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SWITCH MECHANISM FOR SIGNAL AND OTHER ELECTRICAL CIRCUITS

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This invention relates to switch mechanism for signals and other electrical circuits of a kind wherein a switch is operated at predetermined time intervals by means of a constantly operating member.

One of the kinds of apparatus with which such a switch mechanism may be advantageously used is the so-called system of traffic signal lights now commonly employed at street intersections and at the intersections of other traffic highways.

In such installations, the switch mechanism which controls the operation of the signal lights is ordinarily mounted apart from the lights themselves and in such position that it is readily accessible to an authorized person for adjustment, whereby the on and off time intervals for the various lights may be adjusted by proper adjustment of the switch mechanism. Obviously, it is desirable to have the switch mechanism for such apparatus of a compact and simple nature, readily accessible for inspection and adjustment, and of such construction as to be capable of continuous operation for extended periods without liability to failure.

In switch devices for the purpose mentioned, with which I am familiar, considerable reduction gearing and complicated adjustable switch mechanism is employed; and one of the objects of this invention is to provide a switch mechanism which is susceptible of all such adjustment as may ordinarily be found necessary for the proper operation of traffic signals and the like, but which at the same time is of compact form, few parts, and simple rugged construction.

In traffic signal systems of the kind mentioned, various visible, and sometimes audible signals are used. For example, there may be a red light which remains lighted for a certain time interval and is then extinguished and a green light lighted; or there may be a red light which is lighted for a predetermined time interval, and an amber light lighted near the expiration of such time interval and burning simultaneously with the red light, and both extinguished, and then a green light lighted for a predetermined time interval and an amber light lighted near the

expiration of this time interval and burning with the green light, and then both extinguished and the red light lighted and so on; or the lights may operate according to either method just described and an audible signal, such as a bell, sounded when the changes from red to green and from green to red are to be made; and it is a further object of the invention to provide switch mechanism in which all of the various switches necessary for the operation of visible and audible signals, either as just pointed out or according to other conceivable schemes of operation, may be embodied in a single simple organization of switch mechanism.

The invention contemplates a switch mechanism, including two relatively movable contact carrying members, preferably in the form of co-axially arranged relatively rotatable disks, these members being driven by a single driving member and having such characteristics, notably a difference in diameter, whereby they will be rotated by the driving member at different speeds to thus obtain a circuit controlling switching action between their contacts. And the invention contemplates also various structural refinements whereby the switch mechanism is made markedly simple and efficient, as will be hereinafter more fully explained and finally claimed.

In the accompanying drawings illustrating the invention, in the several figures of which like parts are similarly designated, Fig. 1 is a side elevation of apparatus embodying the features of this invention. Fig. 2 is a partial longitudinal axial sectional elevation of the apparatus shown in Fig. 1. Fig. 3 is an inner face view of the toothed disk carrying the contact plates, and Fig. 4 is an outer face view of same. Fig. 5 is an outer face view of the toothed disk carrying the contact arms, and Fig. 6 is an inner face view of same. Fig. 7 is a wiring diagram showing a conventional set of circuits which may be controlled by the switch mechanism of the invention and which is suitable for a system of visible traffic control signals.

The switch mechanism includes, in the form illustrated, a base 1 carrying an upstanding

bearing bracket 2, preferably formed integral therewith, and a removable bearing bracket 3 suitably spaced from the bearing bracket 2. Mounted in suitable bearings 4 and 5 in the brackets 2 and 3, respectively, is a shaft 6 upon which are mounted for free relative rotation the contact carrying members or disks 7 and 8.

These disks are formed of some insulating material, such as fiber or the like, and are provided at their peripheries with gear teeth 9 and 10, respectively, which mesh with the teeth 11 of an elongated pinion 12 carried by and rotatable with the shaft 13 of a motor 14 fixed to the base 1.

The disk 7 is of greater diameter than the disk 8, and has more teeth upon its periphery, and the teeth 11 of the pinion 12 are of a depth sufficient to accommodate the teeth of both of the disks 7 and 8 and to thereby drive the disks simultaneously regardless of their difference in diameter, but at different speeds, the disk 7 having the greater peripheral speed.

