

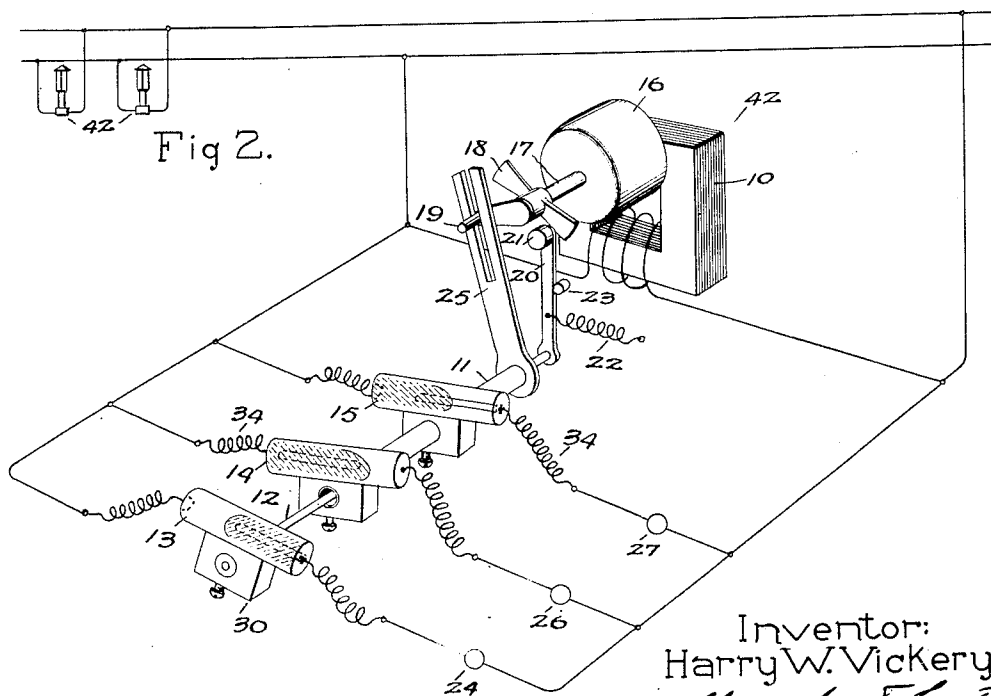
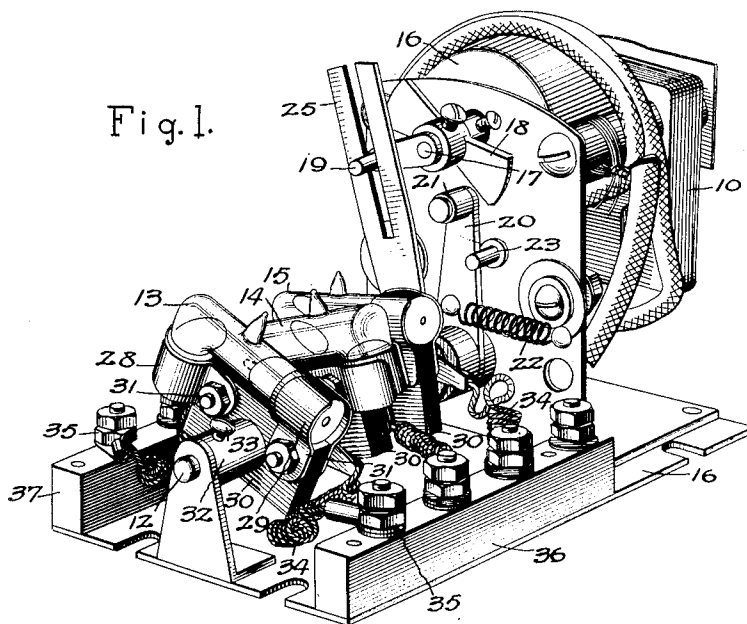
Feb. 5, 1929.

