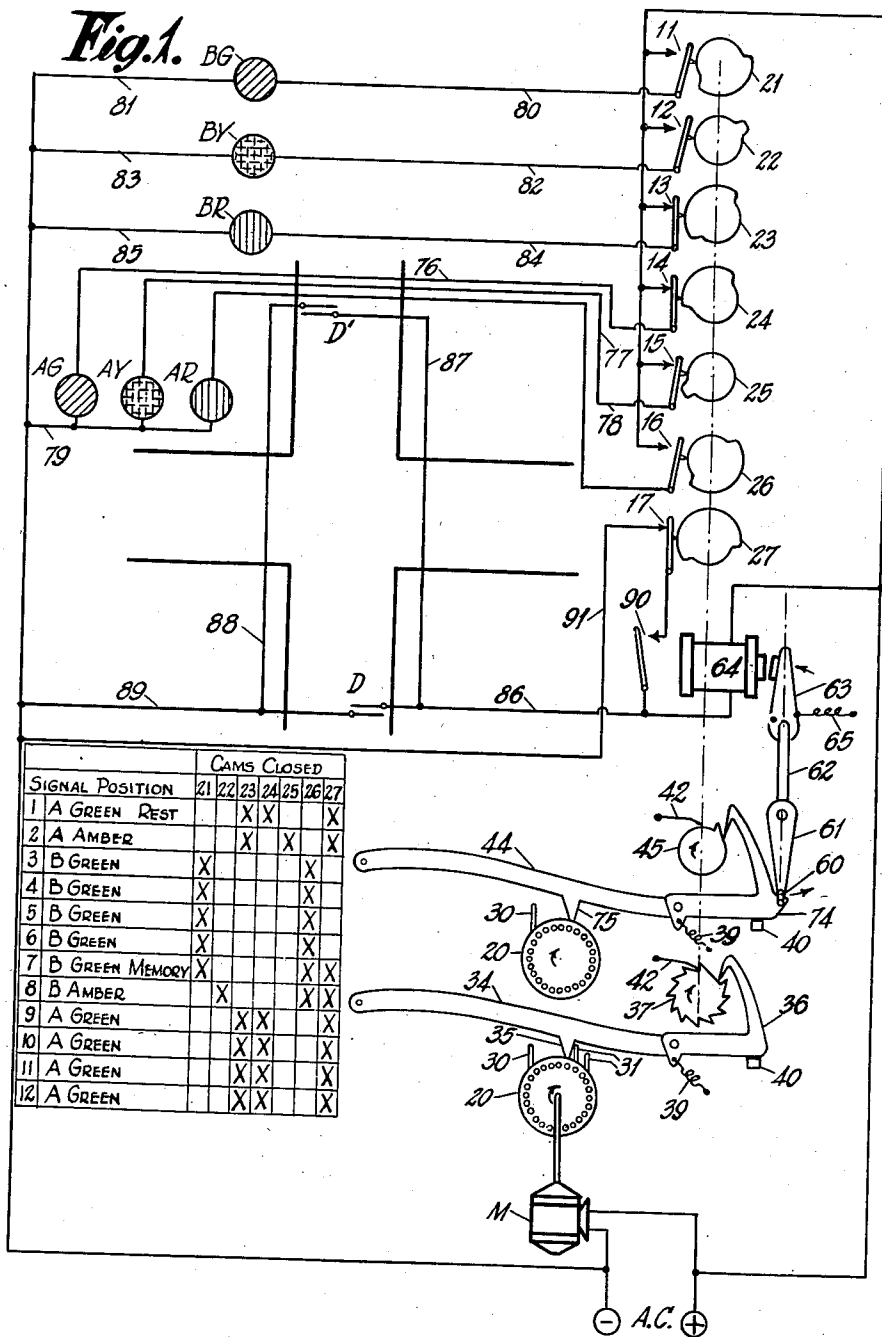
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2,291,855