The disk 7 carries upon its inner face a plurality of segmental contact plates 15, 16, 17, and 18 arranged circumferentially upon one predetermined radius, and a second plurality of segmental contact plates 19, 20, 21 and 22 arranged circumferentially upon another predetermined radius, preferably so that they lie nearer to the center of the disk than do the first mentioned contact plates. It will be seen that the contact plate 15 extends through an angle of approximately 180°, whereas the contact plates 16, 17, and 18 extend through angles approximately 60° each, spaces or gaps being left between the adjacent ends of all of the plates. It will be seen also that the contact plates 19, 20, 21 and 22 extend through an angle of approximately 25° each and are so arranged relatively to the plates 15, 16, 17 and 18 that an end of each one of them lies on a diametrical line substantially coincident with one end of each of the plates 15, 16, 17 and 18. Referring now to Fig. 4 it will be seen that the contact plates 15, 16, 17 and 18 are mounted in fixed relation relatively to the inner face of the disk 7 by means of screws 23 and 23' which pass through the disk and are threaded into the plates. The screws 23 attach the mid portion of the plate 15 to the disk and the screws 23' attach the adjacent end portions of the plates 15, 16, 17 and 18 to the disk. In addition to these screws 23 and 23' I provide combination attaching and binding screws 24 which will be referred to in more detail later.

The contact plates 19, 20, 21, and 22 are similarly attached to the inner face of the disk 7 by means of screws 25 and 26, the screws 25 acting merely as attaching screws and the screws 26 acting both as attaching screws and as binding screws and electrical

conductors, as will be hereinafter pointed out.

Held beneath the screws 23' of the plates 15, 16, 17 and 18, and electrically connected to these plates thereby, are conductor members 27 which may be electrically connected by means of washers 28 and screws 29 as shown, whereby any of the plates 15, 16, 17 and 18 may be electrically connected together.

Carried by the screws 26 and electrically connected to the contact plates 19, 20 and 21 thereby are conductor members 30 adapted to cooperate by means of washers 31 and screws 32 with similar conductor members 33 carried by binding screws 34 to which are attached connecting wires or the like 35. By these means it will be seen that any of the contact plates 19, 20, and 21 may be electrically connected to the contact plate 22.

Referring to the hereinbefore recited practical application of the switch mechanism to a traffic signal, it will be recalled that three sets of lights, red, amber and green, respectively, are used. The contact plates 15, 16, 17 and 18 are used for controlling the circuits through the lamps of the red and green lights, for lighting and extinguishing them at predetermined desired time intervals, and the contact plates 19, 20, 21 and 22 are used for properly lighting and extinguishing the lamps of the amber lights in timed relation to the lighting and extinguishing of the red and green lights. With the various contact plates connected as illustrated in Fig. 4, the electrical circuits for the red and green lights are so made that they will remain lighted alternately throughout the same period of time, and the circuits for the amber lights are so arranged that they will be lighted and extinguished in proper timed relation to the extinguishing of the red and green lights.

At some street or highway intersections, notably where a cross street intersects a traffic artery, it is desirable to have the green light, indicating "Go", burn longer for the traffic artery than for the cross street. When this is the case, it will be seen, assuming that the contact plate 15 controls the green lamp, that by electrically connecting the plate 18 or the plates 18 and 17, thereto by means of the association therewith of the washers or the like 29 and screws 28 with the contact members 27 thereof it will be possible to extend the time interval throughout which the green light may burn, the time interval throughout which the red light burns being correspondingly shortened. When this rearrangement is made, obviously the connection of the plates 19, 20, 21 and 22 must be altered, and this may readily be done by changing the location of the washer 31 and screw 32 to a position adjacent to the plate 20 or the plate 21.

Referring to Fig. 2 it will be seen that the disk 7 is fixed upon a metallic sleeve 35 which

carries an insulating sleeve 36 Upon this insulating sleeve 36 are mounted distributor rings 37, 38 and 39 spaced apart by insulating washers 40 and clamped upon the sleeve 36 by means of an insulating washer 41 and set collar or nut 42 screw-threaded onto the end of the sleeve 35

The bracket 2 has an extension 43 in which are mounted brush holders 44, 45, and 46, carrying brushes 47, 48, and 49, in engagement with the distributor rings 37, 38 and 39, respectively