1,701,398

H. W. VICKERY

PERIODIC SWITCHING MECHANISM

Original Filed Feb. 20, 1924 2 Sheets-Sheet 1



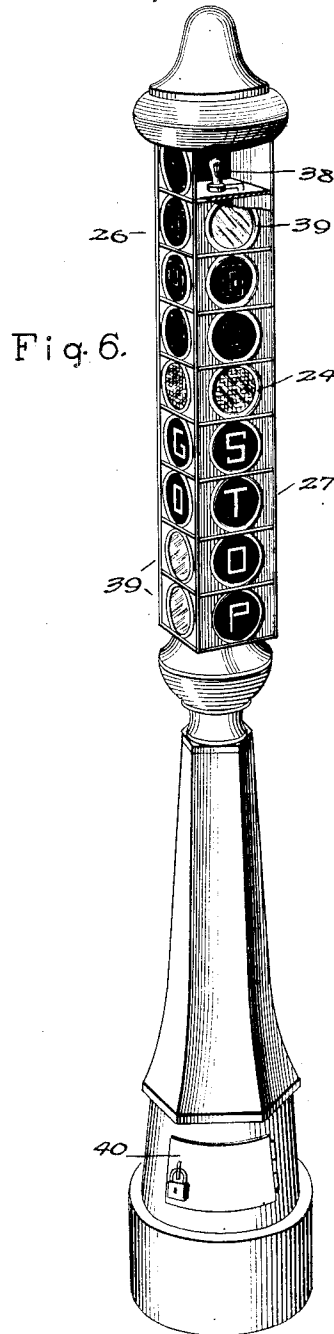
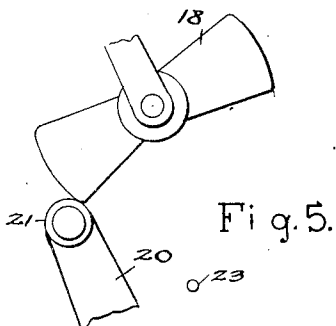
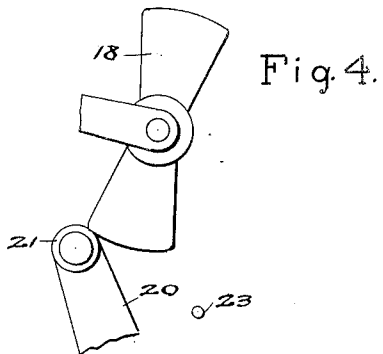
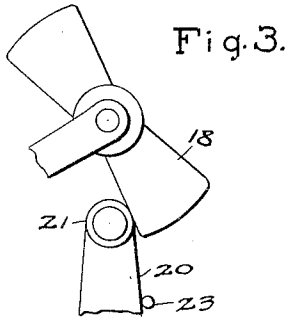
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PERIODIC SWITCHING MECHANISM

Original Filed Feb. 20, 1924 2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

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PERIODIC SWITCHING MECHANISM.

Application filed February 20, 1924, Serial No. 694,142. Renewed August 28, 1928.

My invention relates to time controlled switches for controlling a plurality of translating devices such as lamps and the embodiment hereinafter described is designed for controlling illuminated semaphore signals for street intersections where "start", "stop" and "get-ready" signals are provided to direct the traffic at street intersections. As hereinafter pointed out, the "get-ready" signal is flashed twice for each flashing of the other signals.

The objects of my invention are to provide a highly reliable, simple, and readily adjustable apparatus for this type of work.

The features of my invention which I believe to be novel and patentable will be pointed out in the claims appended hereto. For a better understanding of my invention reference is made, in the following description, to the accompanying drawings, Fig. 1 of which shows a perspective view of a motor-driven switching device embodying my invention; Fig. 2 a schematic view of the same together with the circuit connection; Figs. 3, 4 and 5 show different operating positions of one portion of the mechanism and Fig. 6 shows the exterior appearance of a traffic signal to which my invention is applicable.

Referring now more particularly to Figs. 1 and 2, the switching apparatus consists in general of a suitable electric operating motor 10, a pair of concentric shafts 11 and 12 upon which are mounted mercury tube switches 13, 14 and 15 and suitable mechanical connections between the motor and shafts for tilting the mercury switches in the desired manner and sequence. The apparatus is all mounted on a common base 16. Where mercury tube switches are specified in the description and claims I mean any liquid contact switch which is the equivalent of a mercury tube switch irrespective of whether mercury or some other suitable liquid conductor is used therein.

