April 28, 1942. L. A. CLARK 2,281,139

TRAFFIC SIGNAL

Filed April 24, 1941 2 Sheets-Sheet 1

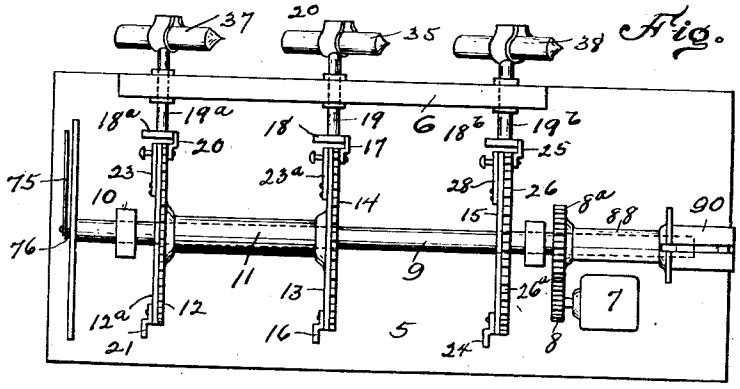



Fig. 1

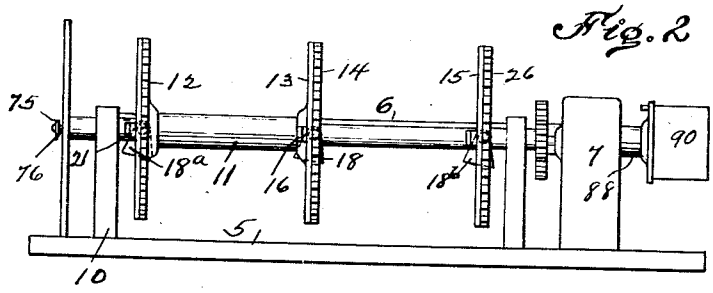



Fig. 2

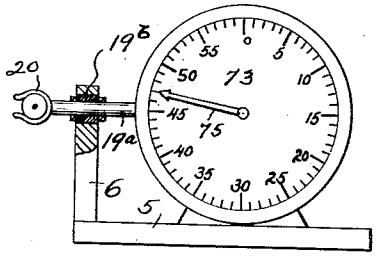



Fig. 3

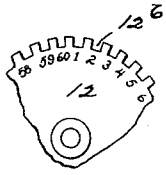



Fig. 4

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Fig. 6

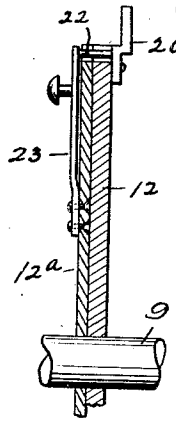
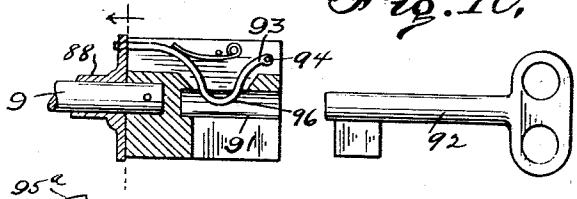



Fig. 10.



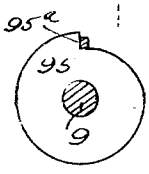
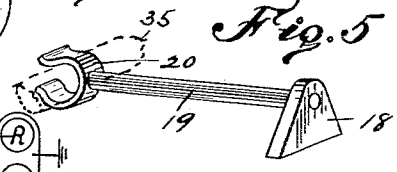