The screw 24 of contact plate 15 is connected by means of a wire 50, or other suitable conductor, with the distributor ring 37 and therethrough with the brush 47 and brush holder 44 The screw 24 of contact plate 16 is connected through a wire 51 or other suitable conductor, with the distributor ring 39 and therethrough with the brush 49 and brush holder 46, and the screw 26 of the contact plate 22 is connected by a wire 52, or other suitable conductor, with the distributor ring 38 and therethrough with the brush 48 and brush holder 45 The wires 50, 51 and 52 are shown as arranged along the outer face of the disk 7 and extending into and through the sleeve 36 to their points of connection with their respective distributor rings but, obviously, other appropriate arrangements of these conductors may be made

Referring to Figs 5 and 6 it will be seen that the disk 8 carries on its inner face two resilient contact arms 53 and 54 having their contact ends 55 and 56, respectively, so radially disposed as to wipe over the two circumferential rows of contact plates 15, 16, 17 and 18, and 19, 20, 21 and 22, respectively These contact arms 53, 54 are connected by means of screws 57 and 58 respectively, with a collector ring 59 secured by screws 60 to the outer face of the disk 8

Mounted in the bracket 3 is a brush holder 61 carrying a brush 62 in electrical contact with the collector ring 59

It will be seen that, due to the difference in speed of rotation of the disks 7 and 8, the contact arms 53 and 54 will travel over the contact plates with which they are associated, thus switching the circuits through the lamps of the red, green and amber lights on and off at proper intervals and in proper timed relation to each other

The arrangement of contact plates, contact arms, distributor rings and brushes hereinabove described is adapted to a system in which three circuits, such as are necessary for red, green and amber signalling lights, are used If more circuits, such as those for audible signals or other devices operated in timed relation to the lights, are necessary, other contact plates, contact arms, distributor rings and brushes may be provided

Referring to Fig 7 it will be seen that two sets of red, amber and green lights have been

indicated, the two amber lamps being in series and a red lamp and a green lamp of each set being in series These sets of lights indicate the oppositely controlled lights visible to the operators of vehicles approaching in two intersecting directions at street intersections, whereby when an operator going in one direction receives the green or "Go" signal, an operator approaching in the intersecting direction will see the red or "Stop" signal

The brush 62 which operates upon the collector ring 59 is connected by wire 63 with the power line and thus the contact arms 53 and 54 are always in circuit with the line Also, one pole of each of the red, amber and green lamps is in circuit, through a wire 64, with the line Furthermore, the motor 14 is constantly operated to impart rotation to the switch mechanism so long as current is supplied from the line Therefore, as the disks 7 and 8 rotate relatively to each other the contact arm 53 will contact, let us say, first with the contact plate 15 This will establish a circuit through wire 63, brush 62, collector ring 59, contact arm 53, contact plate 15, distributor ring 37, brush 47, wire 65, green lamp 66, red lamp 67, wire 64, and back to line The green lamp 66, and red lamp 67, will remain lighted until contact arm 53 rides off of contact plate 15 However, before this occurs contact arm 54 will have engaged contact plate 22 and a circuit will be established through wire 63, brush 62, collector ring 59, contact arm 54, contact plate 22, distributor ring 38, brush 48, wire 69, the two amber lamps 70 and 71, and through wire 64 back to line Due to the relative arrangement of the contact plates 15 and 22 contact arm 53 and contact arm 54 will ride off of the contact plates 15 and 22, respectively, simultaneously, thus extinguishing green light 66, red light 67 and the amber lights 70 and 71 But immediately these circuits are opened circuits through the contact plates 16, 17 and 18 will be closed through wire 63, brush 62, collector ring 59, contact arm 53 and plates 16, 17 and 18 which are interconnected as previously described, distributor ring 39, brush 49, wire 72, red lamp 73, green lamp 74, wire 64, and back to line As the contact arm 53 approaches the end of its travel over contact plate 18, contact arm 54 will engage with contact plate 19 and a circuit will be closed, as previously described with respect to contact plate 22, through the two amber lamps 70 and 71 As contact arm 53 rides off of contact plate 18, contact arm 54 will simultaneously ride off of contact plate 19, and then the circuit first described will be again completed, and so on as long as motor 14 operates

It will thus be seen that by my arrangement I am able to control a plurality of inter-related electrical circuits by means of the two

co-axial relatively rotatable disks to which motion is imparted by a single driving member, thus producing a very simple and efficient switching mechanism. Moreover, by varying the speed of the motor which drives the pinion, or by changing the ratio between the pinion and disks, any desired time intervals may be obtained.

Furthermore, by a rearrangement or alteration of the connections between the various segmental portions of the contact plates, as hereinbefore described, it is possible to vary the relative periods of illumination of the red and green signal lamps to accommodate the switch mechanism to various traffic conditions.

