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2,784,276

STEPPING SWITCH APPARATUS

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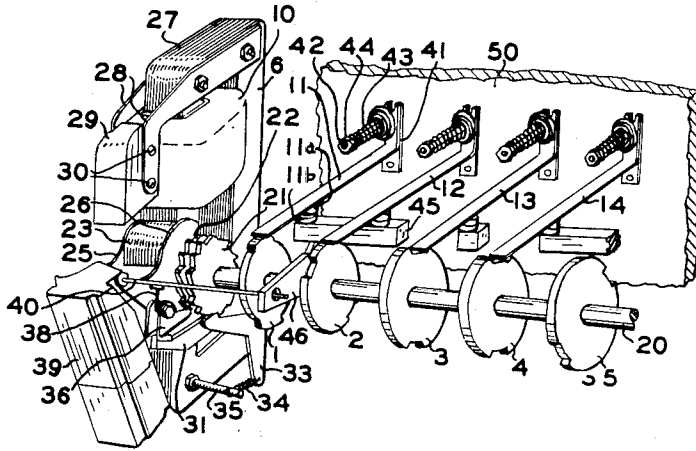


FIG. 1

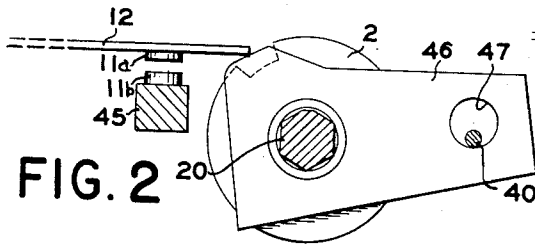


FIG. 2

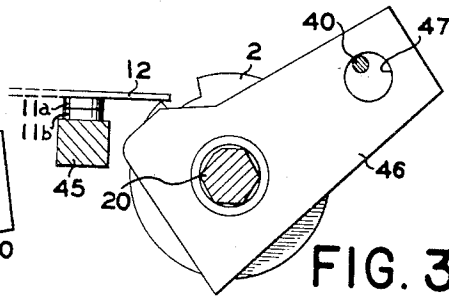


FIG. 3

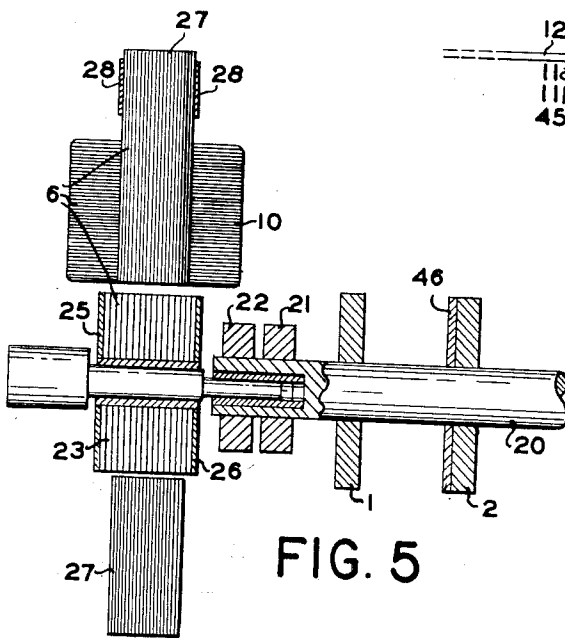


FIG. 4

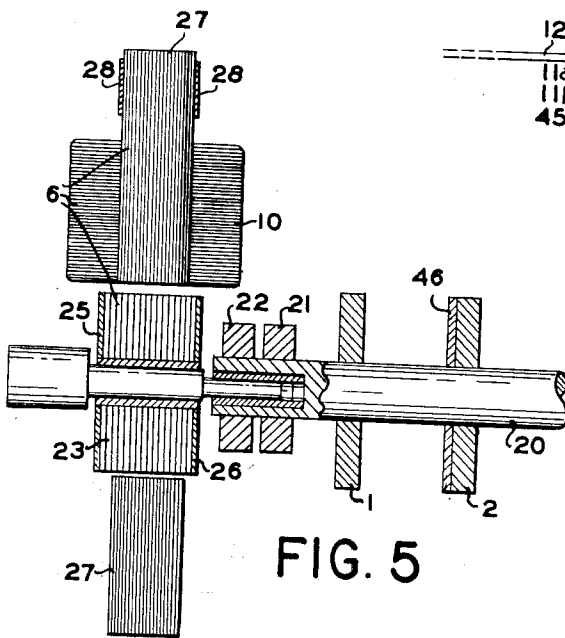


FIG. 5

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2,784,276

STEPPING SWITCH APPARATUS

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Original application February 21, 1949, Serial No. 77,528, now Patent No. 2,624,793, dated January 6, 1953. Divided and this application October 27, 1952, Serial No. 317,074

5 Claims. (Cl. 200—105)

This application is a division of my copending application, Serial No. 77,528, filed February 21, 1949, and which eventuated on January 6, 1953, into United States Patent No. 2,624,793.

This invention relates to signaling systems and apparatus and more particularly to apparatus for providing different schedules of traffic control at different times of the day.

On main thoroughfares, it is desirable to provide a traffic control system that will permit a car starting at one end of the main street to travel at a designated speed and be given a green "go" signal at each intersection. This is termed a progressive traffic control system as the main street green signals at each intersection are timed to come "on" as the vehicle progresses down the street at a specified speed.

The equipment used to provide this type of traffic control normally consists of a local controller at each street intersection which is synchronized with a single master timer. The local controller has a step switch which operates the signals in the proper sequence. A motor driven cycle dial with adjustable levers operates a set of switches momentarily to advance the step switch from one position to the next. The time that the signals remain in each condition is determined by the positioning of the dial levers. The signals go through a complete cycle in the time required for the cycle dial to make one revolution. The cycle dial on each controller is synchronized by the master timer so that the cycle dial at each intersection rotates according to a predetermined phase relation with each other and thus provides progressive movement of traffic along the main street.