Fig 11

Fig. 5



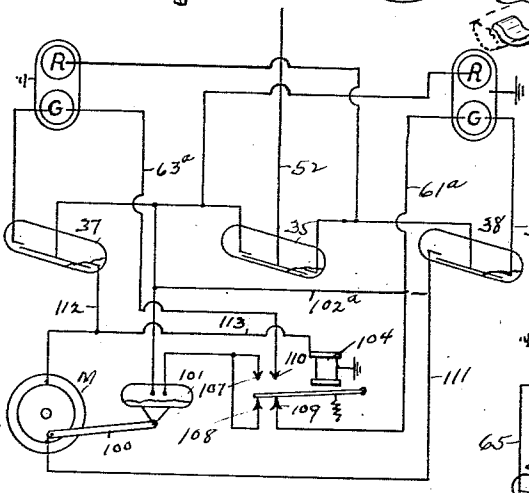




Fig. 9

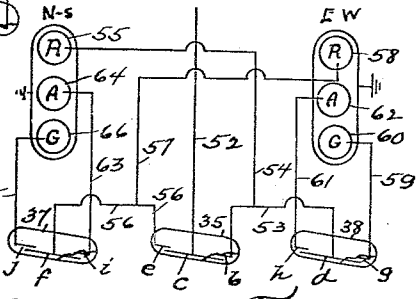



Fig. 7

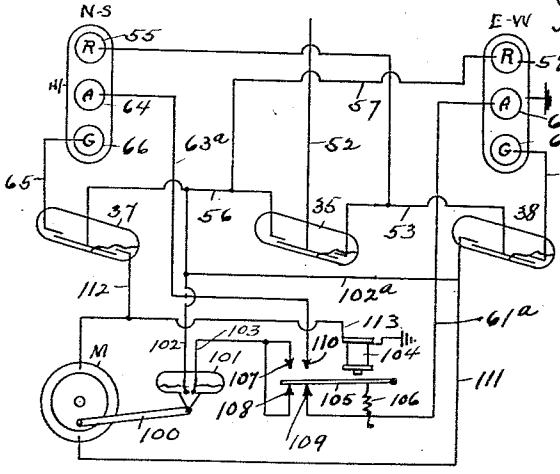



Fig. 8

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# UNITED STATES PATENT OFFICE

2,281,139

## TRAFFIC SIGNAL

Leroy A. Clark, Miami, Fla.

Application April 24, 1941, Serial No. 390,149

10 Claims. (Cl. 200—32)

This invention relates to traffic signalling systems, and more particularly to a very simple and economical circuit making and breaking mechanism for controlling traffic lights and to a new arrangement of wiring by virtue of which the likelihood of getting the various lights wholly out of synchronism, or the likelihood of the short-circuiting of any of the lights under attempts of inexperienced persons to adjust the timing of the same, will be prevented. This application is a continuation in part of my application, Serial Number 266,637, filed April 7, 1939, which became Patent No. 2,243,088.

A further object of the invention is to provide a simple manual control for the mechanism.

A further object of the invention is to provide means for effecting a flashing of the caution signal, if desired.

A further object of the invention is to provide a traffic signal in which one of the lights, such as the green light, for example, may be caused to serve both as a "caution" and as a "go" light by causing it to show as a steady light during the "go" period and to flash through the "caution" period as an indication that the red or "stop" signal is about to flash on.

Embodiments of the invention by virtue of which I accomplish the foregoing objects are illustrated in the accompanying drawings, wherein:

Figure 1 is a plan view of the timing mechanism of the invention;

Fig. 2 is a front elevation of said timing mechanism;

Fig. 3 is an end elevation of the timing mechanism;

Fig. 4 is a fragmentary view of one of the toothed disks hereinafter described;

Fig. 5 is a perspective view of one of the mercury switches, its holder and operating shaft;

Fig. 6 is a detail view of a means for variably setting the trips or tappets of the disks to varying positions with respect to each other;

Fig. 7 is a diagrammatic view of one form of wiring in which no flashing of the caution light takes place;

Fig. 8 is a diagrammatic view of the wiring and mechanism used when the caution light is a flashing light;

Fig. 9 is a form of wiring and mechanism used when the green light is caused to function both as a "caution" and "go" signal;

Fig. 10 is a detail view partly in section of the manual control elements, and,

Fig. 11 is a sectional view on line 11—11 of Fig. 10.

Like numerals designate corresponding parts throughout the several figures of the drawing.