Various changes and modifications in the construction and operation of the device are considered to be within the spirit of the invention and the scope of the following claims.

What I claim is:—

1. A switch mechanism, including two contact-carrying disks of different diameters provided upon their peripheries with gear teeth, and a driving pinion meshing with the teeth of both disks and adapted to drive them simultaneously at relatively different speeds, whereby switching action of their contacts is obtained.

2. A switch mechanism, including two disks of different diameters arranged in co-axial juxtaposition, one of said disks carrying a plurality of contact plates and the other disk carrying a contact arm for cooperation with said plates, said disks provided upon their peripheries with gear teeth, and a driving pinion in mesh with the teeth of both of said disks for simultaneously driving same at different speeds, whereby said contact arm will traverse said contact plates to produce a switching action at predetermined time intervals.

3. A switch mechanism, including two disks of different diameters arranged in co-axial juxtaposition, one of said disks carrying a plurality of contact plates and the other disk carrying a plurality of contact arms for cooperation with said plates, a current distributor rotatable with one of said disks, brushes for cooperation with said distributor, gear teeth on the peripheries of said disks, a driving pinion meshing with the teeth of both disks for rotating same simultaneously at relatively different speeds, and means providing an electric circuit through said contact arms, contact plates and distributor, whereby as said disks rotate said contact arms will travel over said contact plates to produce a timed switching action in said circuit.

4. A switch mechanism, including two disks of different diameters toothed upon their peripheries and arranged coaxially face to face in spaced relation, a driving pinion meshing with the teeth of both of said disks

for simultaneously driving same at different speeds, one of said disks provided with a plurality of contact plates arranged in circumferential alignment, the other of said disks provided with a contact arm adapted for sliding engagement with said contact plates during relative rotation of said disks to produce a circuit making and breaking action at predetermined time intervals determined by the connection of said plates and the relative rotative speed of said disks, and means whereby certain of said plates may be electrically connected or disconnected to vary said time intervals.

5. A switch mechanism, including two disks of different diameters toothed upon their peripheries and arranged coaxially face to face in spaced relation, a driving pinion meshing with the teeth of both of said disks for simultaneously driving the same at different speeds, one of said disks provided with two rows of circumferentially arranged contact plates, the other of said disks provided with two contact arms one of which is arranged for sliding engagement with each of said circumferential rows of plates during relative rotation of said disks to produce circuit making and breaking action between said plates and their respective arms at predetermined time intervals determined by the connection of said plates and the relative rotative speed of said disks, one of said arms adapted to close a circuit at a time adjacent to the opening of a circuit by the other arm and to open the former circuit simultaneously with the opening of the latter circuit, and means whereby certain of said plates in each circumferential series thereof may be electrically connected or disconnected to vary said time intervals.

In testimony whereof I have hereunto set my hand this 24 day of Sept., A. D. 1930.

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1,863,658

SWITCH MECHANISM FOR SIGNAL AND OTHER ELECTRICAL CIRCUITS

Filed Oct 23, 1930

4 Sheets-Sheet 1

FIG. 1.