TRAFFIC ACTUATED SIGNALING APPARATUS

Filed Jan. 2, 1941

3 Sheets-Sheet 1



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*Fig. 2.*

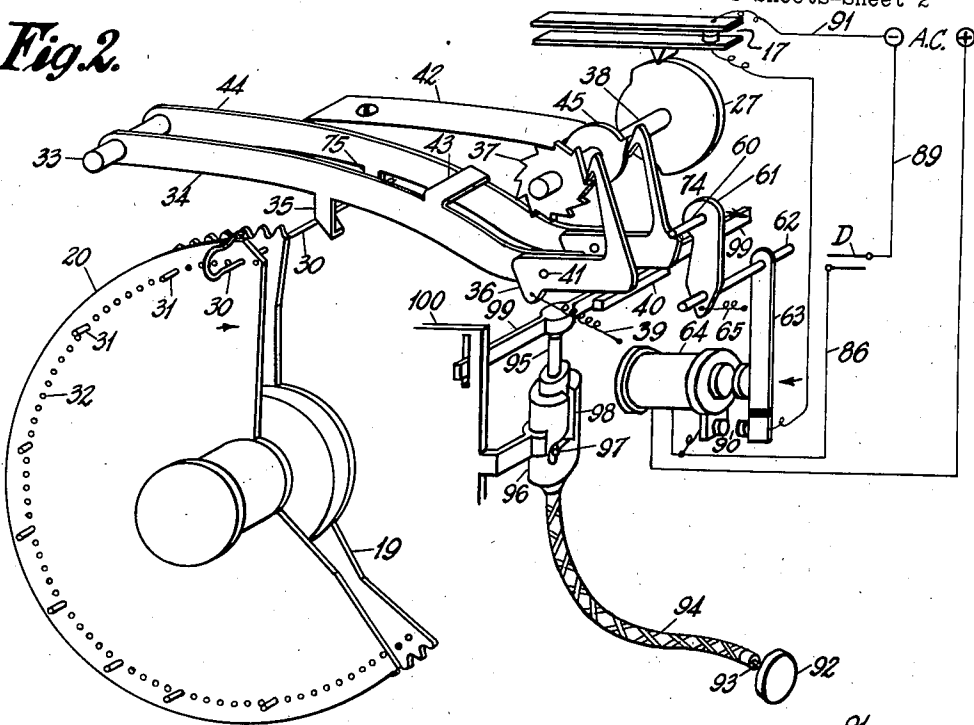


*Fig. 3.*

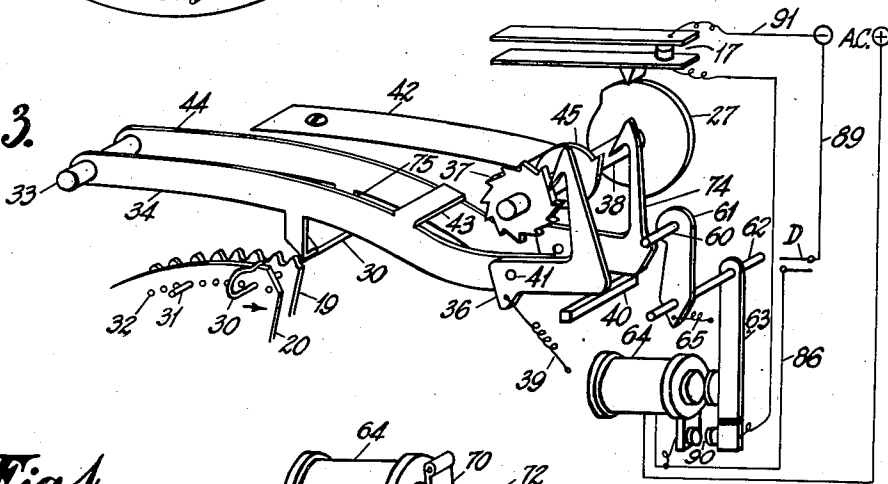
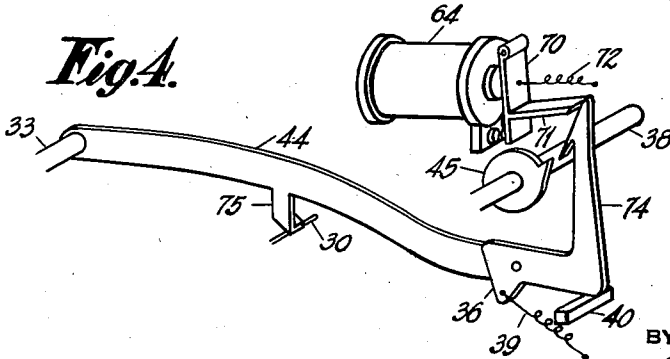


*Fig. 4.*



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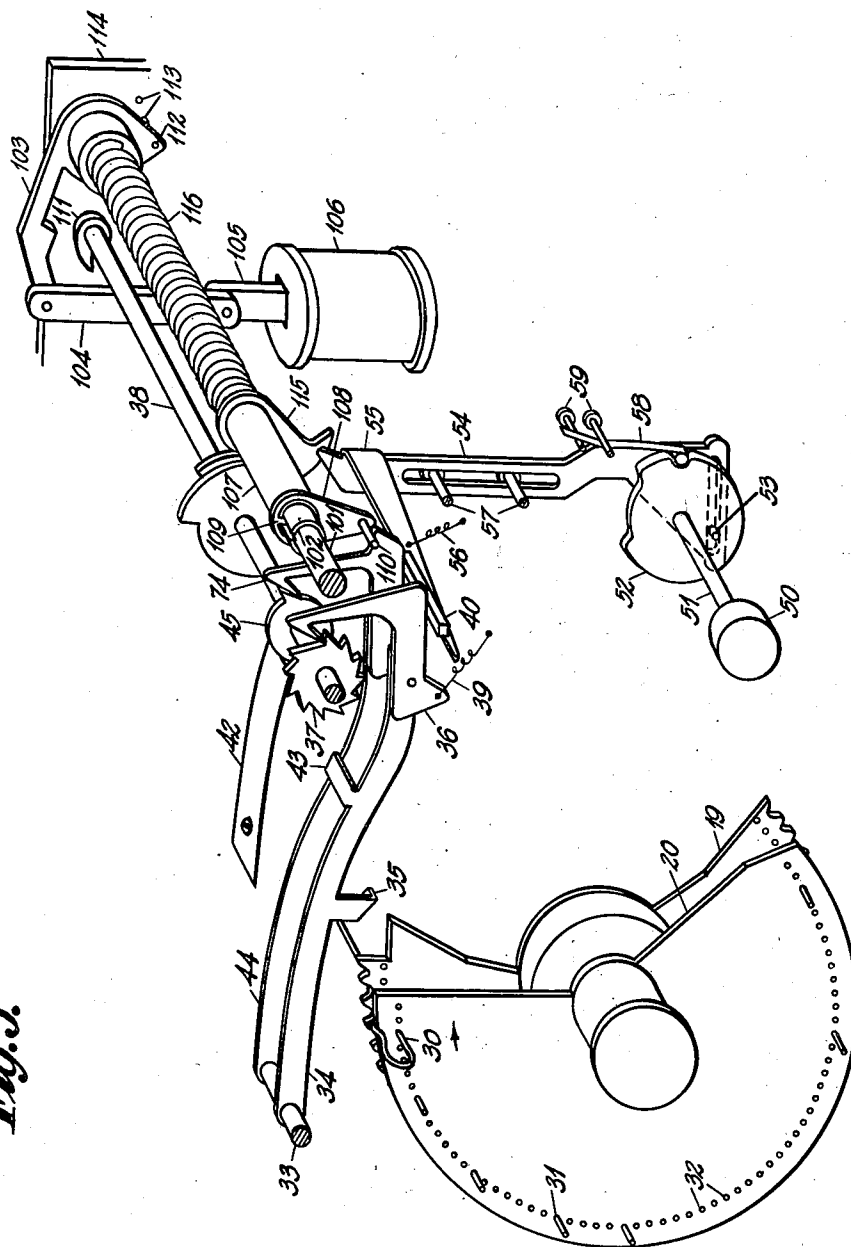
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TRAFFIC ACTUATED SIGNALING APPARATUS

