

Nov. 8, 1938.

H. F. OBERGFELL

2,135,832

MULTICONTACT DEVICE

Filed Nov. 9, 1936

FIG. 1

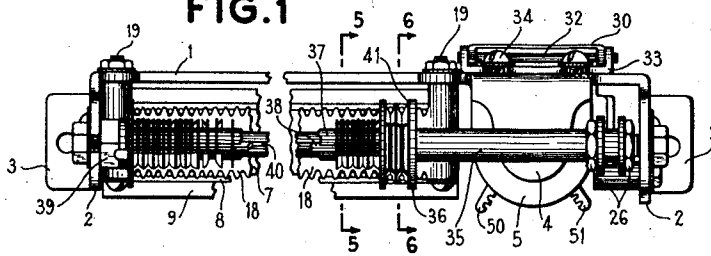


FIG. 2

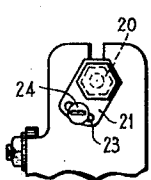


FIG. 3

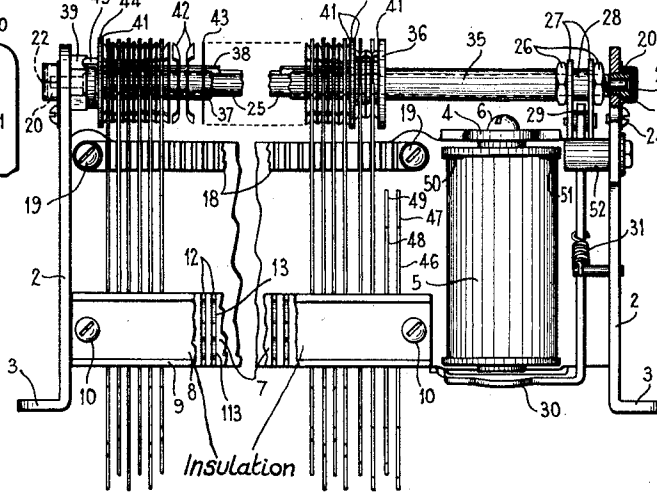


FIG. 4

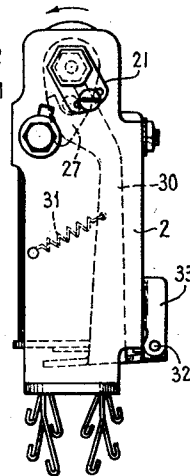


FIG. 5

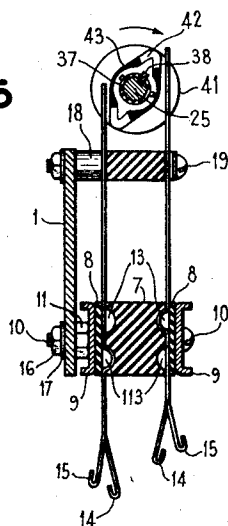
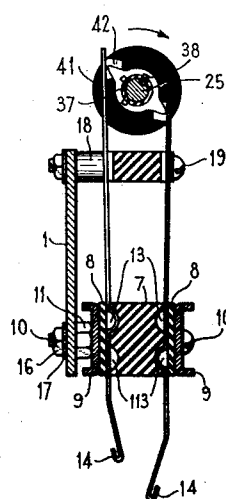


FIG. 6



INVENTOR.

HERBERT F. OBERGFELL

BY

Chas. H. Condy
ATTORNEY.

UNITED STATES PATENT OFFICE

2,135,832

MULTICONTACT DEVICE

Herbert F. Obergfell, River Forest, Ill., assignor to
Associated Electric Laboratories, Inc., Chicago,
Ill., a corporation of Delaware

Application November 9, 1936, Serial No. 109,813

7 Claims. (Cl. 200—1)

This invention relates in general to multiple contacts operating devices and more specifically to a device capable of simultaneously controlling a relatively large number of electrical circuits.

One object of the invention is to provide a device of this type which is of simple construction, thoroughly reliable in operation, and inexpensive to manufacture and assemble.

Another object of the invention is to provide a device that is capable of closing and opening a large number of electrical circuits by a single movement of the device controller.

One of the features of the invention relates to the construction of the device whereby the same is easily assembled and wherein very little adjustment is required after assembly; the contact springs being self guided by the contact closing means and contact spring guides.

Another feature relates to a circuit closing and opening cam which provides two brushing or wiping surfaces for each contact of a pair of contact wires, thereby insuring good self-cleaned contact relation between the contact engagement cam and the contact wires.

Another feature relates to the construction of the contact engagement cam, which is made up of two individual wiper segments of the same design. These two segments are placed face to face on the cam shaft in such a manner, that a V-shaped notch is formed on opposite ends of the pair of segments. The design of the cam assemblies permits them to be placed on the cam shaft so that a slight rotary motion of the shaft will either open or close electrical circuits.

The foregoing objects and features, together with others not specifically pointed out, will be described hereinafter with reference to the accompanying drawing, in which—

Fig. 1 shows a top view of the multi-contact device.

Fig. 2 shows a partial left end view of the multi-contact device.

Fig. 3 shows a front view of the multi-contact device.

Fig. 4 shows a right end view of the multi-contact device.

Fig. 5 shows a transverse section on the line 5—5 in Fig. 1.

Fig. 6 shows a transverse section on the line 6—6 in Fig. 1.

The multi-contact device, in the preferred form shown, may be said to consist of three parts, namely, the mounting frame and contact wire assembly, the cam shaft assembly, and the means for operating the cam shaft.

Referring now to the drawing, there is provided a formed mounting frame 1 of magnetic material, having forward projecting side plates 2, each of which are also formed with outward projections 3 for mounting the device in any suitable manner. The forward projecting member or heel piece 4, which is also a formed part of the mounting frame 1, is provided for mounting the electromagnet 5, by means of screw 6. The heel piece 4 and mounting plate 1 form the return path of the magnetic circuit for the electromagnet 5.