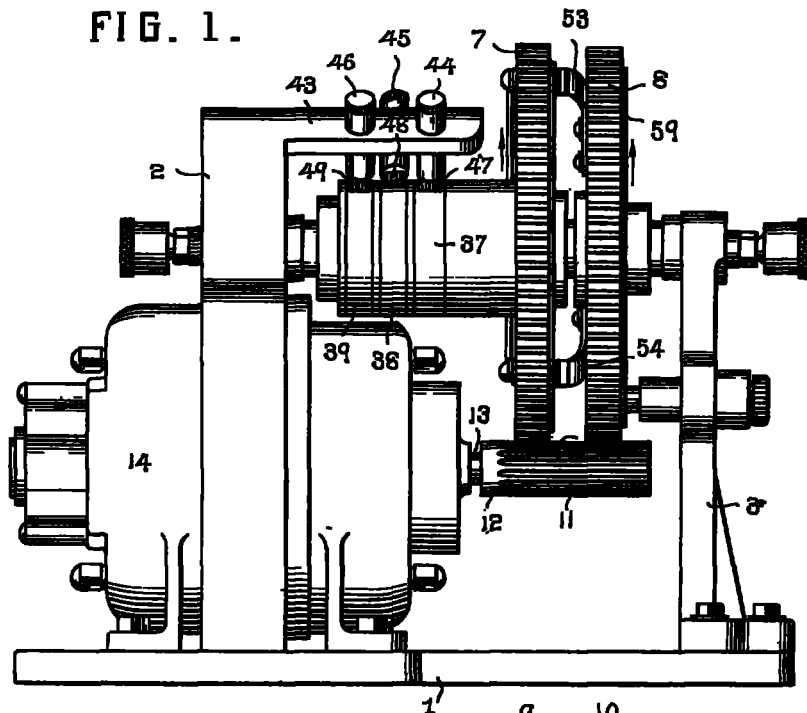
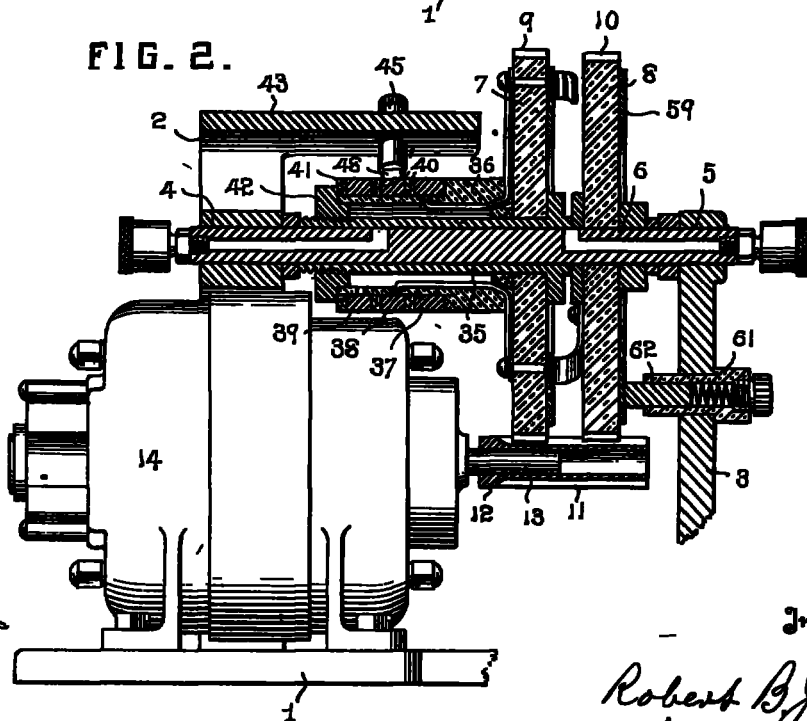


FIG. 2.



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1,863,658

SWITCH MECHANISM FOR SIGNAL AND OTHER ELECTRICAL CIRCUITS

Filed Oct 23 1930

4 Sheets-Sheet 2

FIG. 3.