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3 Sheets-Sheet 3

Fig. 5.



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## UNITED STATES PATENT OFFICE

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TRAFFIC ACTUATED SIGNALING  
APPARATUS

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Application January 2, 1941, Serial No. 372,763

9 Claims. (Cl. 177—337)

The present invention relates to traffic control apparatus and more particularly to apparatus of the traffic actuated type.

Apparatus has in the past been proposed for controlling traffic right of way signals and includes a rotary disc timer having pins or keys removably inserted in holes in the disc which is continuously rotated at constant speed by a timing motor, of synchronous type for example. The pins are adapted to actuate a lever, pawl and ratchet arrangement to advance a camshaft step-by-step through a cycle. Cams on the camshaft control signal circuits for displaying right of way indications alternately to main and cross roads.

In this type of controller the cycling of the camshaft may be kept in synchronism with the rotation of the disc by providing a blank space on the aforementioned ratchet from which camshaft position advancement of the camshaft is accomplished by a special pin in the dial actuating a second lever, pawl and ratchet arrangement in which the latter ratchet has a single tooth corresponding in position to the blank space on the first ratchet. Accordingly it is assured that the camshaft can start off each cycle of operation only at the point in the dial where the special pin is located.

Applicant's invention contemplates the provision of mechanism in such a signal controller for rendering the signal controller actuatable by traffic so as to initiate its signal cycle responsive to traffic actuation. Normally in absence of traffic actuation this mechanism renders ineffective the operation of the second aforementioned lever, pawl, ratchet combination so that although the disc continues to rotate, the camshaft remains in a resting position where the cams are arranged to provide right of way indication to the main road. Upon actuation by traffic of a suitable traffic detector of any well-known construction located in the cross road, however, the interference with the action of the second pawl and ratchet combination is removed and the special pin aforementioned is made effective when next it actuates its cooperating lever to advance the camshaft one step in its cycle. From this step the other pins are operable to advance the camshaft through the remainder of its cycle—in which right of way is displayed to the cross road and again to the main road, together with suitable intervening right of way "change" indications—and back to its resting position.

In the event of detector actuation by cross road traffic which has been unable to pass the intersection during this cycle of the camshaft

the mechanism again renders effective the second pawl and ratchet and another cycle of camshaft operation ensues. When, however, a lapse in the cross road traffic occurs, the interfering mechanism of the invention prevents the advancing of the camshaft from its main road right of way resting position by rendering the second pawl and ratchet combination ineffective.

To provide for cross road traffic units which actuate the detector too late in the cross road right of way period to cross the intersection as well as traffic actuating the detector after right of way has reverted to the main road, a "memory" feature is incorporated which "remembers" such traffic and causes the camshaft subsequently to be advanced from its resting position and through another cycle of operation.

It is an object of the invention to provide a traffic signal controller in which a pawl unit is reciprocated adjacent a ratchet at desired time intervals by keys in a rotating dial in accordance with the selected spacing of the keys in the dial, and in which the pawl unit is normally ineffective to engage the ratchet as it is reciprocated in absence of traffic actuation but is made to engage the ratchet to advance a step-by-step signal switch through a signaling cycle responsive to traffic actuation.

It is also an object of the invention to provide a traffic signal controller in which a pawl is reciprocated adjacent a ratchet periodically by a key in a rotating dial, and in which the pawl is normally held away from the ratchet as it is reciprocated in absence of traffic actuation but is made to engage with the ratchet to advance a step-by-step signal switch to initiate a signaling cycle responsive to traffic actuation.

It is another object of the invention to provide a traffic signal controller in which keys in a rotating dial reciprocate a double lever and pawl combination adjacent a cooperating double ratchet, with one pawl reciprocated once per dial cycle by one key adjacent a single tooth ratchet and with the second pawl reciprocated in engagement with a second ratchet having a blank tooth position corresponding to the single tooth of the first ratchet by each of the remaining keys to complete the dial cycle, and in which the first pawl is normally held away from its ratchet as it is reciprocated in absence of traffic actuation but is made to engage the ratchet responsive to traffic actuation to initiate a cycle of operation of a signal switch connected to the ratchet.

It is a further object of the invention to provide a traffic signal controller in which keys in a ro-

tating dial engage a pawl assembly to reciprocate the latter adjacent a ratchet for advancing a signal switch step-by-step through a signaling cycle, and in which improved manual control means is provided to move the pawl assembly out of engagement by said pins and to reciprocate the pawl assembly directly in engagement with the ratchet.