This invention pertains mainly to above mentioned type of traffic controllers except having multiple cycle dials any one of which may be selected to advance the step switch. Multiple cycle dials permit setting a different timing program on each to handle different traffic conditions most efficiently.

The object and general nature of the present invention is the provision of a new and improved stepping switch in which a switch is under the control of two means, one progressively advanced by a solenoid and the other serving to modify the response of the switch to the first means by the operation of the solenoid.

Previous types of multi-dial controllers have not been provided with a satisfactory means of transferring the step switch control from one dial to the other. If this transfer is made without proper synchronization, the signals may remain in one position for an extended period which may be under some circumstances as long as the main street green interval. This causes confusion and unnecessary interruption of traffic.

One object is to provide means whereby a minimum disturbance will result in the movement of traffic at an intersection when transferring from one schedule to another. This makes the transfer possible only when the cycle dials and step switch are in a selected position.

Another object of my invention is to provide an im-

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proved system of traffic control in which each dial of a multi-dial controller is driven by a separate motor at a selected speed from a number of available speeds, any one of which may be selected to control the signal cycle.

Another object is to keep the signal control step switch in synchronism with the cycle dial when transferring from one cycle dial to another.

Another object is to provide a step switch mechanism with a switch to provide a momentary impulse for effecting transfer from one dial to another when the step switch is in a predetermined position.

Reference is made to the following description and the accompanying drawings for a better understanding of my invention together with other and further objects thereof.

Referring to the drawings,

Fig. 1 is a schematic view of the step switch.

Figs. 2, 3, 4, are detail views of the transfer cam and contact on the step switch.

Fig. 5 is a sectional view of the solenoid, armature, ratchet wheels and the cams.

The cycle dial units may be termed timers as they provide impulses according to a preset timed schedule to advance shaft 20.