The timing mechanism is supported upon any suitable base **5**, carrying an upstanding block **6**, of Bakelite or other suitable insulating material. A synchronous motor **7**, such as is commonly employed in the driving of electric clocks, drives through gears **8**, **8a** to a sleeve **88** that is loosely mounted on a main drive shaft **9**. Shaft **9** has a block **90** fixed upon its end. This block has a keyhole **91** formed in it for the reception of a manual control key **92**. A dog **93** is pivoted at **94** in and upon the block and the end of said dog projects beyond the inner end of the block to be engaged by the shoulder of a notch **95a** of a disk **95**. This disk is fixed upon the outer end of sleeve **88**. As long as the dog lies in position to be engaged by said notch, the turning of sleeve **88** by the motor acts to turn shaft **9** through block **90**. When it is desired to control the signal manually, the key **92** is thrust into the block to engage the dog at **96** and lift the end of the dog enough to free it of the notch of disk **95**. Shaft **9** is thereupon freed from the motor and may be rocked back and forth to manually control the lights, through key **92**.

The motor, when in action, serves to drive shaft **9** at a uniform and determined rate of speed, as for example, one revolution per minute.

Shaft **9** is suitably suported in bearings **10**. A sleeve **11** is mounted to turn with respect to shaft **9**. This sleeve carries disks **12** and **13**, said disks being fixed to the sleeve so that they are forced to turn together. The shaft **9** has a pair of disks **14** and **15** pinned or otherwise secured thereto, so that they are forced to turn with the shaft. Disk **13** carries a trip arm **16**, and disk **14** carries a trip arm **17**.

These trips act as the disks rotate to thrust in one direction or the other against one tip or the other of a triangular plate **18** that is mounted upon the end of a shaft **19** (Fig. 5). Shaft **19** is journaled in a sleeve **19b** of block **6** and carries a clip **20** at its outer end that is adapted to receive the glass tube forming the body portion of a conventional mercury switch, said switch constituting the master switch **35**, hereinafter described.

As the disks **13** and **14** rotate, the trips act to rock the shaft **19** first in one direction and then in the other. This tips the tube **35** of the master mercury switch.

The structure described is duplicated with re-

spect to additional mercury switches 37 and 38, and the same reference characters have been applied. The rock shafts 19a—19b of the switches 37 and 38 carry triangular plates 18a—18b. The plate 18a is engaged and moved in one direction by a trip arm 20 and in the other direction by a trip arm 21. Trip arm 20 is carried by disk 12 and trip arm 21 is carried by a disk 12a that is loose on shaft 9 and may be held in any desired angular relation to disk 12 through the medium of a pin 22 which is carried by a spring plate 23 fixed to disk 12a and is adapted to engage any one of the teeth 12b of disk 12. (See Fig. 6). A corresponding spring plate 23a provides for angularly setting the trip 16 with respect to trip 17.

In like manner, plate 18b is moved by a trip arm 24 on disk 15 and by a trip arm 25 of a disk 26. Disk 26 is loose on shaft 9 and is held in any desired angular relation to disk 15 by a pin 22 on spring arm 28. Arm 28 is secured to the face of disk 15 and may be sprung away from said disk far enough to disengage pin 22 from the teeth 26a of disk 26 when it is desired to adjust the angular relation of trip arms 24 and 25, to, in turn, determine the interval of time which shall elapse between the time of tilting the mercury switch 38 in one direction and the time of tilting said switch in the opposite direction.

I have illustrated that the disks 12, 14 and 26 are toothed disks and in Fig. 4 I have indicated that the disks may have their notches numbered with numerals *a* from one to sixty, indicative of seconds. The positioning of the trip arms 16 and 17 determines the time of change between the N–S red light and the E–W red light; while the positioning of the trip arms 20, 21; 24, 25, determines the period through which the amber light will show before the green light comes on.

The manner in which this is accomplished may easily be understood by referring to Fig. 7. In this figure, 52 indicates a conductor constituting a source of incoming current. The mercury switches that I employ, while being of a conventional type, differ from simple circuit closers in that they complete one circuit when tipped in one direction and complete another circuit when tipped in another direction.