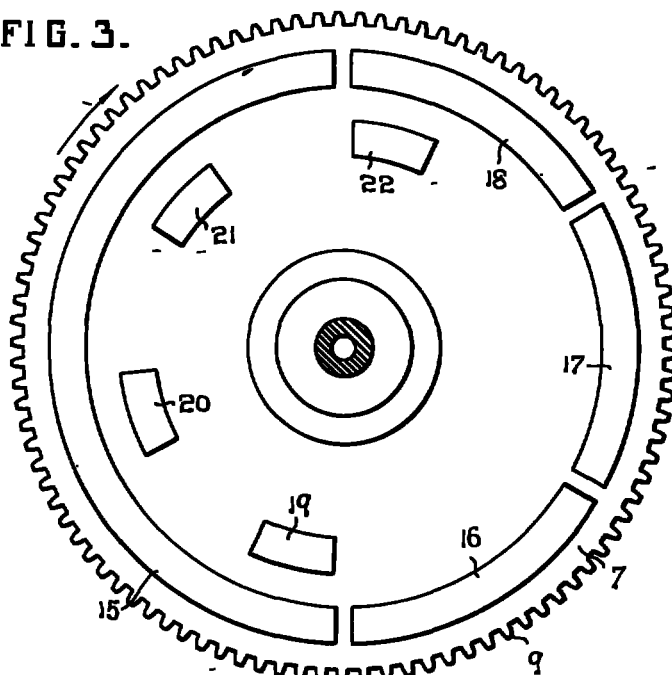
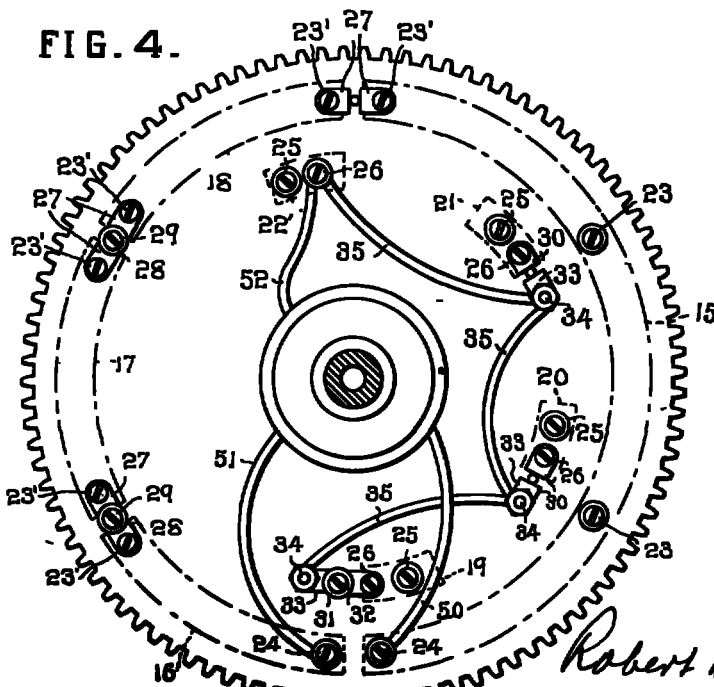


FIG. 4.



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1,863,658

SWITCH MECHANISM FOR SIGNAL AND OTHER ELECTRICAL CIRCUITS

Filed Oct 23 1930

4 Sheets-Sheet 3

FIG. 5.

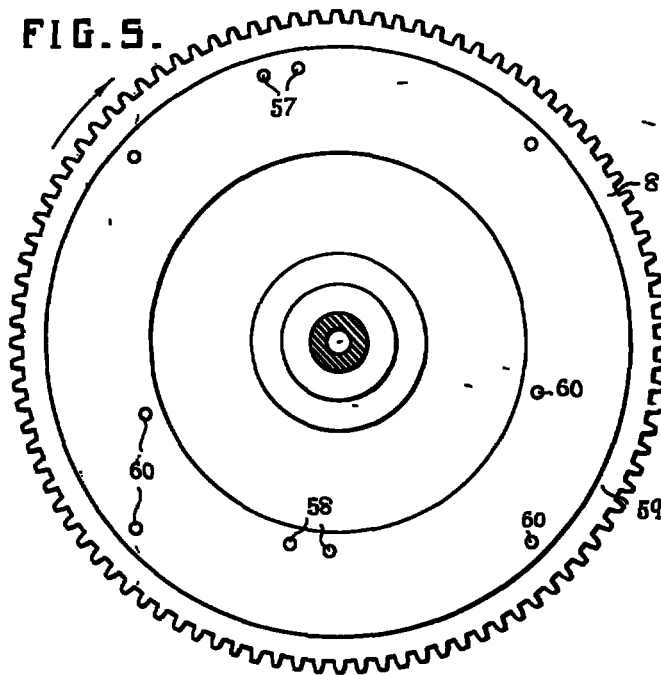
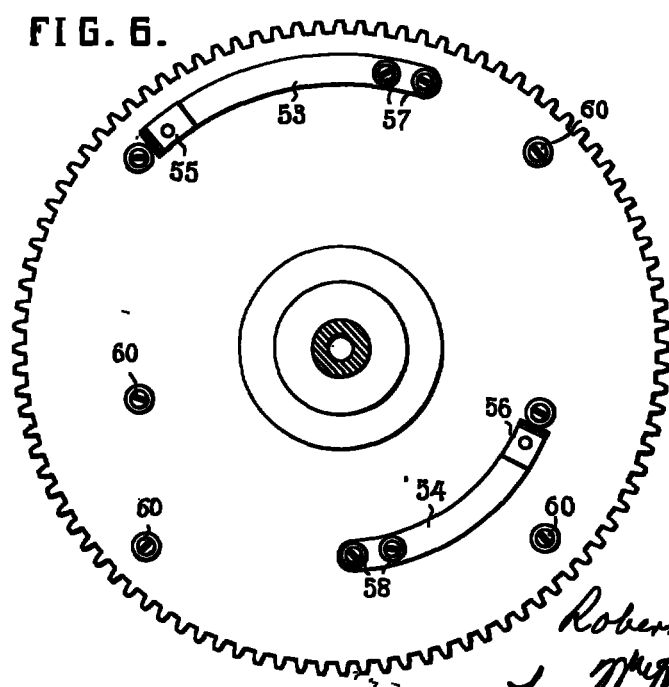


FIG. 6.