Referring now to the accompanying figures of drawings:

Fig. 1 is a schematic representation of an intersection, traffic signals thereat, traffic detectors in one of the roads and a rotating disc type signal controller embodying mechanism for operating the controller through a signal cycle responsive to actuation of the detectors;

Fig. 2 is a semi-perspective view of the controller of Fig. 1 showing in detail the rotating disc, pins, the lever, pawl and ratchet assemblies, camshaft, vehicle actuated "interfering" mechanism, and manual control apparatus for superseding action of the timer disc and governing operation of the camshaft manually when desired;

Fig. 3 is another view of positions of the equipment represented in Fig. 2 except that the special pin for actuating the second pawl-lever-ratchet combination is shown rotated into lifting engagement with the levers, and the interfering mechanism, represented herein in the absence of traffic actuation, is effective to prevent rotation of the camshaft and by preventing the second pawl from engaging the tooth of its ratchet;

Fig. 4 is a semi-perspective view of portions of a signal controller embodying a somewhat different "interfering" mechanism; and

Fig. 5 is a semi-perspective view of another embodiment of traffic actuated "interfering" mechanism incorporated in a rotating disc type of signal controller, and also disclosing a different manual control arrangement from that shown in Fig. 2.

Identical parts which are shown in several figures bear the same reference character in each view.

Considering now the embodiment shown in Figures 1, 2 and 3, and with reference particularly to Fig. 1, there is represented the intersection of main and cross roads having for each road the conventional green, amber and red signals for indicating to traffic there on right of way, change of right of way, and interruption of right of way respectively in accordance with customary practice. In or adjacent to the cross road approaches to the intersection are located traffic detectors D, D' which may for example be of the type in which two contact plates are brought into contact with each other to close a circuit upon the passage of a vehicle. Any other type of detector such as the well known types employing magnetic, photoelectric, or sonic principles for example may of course be substituted.

The timer or controller itself is shown schematically at the right side and in the lower part of Fig. 1, and the mechanism involving the features of the invention is shown in several forms and more detail in the partially cut away views in the remaining figures of the drawings.

As indicated in Figs. 1 to 3 inclusive, such a controller includes a disc 20 which is driven at constant speed by a motor M (Fig. 1) through suitable gearing (not shown) including the gear member 19 attached to the rear of and integral with disc 20. Pins or keys 31 inserted in perforations 32 in the disc 20 are arranged when rotated

to the top of their path of revolution to engage the projection 35 from lever 34 which is pivoted at shaft 33. The lever carries at its free end the pawl 36, pivotally mounted on the lever at 41. Normally the pawl 35 rests with its jaw engaging a tooth on the cooperating ratchet 37 mounted on the camshaft 38, and with its under side resting on the backstop 40.

When as mentioned above one of the pins 31 revolves into engagement with the projection 35 on lever 34, the lever and pawl 36 are raised upward, against tension in spring 39 until a new tooth on ratchet 37 is engaged by the pawl 36, and upon the subsequent moving of the pin from under the projection 35 the lever and pawl are instantly brought back to their position against the backstop 40 by tension in the spring 39 causing the camshaft to be revolved one step.

It will be noted that in place of one tooth the ratchet 37 has a blank space and when this blank space is presented to the pawl 36, the pawl is not able to advance the ratchet. This is of significance in maintaining the camshaft and the timing disc in synchronism with each other, synchronization being accomplished by stopping the camshaft in one step in its cycle, where the blank space on ratchet 37 is presented to pawl 36, and then permitting the camshaft to start again only at a predetermined point in the timing disc.

To provide for starting the camshaft from this resting position a second lever-pawl-ratchet assembly 44, 74, 45 is located alongside of the first and actuated by a special long pin 30 which unlike the other pins is adapted to engage the projection 75 on the second lever 44 as well as projection 35. Ratchet 45 has only one tooth, located in a position corresponding to that of the blank space on ratchet 37, so that when the long pin 30 engages the projection on lever 44 it forces upward the lever 34 as well as the lever 44, due to the overlapping arm 43 on lever 34.

Pawl 74 engages the tooth on ratchet 45 and when the long pin moves out of engagement with lever 44 tension in spring 39 immediately restores the pawls and levers to their normal position against backstop 40 causing the camshaft to be advanced one step. Backward movement of the camshaft is prevented by dead pawl 42 which cooperates with both ratchets.

The resynchronizing of the camshaft and timing dial is of particular significance in connection with the traffic actuated operation of the controller and with the manual control means which as will be described may supersede when desired automatic timing of the camshaft step-by-step operation by the timing dial and pins.

Three embodiments of the portions of the control apparatus which render the step-by-step sequence switch or camshaft responsive to traffic actuation are disclosed in the present application for example although it will be appreciated that still other forms of the mechanism and not shown herein may utilize the features of applicant's invention.

Referring again to the embodiment shown in Figs. 1 through 3, and particularly to Fig. 2, it will be noted that the pawl 74 is formed to provide a shelf or lip at the back of the elbow of the pawl, and over which the pin or stop 60 extending from a member 61 may be rotated. This elbow is rigid. When the stop 60 is in such a position over the shelf, the normal action of the pawl 74 upon the engagement of lever 44 by the long pin 30 is altered, so that the jaw

of the pawl 74, as shown in Fig. 3, is prevented from engaging the tooth on ratchet 45. Accordingly stop 60 causes the action of the long pin 30 in raising the lever 44 and pawl 74 to be ineffective in advancing the camshaft from the resting position or step previously described.

Member 61 is tightly fitted to a shaft 62 which is freely journaled in bearings now shown. Also fixed on shaft 62 is member 63 which is constructed as an armature of a magnet 64 so that when the magnet is energized the armature 63 is attracted into contact with the end of magnet 64 causing the shaft 62 to rotate (clockwise in Figs. 2, 3) through a small arc. This movement is sufficient to cause member 61 in turn to move the stop 60 from its position over the shelf of pawl 74 and out of the range of movement of pawl 74. Spring 65 attached to member 63 acts in opposition to the magnet and ensures that when the magnet is deenergized the stop 60 will resume its position over the shelf on pawl 74 to obstruct the movement thereof as described.