For example, when 35 is tipped to the right, a circuit is completed at *b* through the contact bar *c* of the mercury switch to conductor 53. This conductor is connected to the contact bar *d* of the mercury tube 38, but at a point ahead of said mercury tube 38, a conductor 54 connects 53 with the N–S red light 55. When the tube 35 is tipped in the opposite direction, a circuit is completed at *e* between contact bar *c* and a conductor 56 which leads to the contact bar *f* of mercury tube 37. However, at a point ahead of mercury tube 37, a conductor 57 leads from 56 to the E–W red light 58.

Thus it will be seen that the tube 35, which constitutes the master switch, controls the two red lights under the influence of the setting of the two complete units 12, 13 and 14, 15, and that this control of the red lights which determines the duration of the complete cycle of operation of the switch is independent of the period of dwell between the amber and green lights of the N–S, E–W sides of the signal, this duration being determined by the time of tipping of 37 and 38.

With tube 38 in the position illustrated in Fig. 7, a circuit is completed at *g* through conductor 59 to the E–W green light 60. With tube 38 tipped in the opposite direction, a circuit will be completed at *h* through a conductor 61 to the amber light 62 of the E–W side of the signal. In like manner, with the tube 37 tipped to the position illustrated in Fig. 7, a circuit is completed at *i* through a conductor 63 to the amber light of the N–S side of the signal. When tube 37 is tipped in the opposite direction, a circuit will be completed at *j* through a conductor 65 to the green light 66 of the N–S side of the signal.

In Fig. 3 I have illustrated a feature which may be employed or may be omitted, since the remainder of the structure will operate with or without it. In this feature, I have illustrated a disk 73, graduated as indicated at 74 after the manner of a clock dial and provided with sixty graduations. A pointer or hand 75 is carried by a pin 76, which projects from the end of the shaft 9, and thus the movement of the hand is in unison with shaft 9.

This facilitates the work of the officer charged with synchronizing lights at different intersections, because with the second hand of his watch set in synchronism with the hand 75, he can, if the disk 74 and hand 75 be exposed to view, drive along the street and at a glance determine just how much any given signal is out of synchronism with its fellows.

I am aware of the fact that it is quite old in the art to provide circuit closers embodying a plurality of contact making and breaking members, and even to use tipping mercury switches in conjunction therewith. However, I do not know of any mechanism embodying such extreme simplicity as that disclosed in this application or embodying the master switch controlling the relation of the N–S cycle with respect to the E–W cycle while leaving such master switch wholly free of accidental short-circuiting due to the effort of any person to adjust the auxiliary switches controlling the amber and green lights of the N–S side of the signal, upon the one hand, and the E–W side of the signal upon the other. It will be very clear that nothing that an inexperienced person might do in endeavoring to adjust the relationship of the amber and green lights could bring about any disorganization of the main cycle of operation.

In those traffic signals having a plurality of switches all of equal value, one of which controls one red light, another of which control the other red light, another of which controls one green light, another of which controls the other green light, another of which controls one amber, and another of which controls the other amber light, all of said switches being independently adjustable, it is very easy to get the various lights so mixed up that it is almost impossible to straighten them out. In an endeavor to do so, the inexperienced person frequently connects two positives to the same light, resulting in short-circuiting the lights, burning them out, and bringing about confusion in traffic. Nothing of this sort can happen with the signal of the present invention.

In Fig. 8 the arrangement differs from that shown in Fig. 7 in the following respects: A motor M is connected by a connecting rod 100 with a tiltable mercury switch 101, and as the motor rotates, the tube of this switch is rocked back and forth. Two wires or connectors 102, 103, are arranged to be connected by the mercury in the switch, when the latter is in its intermediate position, and thus two connections are made for each rotation of the motor M. A relay magnet 104 is arranged to attract an arma-

ture 105 in one direction, said armature being moved in the opposite direction by a spring 106.

The wire 103 of the flasher is connected to a contact point 107 arranged to be engaged by the armature, when said armature is attracted by the magnet. This wire is also connected to contact point 108 arranged to be engaged by the armature, when the armature is moved away from the magnet by the spring 106. When in the latter position, 108 is connected by the armature with a contact point 109, the latter, in turn, being connected by a conductor 61a with the E–W caution light 62. When the armature is attracted by the magnet, it bridges the space between and connects contact 107 with a contact point 110. This contact point is connected by a conductor 63a with the N–S caution light 64.