The step switch assembly shown in Fig. 1 and mounted in the controller housing includes a shaft 20 with suitable bearing supports upon each end. Attached to the shaft 20 is a series of cams 1 through 5 (see Fig. 1) and two ratchet wheels 21 and 22 (Fig. 1) each having 12 notches.

Free to oscillate upon shaft 20 is a laminated armature 23 (Fig. 1) consisting of laminations riveted between side plates 25 and 26. The C-shaped laminations 27 are the field poles for the armature which are magnetized by coil 10. The C-shaped laminations 27 and the coil 10 together constitute a solenoid or actuating means for the shaft 20. Two brackets 28 are attached to the top sides of the laminations 27 and project past the front of the laminations to hold a rubber bumper 29 which is attached with 2 screws 30. On the bottom side of the laminations, an angle bracket 31 is securely bolted. At the back side and near the bottom of laminations 27, a stud carries pawl 33 in lateral alignment with ratchet 21. A spring 34, attached between the pawl and a screw 35 in the laminations 27, causes the pawl 33 to be biased toward engagement with ratchet 21.

The armature side plates 25 and 26 have a projecting portion which extends toward the front of the assembly. A pawl 36 is secured in lateral alignment with ratchet 22. A spring 38 keeps the end of pawl 36 in engagement with the ratchet 22. Attached between the projecting portions of the side plates 25 and 26 is a weight 39. A rod 40 projects from the weight 39 and the armature side plates. The top and bottom portion of the armature laminations 23 are each spiral shaped so that when the weight 39 holds the armature as shown in Fig. 1, approximately a 1/16 inch air gap exists between the field pole and the front of the spiral armature. When the coil 10 is energized, the magnetic lines of force, endeavoring to establish a magnetic path of minimum reluctance, rotate the armature and raise the weight 39 until it strikes the rubber bumper 29. At this point there is only a thousandths air gap between the armature and field laminations. This movement is sufficient to cause pawl 36 to move slightly past the next tooth in ratchet 22. Pawl 33 prevents the shaft 20 from rotating in the upward direction with the armature. When coil 10 is deenergized, weight 39 falls downward and pawl 36 causes the shaft 20 to move forward the angular distance equal to one ratchet tooth. When pawl 36 hits the angle plate 31, the armature stops and the shaft is prevented from moving farther because of the wedging action of pawl 36 between the angle plate 31 and ratchet 22.

Associated with the cam 1 is an L-shaped contact finger 11 which is pivotly mounted on a terminal lug 41 secured to an insulating base panel 50. A screw 42 going through the panel 50 and lug 41 holds a spring 43 between nut 44 and contact finger 11. This spring presses contact finger 11 downward so that a contact point 11a attached to the finger comes into engagement with contact 11b on a stationary bus bar 45. The end of finger 11 rides on cam 1 and is lowered and raised as the cam is rotated according to cut out sections of the cam.

Contact finger 12 operates in a similar manner except it is controlled by cam 2 and in addition by a cam 46 which oscillates about shaft 20. Cam 46 has a projecting portion with an opening 47 through which rod 40 projects. When coil 10 is energized to move the armature upward, rod 40 moves cam 46 upward. Deenergizing coil 10 releases the armature and cam 46 drops to its normal position. Cam 2 has a cut out section or notch, which permits contact finger 12 to close its contact if the cam is positioned as shown in Fig. 2. However, the cam 46 prevents the finger 12 from falling into the notch in cam 2. When coil 10 is energized, cam 46 is rotated and the raised portion of the cam is moved away from the contact finger 12 allowing it to close as shown in Fig. 3. When coil 10 is deenergized, cam 46 drops and cam 2 is also rotated one step so its notch is no longer presented to finger 12. Thus the next five succeeding oscillations of cam 46 will not lower finger 12 as it is held by cam 2 as shown in Fig. 4.