Referring now to Fig. 1 in particular, the manner in which applicant's traffic actuated timer is arranged for the control of signals at an intersection is disclosed. In the lower left portion of this figure is a chart showing the signal indications and cam contacts of the signal controller closed in each camshaft position.

In the figure is represented the intersection of the main and cross roads together with suitable signals AG, AY and AR for indicating green or go yellow or change and red or stop respectively to the traffic on the main road, and corresponding signals BG, BY and BR for the cross road traffic. Detectors D, D' of any suitable construction for closing a circuit momentarily upon the passage of a vehicle near or across them are located in the cross road approaches to the intersection and are connected in parallel with each other to energize when actuated the magnet 64.

The camshaft is represented at the right side of the figure by the vertical broken line and carries on it ratches 37, 45 and cams 21-27 which operate circuits through contacts 11-17. Assume that the camshaft is standing in its rest position (as shown) from which it may be advanced only by action of the pawl 74. This position will be referred to as the artery (main road) green resting position or position 1. In this position a circuit is completed from plus side of power supply through contact 14, wire 76, main road green signal AG, wire 79 to minus side of power, and also from plus via contact 13, wire 84 through cross road red signal BR and via wire 85 to minus power.

It will be appreciated that although the timing disc 20 and pins 30, 31 will be continuously revolved by motor M, the camshaft will remain in position 1 in the absence of traffic actuation of detectors D, D', thus causing the AG and BR signals to be displayed. Operation of lever 34 and pawl 35 by pins 31 is ineffective to advance the camshaft, as pointed out on account of the blank space on ratchet 37 which is presented to the pawl in this position. Furthermore long pin 30 which actuates lever 44 and pawl 74 once in each camshaft since the stop 60 will assume the position shown over the shelf on pawl 74 by tension in spring 65 in the absence of traffic actuation, thus interfering with the normal free action of pawl 74 and preventing the pawl from engaging the tooth on ratchet 45.

Upon traffic actuation of a detector a cycle of camshaft operation is initiated by energization of

magnet 64 by a circuit from plus power through the coil of magnet 64, wires 86, 87, detector D, for example, wires 88, 89 to minus power. A holding circuit for the magnet 64 paralleling the circuit through the detectors extends from plus power through the magnet, make contact pair 90 closed when the magnet is energized, cam contacts 17, wire 91 to minus power, maintains the magnet energized following detector actuation.

Armature 63 is attracted by the magnet against tension in spring 65 and causes the shaft to rotate counterclockwise a few degrees imparting a slight displacement to member 61 and stop 60 which is moved off the shelf on pawl 74. The next actuation of lever 44 by long pin 30 accordingly is effective to lift pawls 34 and 74, of which the latter now free of interference, engages the tooth on ratchet 45. When the pin 30 passes from under projection 75 pawl 74 under tension in spring 39 advances the camshaft one twelfth of a revolution in a clockwise direction to position 2. The mechanism may be arranged for clockwise movement of the member 61 by energizing magnet 64 as in Figs. 2 and 3 or for counterclockwise movement as in the simplified diagram of Fig. 1.

Although the camshaft shown is represented as having twelve positions, one having a somewhat greater or lesser number may be substituted with a corresponding change in the number of pins 31 in dial 20. It will be noted that the eleven pins 31 and the long special pin 30 which operates both levers 34 and 44 together provide the twelve actuations for the camshaft cycle. Normally one cycle of camshaft 38 provides one complete traffic signal cycle including five steps comprising a green signal for one street, an amber signal period for that street, five steps comprising a green signal for the intersecting street and an amber signal for the latter street. Many types of signal cycles in use, however, have more than four signal periods, as for example those employing two successive amber or change periods for each street, and those providing green signal periods for more than two separate traffic movements. The present equipment is readily adapted to provide such cycles by allotting fewer camshaft steps to the green signal periods, thus making available steps to care for such additional periods without reconstructing the camshaft, or ratchets, or making other radical departures.

The camshaft having now been advanced into position 2, the main road green signal AG is extinguished by the breaking of contacts 14 by cam 24 and the main road amber signal AY is energized by a circuit from plus power through contacts 15, which are closed by cam 25, wire 77, signal AY, wire 79 to minus power. The portion of the timing cycle in which the amber signal is displayed is determined by the angular distance from long pin 30 to the first one of pins 31 which is next to actuate its co-operating lever 34. When this first pin 31 actuates projection 75 on lever 34 the pawl 35 engages a tooth on ratchet 37 and after the pin has passed out from under the projection the pawl 35 under tension in spring 39 is returned to its position against backstop 40 rotating the camshaft to position 3.

In position 3 the main road amber signal AY and cross road signal BR are extinguished by opening of cam contacts 15 and 13 respectively and the main road red signal AR and the cross road green signal BG are illuminated. Circuit

is completed from plus power through cam contacts 16, wire 78, AR signal, wire 79 to minus power and through cam contacts 11, wire 80, BG signal, wire 81 to minus power. Traffic on the cross road which initiated the cycle of camshaft operation by actuation of the detector D or D' is permitted to cross the intersection.

The next pin 31 to be rotated by the disc 20 into engagement with projection 75 on lever 34 causes the camshaft to be advanced from position 3 to position 4 by action of pawl 35 in the manner previously described. As the embodiment disclosed provides a plurality of cross road green signal positions it will be noted from the chart in Fig. 1 that the same signal indications are continued in position 4 and also in the following positions 5, 6 and 7. Successive operations of lever 34 by successive pins each advance the camshaft one step.