The left-hand contact of the mercury switch 38 is connected by a conductor 111 with the motor M. With the parts in the position illustrated in Fig. 8, the E–W go light 60 receives current as previously described from 52, 53, 38 and 59. The next movement is a shifting of switch 38 which takes place before any movement of switch 35. When this happens, the mercury travels to the left-hand end of the tube of switch 38, extinguishing "go" light 60 and energizing "caution" light 62 through the flasher. The wire 102 is connected to the conductor 56 and is also connected through a shunt 102a with the conductor 111. When the tube of switch 38 is tipped to the left, the flashing motor M is energized.

The connection to the E–W flashing light 62 at this time is as follows: From positive conductors 52, through 53, 111, 102a, 102, 103, contacts 108, 109 and conductor 61a. The next operation is when the tube of master switch 35 tips downwardly toward the left. This lights the E–W red light 58 from 52, through 56 and 57. It also lights the N–S green light from 52, through 56 and switch 37, the latter at this time being tipped downwardly toward the left to establish connection with conductor 65. This condition continues until the switch 37 tips downwardly toward the right to extinguish the "go" light 66 and light the "caution" light 64.

When the tube of switch 37 tips downwardly toward the right as described, the motor M is energized with current from 52, through 56, switch 37, conductor 112. Current is also supplied through conductor 113 to the winding of magnet 104, thus attracting the armature 105 against the action of spring 106. "Caution" light 64 is then caused to flash by current from 52, through 56, 102, 103, 107, 110 and 63a. It will be observed that at this time, the connection 102a has no effect upon any of the lights because the tipping of 38 to the left broke the connection to conductor 59.

In the modification illustrated in Fig. 9, the arrangement is substantially the same except that the "go" light also serves as the "caution" light, being connected in one position of switch 37 to burn steadily with current from 52, and being connected in the other position of said tube with 52 through the flasher.

While the machine that I have devised for accomplishing the foregoing results, and which I have illustrated herein, has been found to be highly efficient in actual tests and is very economical of construction and certain in operation, I wish it to be understood that the invention is not limited to this particular mechanism. It is clear that the skilled engineer may find other ways of utilizing the principles of the invention through mechanism of another type. Therefore, it is to be understood that the invention includes within its purview whatever changes fairly come within either the terms or the spirit of the appended claims.

Having described my invention, what I claim is:

1. In a traffic control mechanism, the combination with a double throw master switch and a pair of auxiliary double throw switches, of a motor, a first rotative part driven by said motor, a second rotative part mounted to turn with but adjustable upon the first rotative part, means for holding said parts in locked position and in varying positions of circumferential adjustment with respect to each other, an actuating member upon the said first rotative part for throwing the master switch in one direction, an actuating member upon said second rotative part for throwing the master switch in the other direction, actuating means carried wholly by the first rotative part arranged to engage and move one of the auxiliary switches first in one direction and then in the other in the rotation of said part, and actuating means carried wholly by the second rotative part for moving the other auxiliary switch first in one direction and then in the other in the rotation of said second rotative part.

2. A structure as recited in claim 1, in combination with a manual control member and means under control of said member for disconnecting the first rotative part from the motor and means through which said first rotative part may be manually actuated by said manual control member.

3. A structure as recited in claim 1 wherein the first rotative part comprises a shaft, a sleeve upon said shaft, gearing between the motor and sleeve by which continuous rotation is imparted to the sleeve, interengaging means between the sleeve and shaft and manually operable means for throwing said interengaging means out of action to free the shaft of the sleeve.

4. A structure as recited in claim 1 wherein the first rotative part comprises a shaft, a sleeve upon said shaft, gearing between the sleeve and motor, a block having a keyhole in it fast upon the shaft, a notched disk upon the sleeve and a dog pivoted upon the block for engagement by the notched disk, said dog being shaped to be engaged by the key and to be moved out of engagement with the disk and the keyhole of the block being so shaped as to prevent rotation of the key therein, so that when the key is inserted in the block, the block and shaft may be manually manipulated by the key.