The terminal shaft 17 has on its forward end an adjustable double-ended cam member 18 and a crank arm 19. Cam member 18 cooperates with a lever arm 20 preferably provided with a roller 21 on its outer end which cooperates with the periphery of the cam in the manner now to be described. The terminal shaft of the motor and the parts carried thereby, rotate in a clockwise direction. Lever arm 20 which is secured to shaft

12, is normally pulled to the right by a spring 22 against a stop 23. Cam member 18 in rotating, moves against the roller 21 with the radial edge of the cam against the roller as in Fig. 3. The lever 20 is then moved to the left to the position represented in Fig. 4 where the roller 21 moves from the edge of cam 18 to the periphery thereof. The lever 20 maintains this position while the cam periphery rolls on the roller to the rear edge of the cam as indicated in Fig. 5. At which time, the lever is released and snaps back against stop 23. Thus, it will be evident that the distance the lever 20 is moved is determined by the radial length of cam 18 and the duration of time the lever 20 is maintained in a restrained position, is determined by the periphery length of cam 18. There being two such cams 180° apart, the lever 20 together with shaft 12 is oscillated in this manner twice for each revolution of the shaft 17. This mechanism operates the switch 13 which controls the "get-ready" signal indicated at 24. In the position indicated in Figs. 1 and 2, this switch is open and when the lever 20 is in the position shown in Figs. 4 and 5, the switch 13 is closed.

The crank arm 19 cooperates with the forked lever 25 which is secured to shaft 11. Shaft 11 is preferably hollow which permits the two shafts 11 and 12 to be concentrically mounted and independently operated by this simple mechanism. The forked lever 19 simply moves back and forth due to the rotation of the crank 19 and thus rocks the shaft 11. The shaft 11 controls the "start" and "stop" signal switches 14 and 15, and the "start" and "stop" signals 26 and 27. One of these switches is opened while the other is closed and vice versa. Thus in Fig. 2 switch 15 is closed and switch 14 is open. These switches open and close once for each revolution of the shaft 17.

I prefer to use mercury tube switches as indicated because they can be made to stand continuous service without burning the contacts to such an extent as to render them useless or destroy the accurate adjustment of the sequence of operation. The tubes have their electrodes in opposite ends thereof and one electrode is made considerably longer than the other to reduce the resistance of the switch and to secure reliability of operation. The mercury tubes are secured in clips 28 and 29, which clips enclose metallic bands on

the ends of the tubes, and which constitute the circuit terminals of the tubes. The clips 28 and 29 are rigidly secured to members 30 of insulating material by means of bolts 31.

5 The insulating members 30 are secured to suitable bushings 32 which in turn are adjustably secured in fixed relation to their respective shafts by screws 33. The external electric terminals consist of flexible conductors 34 secured between the terminal clips 10 and stationary terminal posts 35 set in insulating blocks 36 and 37 as illustrated.

Since the various tubes are adjustably mounted on their respective shafts, and since 15 the cam 18 is adjustable with respect to crank arm 19, it will be evident that the desired relation of signal operations may be secured for conditions met with in traffic signalling.

In Fig. 6 I have shown a signal tower suitable for controlling heavy traffic conditions at 20 street intersections. The upper portion of the tower has, in this case, nine sections each containing an electric lamp as indicated at 38. This portion of the tower has a rectangular cross-section, such that the four sides 25 face in four different directions. The various sections are provided with windows on their four sides. Some of these windows are closed with an opaque enclosure such as at 39, other windows are provided with transparent 30 sections in the form of letters, while the central section 24 has all four sides provided with a yellow lense and which in this case constitutes the "get-ready" signal. The opposite 35 faces of each section are similar so that the same signals are flashed in opposite directions when the lamps contained therein are energized.

The lamps in the four upper sections are 40 controlled in this case by the switch 14. The lamp in the central section 24 is controlled by the switch 13 while the lamps in the four lower sections are controlled by the switch 15. The lamps of the upper, middle and lower 45 sections may thus be represented by the signal lamps 26, 24 and 27 respectively in Fig. 2. When switch 15 is closed, as indicated in Fig. 2, the lamps in the four lower sections will be energized and the "stop" signal will be 50 flashed in two opposite directions for one street while the "go" signal will be flashed for the street at right angles thereto. Just before these lamps are extinguished and the upper set of lamps are energized, to reverse 55 the "start" and "stop" signals with respect to the intersecting streets, it is desirable to flash a "get-ready" signal to indicate to the traffic that a change is about to take place. This is done by the momentary flashing of lamp 24 in 60 the central section due to the closure of the switch 13, which remains closed only for an instant. The next operation is to open switch 15 and close switch 14, which extinguishes the lower set of signal lamps and flashes on the 65 upper set of signal lamps, thereby reversing

the words "Stop" and "Go" with respect to the intersecting streets. The switches 14 and 15, unlike switch 13, do not snap open but are tipped back and forth somewhat more slowly so that the duration of the "start" and "stop" 70 signals are of appreciable length and the arrangement is such that one of these switches is closed while the other is open. Again, just before the "stop" and "go" signals are changed, it is desirable to flash the "get-ready" 75 signal which is done by the second closure of switch 13, which, it will be remembered, is arranged to close twice for each operation of the other two switches.