To deenergize magnet 64, which was energized by the initiating detector actuation, the hold-in circuit for the magnet through its contacts 90 cam contacts 17, wire 91 to minus power is broken at contacts 17 by the cam 27 in all positions of the cross road green signal except the last, that is in positions 4, 5 and 6. In order to ensure that vehicles crossing the detectors D, D', in the final portion of the cross street green period too late to cross the intersection will initiate another cycle of the camshaft to enable them to cross, the hold-in circuit contacts 17 are again closed in position 7, the last cross road green period. Magnet 64 may therefore be locked-in again through the hold-in circuit in position 7 and subsequent periods as indicated in the cam chart in Fig. 1 for cam 27.

When the camshaft 38 reaches position 8 the cross road green signal BG is extinguished by the opening of contacts 11, and by the closure of contacts 12 circuit is completed from plus power via contacts 12 wire 82 cross road amber signal BY, wire 83 to minus power.

The next actuating pin 31 which operates lever 34 causes the camshaft to be advanced to position 9, the first of five main road green signal positions. Contacts 12, 16 are opened by cams 22 and 26 extinguishing the BY and AR signals and cams 23 and 24 operate to complete circuits for energizing the AG and BR signals. These circuits extend from plus power through contacts 13 wire 84 signal BR, wire 85 to minus power, and through contacts 14 wire 76, signal AG, wire 79 to minus power.

When successive actuations of the pins 31 have advanced the camshaft 38 into position 1, the main road green resting position the camshaft cycle of operation is completed and the camshaft will remain thereafter in this position until the magnet 64 is energized and special pin 30 actuates lever 44.

To provide for manual operation of the signals stepping of the camshaft may be rendered independent of the automatic timing by dial 20 and of the traffic actuated mechanism by turning clockwise the button 92 (Fig. 2) which projects from the end of flexible cable 93 enclosed in sheath 94. The upper end of cable 93 is fitted to a shaft 95 which slides in the slotted collar 96, and a pin 97 fitted to the shaft 95 moves in the slot 98 and guides the motion of the shaft and cable.

When the button 92 is turned clockwise the pin 97 moves across the lower or slanted portion of the slot 98 and permits vertical movement of the shaft 95 if the button 92 now be pressed.

Mounted in a swivel fitting at the top of shaft 95 is a horizontal bar member 99 which is capable of moving up and down upon corresponding movements of the button but is prevented from horizontal movements by the guiding slot in plate 100 into which one end of the bar 99 is fitted.

As the button 92 is rotated sufficient vertical movement of the shaft is introduced by the pin 97 travelling in the slanted portion of slot 98 to raise the bar slightly. The bar 99 bears against a cam-shaped edge of member 61 forcing the member 61 to move slightly clockwise and causes the stop 60 to be displaced from over the shelf on pawl 74. Bar 99 also bears against the bottoms of pawls 36 and 74 raising them and their associated lever arms out of range of the actuating pins 30 and 31. The camshaft accordingly remains in the position into which it was last moved. Advancement of the camshaft one position is accomplished manually by pressing the button 92 and allowing it to snap back to a position where the pin 97 is at the bottom of the vertical portion of slot 98.

This action causes the bar 99 to rise extending spring 39 forcing both pawls 36 and 74 into engagement with the next teeth in their respective ratchets and then by tension in the extended spring 39 to return the pawls and horizontal bar 99 to the normal manual position just described.

It will be appreciated that where a number of intersections along a main road are provided with signal controllers of the disclosed type in which the constant speed disc in each is driven by a self-starting synchronous type motor coordinated operation of the several controllers in desired time phase may be produced by setting the special pins 30 and the remaining cycle pins in the several controllers in the desired relationship. Transfer of right of way from the main road in response to cross road traffic actuation at all the intersections therefore occurs only in accord with a predetermined plan, preferably arranged to provide a minimum of stopping of main road traffic.

An alternate embodiment of the mechanism which permits the camshaft to be advanced from its resting position responsive to traffic actuation is shown in Fig. 4. In the embodiments of Figs. 4 and 5 the camshaft, ratchets, pawls, rotating disc and pins all may preferably take the same form as shown in Figs. 1, 2 and 3. In the arrangement of Fig. 4, however, the magnet 64 is located above the camshaft 38 and ratchet 45 and its cooperating armature 70 is provided with a rearwardly projecting extension 71 which serves as a stop in conjunction with the pawl 74. When the magnet 64 is de-energized and the armature 70 is moved to its back position by tension in spring 72.

Actuation of lever 44 by the long pin 30 which raises lever 44 and pawl 74 causes the upper part of the pawl 74 to bear against the end surface of the stop 71, as shown in Fig. 4, preventing the pawl from engaging the tooth on ratchet 45. Energization of the magnet 64 by traffic actuation of a detector moves the armature 70 and stop 71 out of the position where the latter interferes with the action of the pawl 74; and accordingly actuation of the lever 44 and pawl 74 by special pin 30 while the magnet is energized permits the ratchet 45 and camshaft 38 to be advanced from the rest position to commence a complete cycle of operation as described in connection with the previous embodiment.

A still further embodiment of the invention is disclosed in Fig. 5. This form of the mechanism for interfering with the action of pawl 74 and ratchet 45 to prevent movement of the camshaft from the resting position except in response to traffic actuation also permits the incorporation in the apparatus of a manual control arrangement, which is shown to be of a different type from that of Fig. 2.

Parallel to the camshaft and to the side of the camshaft over the elbow of the pawls 35 and 74 a fixed shaft 101 is mounted. A sleeve 102 is positioned on the shaft and is capable of being rotated thereon through a small angle by action of a lever 103 attached to the rear end of the sleeve. The lever 103 is in turn operated through a linkage 104 by the armature 105 of a solenoid 106. The solenoid is energized momentarily by actuation of the cross road detector with which it is connected in series between the power supply leads.