5. In a circuit controlling mechanism for traffic signals, a synchronous motor, a shaft driven by said motor, a pair of trip-carrying members fixed to and rotating with said shaft, trips carried by said members, a sleeve loose on said shaft, a pair of trip-carrying members carried by said sleeve, trips on said members, means for holding the sleeve in varying positions of angular adjustment with respect to the shaft, a master switch actuated under control of one trip of the sleeve and of one trip of the shaft and a pair of auxiliary switches, one of which is actuated by a trip of the sleeve and the other of which is actuated by a trip of the shaft.

6. A structure as recited in claim 5 wherein the switches are oscillatory mercury switches, shafts upon which said switches are mounted

and cranks upon said shafts disposed in the path of movement of the respective trips.

7. A structure as recited in claim 5 in combination with a manual control member, movement of which in one direction disconnects the shaft from the motor, and movement of which in another direction turns the shaft to effect manual control of the structure.

8. A structure as recited in claim 5 in combination with a block upon said shaft constituting a part of the driving connection between the motor and the shaft, said block having a keyhole formed therein, a key adapted to enter said keyhole and a locking dog controlled by said key, said locking dog also constituting a part of the driving connection between the motor and the shaft, said locking dog being shaped to be disengaged when the key is inserted and to thereby leave the shaft under the manual control of the key.

9. In combination, a shaft carrying a pair of disks, a trip upon each of said disks, held in fixed circumferential relation to each other by attachment of the disks to the shaft, a sleeve mounted to turn upon said shaft, a pair of disks carried by said sleeve, one of which lies substantially face to face with one of the disks of the shaft, a pair of trips carried by the disks of the sleeve and held in fixed circumferential relation to each other by the attachment of the disks of the sleeve to said sleeve, a latching mechanism between the abutting disks of the sleeve and shaft respectively, adapted to engage at a large number of positions circumferentially of the shaft, so that the sleeve may be locked to the shaft in a large number of varying circumferential positions, a master double throw switch, a part carried by the master switch disposed in position to be engaged by and to move the master switch in one direction under the influence of that trip of the shaft that is carried by the disk which lies in confronting relation to the disk of the sleeve, said part being moved to move the master switch in the opposite direction under the influence of that trip that is carried by the disk of the sleeve which lies in confronting relation to the disk of the shaft, and a pair of double throw auxiliary switches comprising actuating parts disposed in the path of movement of and adapted to be moved in one direction by the trips that are carried by the remaining disks of the sleeve and shaft respectively.

10. In combination, a shaft carrying a pair of disks, a trip upon each of said disks, held in fixed circumferential relation to each other by attachment of the disks to the shaft, a sleeve mounted to turn upon said shaft, a pair of disks carried by said sleeve, one of which lies substantially face to face with one of the disks of the shaft, a pair of trips carried by the disks of the sleeve and held in fixed circumferential relation to each other by the attachment of the disks of the sleeve to said sleeve, a latching mechanism between the abutting disks of the sleeve and shaft respectively, adapted to engage at a large number of positions circumferentially of the shaft, so that the sleeve may be locked to the shaft in a large number of varying circumferential positions, a master double throw switch, a part carried by the master switch disposed in position to be engaged by and to move the master switch in one direction under the influence of that trip of the shaft that is carried by the disk which lies in confronting relation to the disk of the sleeve, said part being moved to move the master switch in the opposite direction under the influence of that trip that is carried by the disk of the sleeve which lies in confronting relation to the disk of the shaft, a pair of double throw auxiliary switches comprising actuating parts disposed in the path of movement of and adapted to be moved in one direction by the trips that are carried by the remaining disks of the sleeve and shaft respectively, members loosely mounted adjacent each of these last-named disks, latching mechanisms between said members and said last-named disks, and trips carried by said members for moving the auxiliary switches in the other direction.

LEROY A. CLARK.