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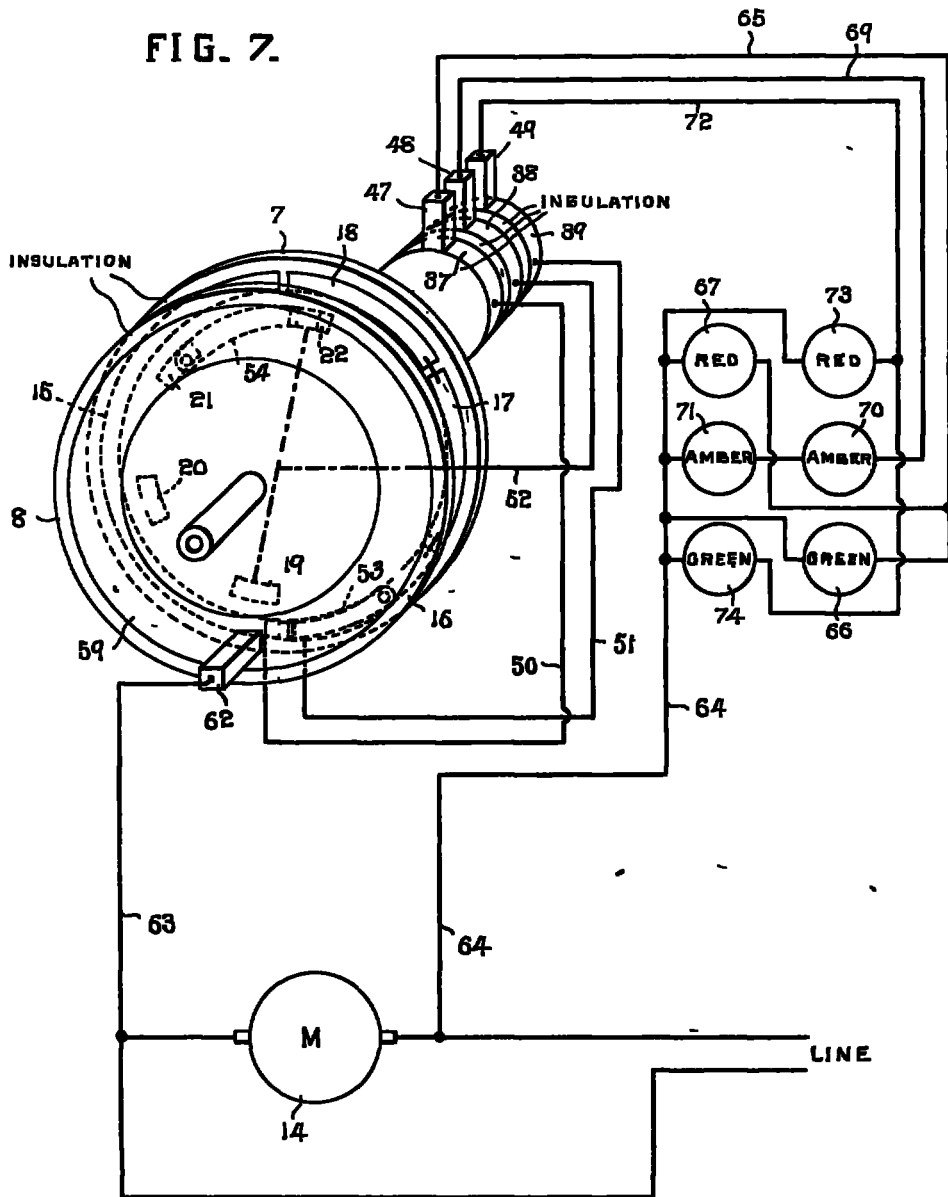
1,863,658

SWITCH MECHANISM FOR SIGNAL AND OTHER ELECTRICAL CIRCUITS

Filed Oct 23, 1930

4 Sheets-Sheet 4

FIG. 7.



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