Mounted on the sleeve 102 near the front end of the sleeve and slidably keyed to a slot therein is a second sleeve 107. The sleeve 107 has fixed to its forward end a member 108 having a key 109 which slides in the slot of sleeve 102 and carrying at its lower end the stop or pin 110. When the solenoid armature 105 is in its outermost position the linkage arrangement causes the stop 110 to be positioned over the shelf forming a part of the pawl 74 where it interferes with the action of the pawl to prevent engagement with the tooth on ratchet 45 and prevents rotation of the camshaft 33.

A detector actuation which momentarily energizes the solenoid 106 causes the armature 105 to be drawn into the solenoid coil. Through the link 104 the lever 103 is rotated and rotates sleeve 102 and shaft 101 through a small angle and displaces the stop 110 outward from its position over the shelf of pawl 74 to a new position is entirely free of interference with the pawl. The next subsequent actuation of lever 44 by the long pin 30 in disc 20 is therefore effective to advance the camshaft one step in the manner previously described.

As the camshaft is revolved through the cross road green positions cam 111 bears upward against lever 103 so that in the final position of cross road green the armature 105 is returned to its normal outermost position and after the cam has revolved to clear the lever 103 the armature 105 is capable of responding to traffic actuations in such final cross road green position to cause a further cycle of camshaft operation. In the absence of such an actuation, however, the armature will remain in its outermost position with stop 110 in position over pawl 74 to prevent recycling of the camshaft from the rest position. A spring detent 112 projects from an extension of lever 103 and cooperates with a pair of depressions 113 in the rear support plate 114 to permit rotation of the sleeve assembly only by positive torque on lever 103 and not by vibration of the control equipment. The detent serves to hold the lever 103 and sleeve 102 with stop 110 in its inner position blocking the pawl 74 until positively operated to its outer position of stop 110 free of the pawl by armature 105, and then holds the lever and sleeve with stop 110 in its outer position until positively operated to its inner position by cam 111.

To provide for manual operation of the signals in the Fig. 5 construction the handle 50 is turned approximately one third of a revolution clockwise

to a "manual" position causing the irregularly shaped cam 52 at the rear end of shaft 51 to rotate.

Pin 53 on the cam moves in the horizontal slot in lever arm 54 and serves as a crank to raise lever 54. The rearwardly slanted tip of lever 54 bears on a curved surface forming a part of the member 115 which is rigidly fixed to the rear end of the sleeve 107. The curved surface is adapted to bear against the tip of lever 54 in all positions assumed by the sleeve, linkage and armature assembly. An arm 55 of lever 54 simultaneously bears against the bottoms of pawls 36 and 74 raising them and their associated lever arms out of range of pins 30 and 31 in this normal manual position.

As the handle 50 is turned to the normal manual position lever 54 rises and forces member 115 and member 108 joined thereto by sleeve 107 backward along the sleeve 102 against tension in the coil spring 116. This action also causes the pin or stop 110 to move backward so that if the stop was resting in a position of interference over pawl 74 it is moved clear of the pawl 74.

Advancement of the camshaft is accomplished by turning the handle 50 an additional partial clockwise revolution and then allowing it to snap back to the normal position. This action causes lever 54 to move slightly higher raising both pawls 36 and 74 (now clear of interference from stop 110) into engagement with the next teeth in their respective ratchets and then by tension in spring 39 to return the pawls to the normal manual position just described, thus advancing the camshaft.

The flat spring 58 supported by pins 59 bears against the edge of cam 52 which is shaped so as to cause the manual handle 50 to rest normally in either manual or automatic positions.

In summary it will be seen from the foregoing that applicant's invention relates to traffic signal control apparatus for operation through a cycle of signal indications to intersecting roads by pins removably inserted near the periphery of a constant speed rotating disc and to mechanism for rendering such operation of the camshaft responsive to traffic actuation of a detector located in one of the roads. The controller employs as a linkage between the camshaft and the driving disc dual lever, pawl and ratchet combinations actuated by the disc pins, and the dual combinations also function to maintain the cyclic step-by-step camshaft in step with the rotating dial. The traffic responsive mechanism normally serves in the absence of traffic actuation to interfere with the action of one of the lever, pawl and ratchet combinations to maintain the camshaft in a resting position but upon actuation such interference is removed to permit the advancement of the camshaft through a cycle of operation by the disc and pins. Moreover the synchronization of the camshaft operation and the constant speed rotating disc ensures in installations at a plurality of related intersections, at which the dials in each maintain the same time cycle by synchronous motors for example, that cycles of signal operation by the camshafts at all the intersections initiated in response to traffic actuations will be maintained in a predetermined relation with one another.

A novel manual control means is provided comprising a button mounted at the end of a flexible cable and is set in the manual position by a partial clockwise revolution of the button. In the manual position the automatic timing by

the dial and the traffic actuated mechanism are rendered ineffective although operation of the dial continues unaffected. Successive pressing and releasing of the button in the manual position advances the camshaft step-by-step through its cycle, and upon return of the button to the automatic position the second pawl and ratchet combination resynchronizes the camshaft and timing dial before a single full dial cycle elapses. With applicant's novel manual control it is not necessary for the operator to open the control case or touch the control mechanism since both the switching from manual to automatic operation or vice versa and manual stepping of the camshaft can all be achieved by manipulation of the button at the end of the flexible cable.

An alternate form of manual control employs a handle and lever combination directly connected with the controller for interrupting the traffic actuated and dial control of the signal camshaft and for direct ratcheting of the latter.