It will be evident that this desired sequence 80 may be secured by the switching device described. The time in which the "get-ready" signal 24 is made with respect to the "go" and "stop" signals is determined by the adjustment of cam 18 with respect to crank 19. The 85 duration of said signal will be determined by the peripheral length of cam 18, while a finer adjustment in this respect may be secured by adjusting the tilted position of tube 13 with respect to lever 20. The time relation between 90 the signal lamps 26 and 27 may be adjusted by the tilt of the tubes 14 and 15 with respect to the forked lever 25 and with respect to each other. Thus, suppose the traffic is considerably 95 heavier on one street than it is on the intersecting street, the "go" signal for the heavy traffic may be adjusted to be energized longer than the "stop" signals, and the "go" signal for the lighter traffic may be adjusted for a shorter period by the proper adjustment of 100 the tubes 15 and 16.

The switching device is preferably placed in the base of the signal tower where it can be inspected and minor adjustments made by 105 opening a door indicated at 40. The door is preferably kept locked so that only authorized persons may open the same. The circuit connections are preferably carried inside the tower to a ground conduit, although an overhead circuit may be used if desired. The same 110 type of switching device may be used for operating additional signals or a lesser number of signals than those hereinbefore described by an additional or a lesser number of tubes mounted on the shafts 11 and 12 and in 115 some cases the "get-ready" signal and its operating mechanism may be omitted.

I prefer to place an ordinary street light in the dome shown in the signal post of Fig. 6 and connect it to the lighting circuit so that 120 when the signal lamps are not in operation the post may be illuminated. This is desirable because the post will usually be situated in the center of two intersecting streets.

While I have shown in the accompanying 125 drawings one embodiment of my invention, I do not wish to be limited thereto but aim to embrace in the appended claims all modifications falling fairly within the scope of my invention. 130

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. A switching device comprising a rotary motor, a pair of concentric shafts, mercury tube switches mounted on said shafts, and mechanical connections between said motor and said shafts for rocking the tubes which are mounted on the different shafts at different rates to open and close said switches.
2. A switching device comprising a constant speed motor, a pair of pivotally mounted mercury tube switches, a mechanical connection between said motor and one of said tubes for rocking the tube to open and close the switch at a predetermined rate, and a mechanical connection between said motor and the other tube for rocking the same to open and close the switch at a different predetermined rate.
3. In a switching device, a constantly rotating motor, a sector shaped cam driven by said motor, a rotary shaft, a crank arm secured to said shaft, a stop, a spring for normally holding said arm against said stop, a roller on the end of said crank positioned in the path of movement of said cam in such manner that the radial surface of the sector shaped cam in rotating contacts with the roller and rotates the crank arm away from said stop against the tension of said spring a distance determined by the radial length of the cam and thereafter the peripheral surface of said cam engages said roller and holds the crank arm in said position a length of time dependent upon the peripheral length of the cam, and a mercury tube switch on said shaft positioned to be open in one extreme position of said crank arm and closed in the other extreme position of said crank arm.
4. A switching device comprising a constant speed motor, a pair of concentric shafts, a mercury tube switch mounted on each shaft and in adjustable relation thereto, a slotted arm secured to one of said shafts, a crank arm driven from said motor having a pin engaging the slot in said arm and arranged to rock the shaft secured thereto back and forth to open and close the switch carried thereby once for each revolution of the crank, a crank arm carried by the other shaft, a double ended cam driven by the motor at the same speed as it drives the first mentioned crank, and arranged to engage the second mentioned crank arm to rock the shaft secured thereto to open and close the switch carried thereby twice for each similar operation of the other switch.
5. A switching device comprising an electric motor, a plurality of mercury tube switches pivotally mounted so as to be rocked back and forth to open and closed positions, a mechanical connection between said motor and some of said tubes for slowly rocking said tubes at a predetermined rate, and a mechanical connection between said motor and another of said tubes for more quickly rocking the same at a different predetermined rate.
6. A switching device comprising a plurality of pivotally mounted mercury tube switches, an electric driving motor, driving mechanism between said motor and said tubes for tipping said switches to open and closed positions and means contained in said mechanism for adjusting the sequence of operation of said switches.

In witness whereof, I have hereunto set my hand this fifteenth day of February, 1924.

HARRY W. VICKERY.