Therefore in the position of shaft 20 corresponding to the cut out portion of cam 2, switch 12 will close when coil 10 is energized and will open when the coil is deenergized. This switch provides an impulse to release the relays described in Patent No. 2,624,793. The other cams 3 thru 9 operate fingers 13 thru 19 respectively according to the cut out portions on their edges. Ratchets 21 and 22 have 12 notches for the particular controller being described. This is a number standardized upon for commercial convenience in providing various signal combinations. Only 6 of the 12 step switch positions are used for the signal display herein described so that the cam contour of each cam between 0° and 180° is duplicated between 180° and 360°. The cams are cut to close the switches in each of six positions shown in the table below where "X" indicates a switch closed and "O" indicates a switch open. The numerals below, from 16 to 19, represent switch blades similar to 11 to 14 which are operated by cams similar to 1 to 5.

Switch	Position of Shaft 20					
	1	2	3	4	5	6
11.....	O	X	X	X	X	X
12.....	O	O	O	O	O	X
13.....	X	O	O	O	O	O
14.....	X	X	O	O	O	O
15.....	O	O	X	O	O	O
16.....	O	O	O	X	X	X
17.....	O	O	O	X	X	O
18.....	O	O	O	O	O	X
19.....	X	X	X	O	O	O

It is of course understood that the specific description of the structure set forth may be departed from without departing from the spirit of this invention as disclosed in this specification and as defined in the appended claims.

Having now described my invention, I claim:

1. In a circuit controller, the combination of a shaft, a solenoid, means connected with the shaft and actuated by said solenoid to advance said shaft step by step, a normally closed switch, a cam having a cutaway portion therein, said cam being mounted on said shaft and having means for holding said switch open except when the cutaway portion is in a predetermined position, a second cam movably mounted on said shaft adjacent said first cam and actuated by said solenoid, having a raised por-

tion to hold said switch open when the solenoid is deenergized and to present a cutaway portion of the cam to the switch when the solenoid is energized, the said switch closing when the cutaway portions of the first and second cams are presented to said switch at the same time, and means actuated by said solenoid for moving said second cam.

2. In a circuit controller, the combination of a control switch, a shaft with which said switch is associated, a cam mounted on said shaft for opening and closing said switch upon rotation of said shaft, a solenoid, means actuated by said solenoid for advancing said shaft step by step, a second cam free to oscillate about said shaft and shaped to hold said switch unresponsive to said first cam, in one position, and responsive to said first cam in a second position, and connecting means between said second cam and the solenoid to hold the second cam in one position when the solenoid is deenergized and to move the second cam to the other position when the solenoid is energized.

3. In a circuit controller, the combination of a control switch, a shaft, intermittent driving means for advancing said shaft, a cam fixed to move with said shaft and shaped to normally hold said switch open and to permit closure of said switch in a predetermined position of said shaft, a member shaped to hold said switch unresponsive to said cam in one position and responsive to said cam in a second position, means movably mounting said member in a position to engage said switch, means to hold said member normally in the first position independently of the rotation and position of said shaft and including a connection to said driving means for moving said member to its second position upon operation of said driving means.

4. In a circuit controller, the combination of a control switch, a shaft, a ratchet means for advancing said shaft step by step, actuating means for the ratchet means, a cam fixedly mounted on said shaft and shaped to normally hold said switch open and to permit closure of said switch in a predetermined position of said shaft, a member mounted for movement on said shaft and arranged to engage said switch and shaped to hold said switch unresponsive to said cam in one position and responsive to said cam in a second position, means to hold said member normally in the first position independently of the rotation of said shaft and including a connection to said ratchet means for moving said member to its second position as the said actuating means operates to advance said shaft.

5. In a circuit controller, the combination of a control switch, a shaft, a ratchet for advancing said shaft step by step, actuating means for the ratchet, a cam fixedly mounted on said shaft and shaped to normally hold said switch open and to permit closure of said switch in a predetermined position of said shaft, a movable member in the form of a second cam mounted to engage said switch and shaped to hold said switch unresponsive to said cam in one position and responsive to said cam in a second position, connecting means between the ratchet and the member including a slip motion connection to move the member to the first position at the end of the ratchet movement in one direction and to delay the return movement of the member in the opposite direction for part of the ratchet movement.

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