It will be understood that many changes in the form, arrangement and character of the various parts may be altered without departing from the spirit of the invention. For example dial 20 and its driving gear 19 might be combined into a single part instead of being separate discs fixed together as shown. Or in lieu of the bent-over arm portion 43 of lever 34 a separate return spring for lever 44 might be added or substituted. A pin might be fixedly mounted on the rear of gear 19 and adapted by a crank at its end to actuate the projection from lever 44 without engaging the projection from lever 34, in lieu of the long pin 30 if desired.

Still other changes may be adopted from the embodiments shown without departing from the spirit of the invention as defined in the following claims:

I claim:

1. In a traffic signal controller having a step-by-step rotary signal switch operable through a cycle of a plurality of right of way signal indications, a ratchet on said switch, a rotating dial and a key therein, and a pawl reciprocated periodically adjacent said ratchet by said key as said dial rotates, traffic actuated control means for said pawl to keep said pawl out of engagement with said ratchet as it is reciprocated in absence of traffic actuation and to bring said pawl into engagement with said ratchet to initiate a cycle of operation of said signal switch responsive to traffic actuation whereby a right of way signaling period will be accorded to the actuating traffic.

2. In a traffic signal controller having a step-by-step rotary signal switch operable through a cycle of a plurality of right of way signal indications, a ratchet on said switch, a rotating dial and a key therein, and a pawl reciprocated periodically adjacent said ratchet by said key as said dial rotates, means for guiding said pawl selectively in and out of engagement with the ratchet as it is reciprocated, and traffic actuated control means for operating said guide means to keep said pawl out of engagement with said ratchet as it is reciprocated in absence of traffic actuation and to bring said pawl into engagement with said ratchet to initiate a cycle of operation of said signal switch responsive to traffic actuation whereby a right of way signaling period will be accorded to the actuating traffic.

3. In a traffic signal controller having a step-by-step rotary signal switch operable through a cycle of a plurality of right of way signal in-

dications, complementary ratchet wheels on said switch one wheel having one tooth corresponding to one right of way signal indication of the cycle and the other wheel having teeth corresponding to all other indications except said one right of way indication, a rotating dial and keys adjustably spaced therein, a pawl reciprocated adjacent the first ratchet wheel by one of said keys as said dial rotates, a second pawl reciprocated in engagement with the second ratchet wheel as the dial rotates, traffic actuated control means for the first pawl to keep said first pawl disengaged from its ratchet as it is reciprocated in absence of traffic actuation and to bring said first pawl into engagement with its ratchet to initiate a cycle of operation of said signal switch responsive to traffic actuation.

4. In a traffic signaling system for interfering traffic lanes having traffic actuated means in one of said lanes and a step-by-step rotary signal switch operable through a cycle of right of way signaling indications for the respective lanes a ratchet connected with said signal switch, a rotary dial and a pin placed in selected angular position therein with respect to the axis of the dial, a pawl reciprocated periodically adjacent the ratchet by said pin as said dial rotates, means for normally maintaining said pawl disengaged from said ratchet as it is reciprocated in absence of actuation of the traffic actuated means and for releasing said pawl for engagement with said ratchet to initiate a cycle of operation of the signal switch at the next reciprocation in response to actuation of the traffic actuated means.

5. In a traffic signal control system for intersecting roads having traffic actuated means in one of the roads, a rotating timing dial, pins adjustably spaced in the dial, a rotary step-by-step signal switch operable through a cycle for signaling right of way to the respective roads, dual lever, pawl and ratchet combinations actuated by the pins as the dial rotates for advancing the signal switch step by step in its cycle, means normally interfering with one of said combinations in one step of the signal switch in which right of way is signaled to another of said roads to deflect its pawl from its ratchet to prevent said combination from advancing the signal switch from said one step, and means responsive to actuation of the traffic actuated means to render ineffective the last mentioned means so as to advance said signal switch through one cycle of operation by said combinations.

6. In a traffic signal control system for intersecting roads having signals for indicating right of way on the roads, traffic actuated means in one of the roads, a rotary step by step signal switch capable of operation through a right of way signaling cycle for the respective roads, a rotating timing dial, pins adjustably spaced in said dial, pawl and ratchet means actuated by said pins for advancing the signal switch through all except one step in its cycle, a second pawl and ratchet means actuatable by a pin in said dial for advancing the signal switch from said one step, means normally deflecting said second pawl from its ratchet as it is so actuated, and means responsive to actuation of the traffic actuated means to remove said deflecting means from said second pawl to permit said switching means to be advanced from said camshaft step by said second pawl and ratchet means to initiate a cycle of the signal switch.

7. A traffic signal controller as in claim 1 in which the traffic actuated control means includes

an armature bearing against the pawl to keep the pawl away from the ratchet and electromagnetic means energizable by traffic actuation to move said armature to release the pawl into engagement with said ratchet.

8. A traffic signal controller as in claim 1 in which the traffic actuated control means includes an armature bearing against the pawl to keep the pawl away from the ratchet and electromagnetic means energizable by traffic actuation to move said armature to release the pawl into engagement with said ratchet, a locking circuit for said electromagnetic means to maintain the latter energized after traffic actuation and including a connection with the signal switch to release the electromagnetic means upon accord

of right of way to said actuating traffic in the signal cycle.

9. A traffic signal controller as in claim 1 in which the traffic actuated control means includes an armature bearing against the pawl to keep the pawl away from the ratchet and electromagnetic means energizable by traffic actuation to move said armature to release the pawl into engagement with said ratchet, a detent for holding said armature in position releasing the pawl when moved to such position and a cam on the signal switch for releasing said detent and returning said armature to its position bearing against said pawl upon accord of right of way to said actuating traffic in the signal cycle.

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