The contact wire assembly comprises a bar 7 of insulating material such as "Bakelite" or hard rubber, two insulating members 8, two metal clamping members 9, and a plurality of contact wires such as 14 and 15, all of which are clamped together by means of screws 10 and nuts 11. The entire assembly is then placed in the proper holes in the mounting frame 1 and fastened thereto by means of washers 17 and nuts 16. Referring to the individual parts mentioned in the above assembly, it will be noted that the two clamping surfaces of the bar 7 are provided with slots 12, the depth and width of which are approximately the same as the diameter of the contact wires. Each slot 12 is provided with two wells or depressions 13 and 113 which are cut so that the formed bend of the contact wires 14 or 15 can be placed in either depression 13 or 113 in both clamping surfaces of bar 7. The contact wires such as 14 and 15, which are preferably of phosphor bronze wire, are given a half circle bend around a small arbor so they can be fitted into either depressions 13 or 113 of slots 12, thus preventing the contact wires from having a tendency to twist or slide when they are clamped in place. The lower ends of the contact wires 14 are slightly longer than the lower ends of contact wires 15, however, both contact wires are formed at the extreme lower end and given a slight outward and inward bend, as is shown in Figs. 5 and 6, to provide adequate space for soldering connecting wires thereto. The lengths of the contact wires 14 and 15 are the same from the half circle bend upward to the tip.

The slots 12 in one clamping surface of bar 7 are directly opposite the slots 12 in the other clamping surface of bar 7. Contact wires 14 and 15 are alternately placed with their half-circle bends in the upper depression 13 of each slot 12 in one clamping surface of bar 7. In the opposite clamping surface of bar 7, contact wires 14 and 15 are placed opposite the same contacts on the other side of bar 7, however, the half-circle bends of these contact wires are all placed in the lower

depressions 113 of each slot 12. The above arrangement is used when the contact wires, in connection with their respective cams are adapted to close electrical circuits when the shaft is rotated in the direction of the arrow, as is clearly shown in Fig. 5. Fig. 6 shows that by altering the contact wire assembly so that the left-hand contact wires 14 and 15 are placed with the half-circle bends in the upper depressions 113 of slots 12 and the right hand contact wires are placed with the half-circle bends in the lower depressions 113 or slots 12, the same contact wires can be arranged to open electrical circuits when their respective cams are placed on the cam shaft 25 as is shown, and the shaft is rotated in the direction of the arrow.

The guide 18 of insulating material is provided with V-shaped grooves against which the contact wires, such as 14 and 15, are normally tensioned and held in alignment when they are not in engagement with their respective cams. The guide 18 is fastened to the mounting plate 1 by means of bolts 19.

Referring now to the cam shaft assembly: The right end of the shaft 25 is threaded sufficiently to enable the nuts 26 to securely clamp the shaft thrust arm 27 and the thrust arm-spacer 28 to the shaft. The spacing collar 35 and metal washer 36 are slid on the shaft 25 and are butted against nut 26. A slotted insulating tube 37, which is long enough to reach from washer 36 to the clamping nut 39, is now slid on the shaft 25. A key or insulating strip 38 is fitted through the slotted tube 37 into the keyway 40 to prevent the tube 37 from slipping as the shaft 25 is rotated. A fibre washer 41, the same diameter as washer 36, is now placed adjacent to washer 36. Each individual cam assembly comprises two metal wiper segments 42, each segment being formed with two diametrically opposite extending arms and each arm being concave shaped at its end to form a wiper. One wiper segment 42 is placed on the tube 37 and key 38 so that its concaved wiper arms are facing in one direction and the other wiper segment 42 of the same cam assembly, is placed on the tube 37 so that its concaved wiper arms are facing in the reverse direction. The two segments 42 accordingly form two diametrically opposite extending V-shaped grooves on each cam assembly in which the contact wires, such as 14 and 15, are engaged and disengaged by the rotary movement of the shaft 25. The thin insulating washers 43 are placed on the tube 37 and key 38 between each cam assembly to insulate the cam assemblies from one another. The number of cam assemblies that can be placed on the cam shaft is determined by the number of pairs of contact wires, such as contact wires 14 and 15.

It will be noted, by referring to Figs. 5 and 6, that the wiper segments 42 of each cam assembly and the insulating washers 43, are keyed so that they can be assembled on the tube 37 and key 38 in either of two positions. Fig. 5 shows the position of a wiper segment 42 when the cam assembly 15 is adapted to close an electrical circuit as the cam shaft 25 is rotated in the direction of the arrow. The other wiper segment 42, of the wiper cam assembly shown, is reversed when it is mounted on the shaft, but the same key slot in the segment is used in either case. Fig. 6 shows the position of a wiper segment 42 when the cam assembly is adapted to open an electrical circuit as the cam shaft 25 is rotated in the direction of the arrow. The wiper segment 42, of the wiper

cam assembly shown in this figure, is mounted on the tube 37 with the right hand key slot engaged with the key 38. The other wiper segment 42, of this wiper cam assembly, is reversed when it is mounted on the shaft and since the position of the cam assemblies of Figs. 5 and 6 are not exactly right angles to one another, the third slot in the wiper segment 42 is required to mount the reversed wiper segment 42.

A metal washer 44 and the insulating washers 41 are placed between a group of wiper cams adapted to close electrical circuits and a group of cams adapted to open electrical circuits. After the required number of cam assemblies have been placed on the shaft, a metal washer 44 and an insulating washer 41 are then placed on the shaft 25 followed by a lock washer 45 and a nut 39 which, when tightened, clamps the entire assembly on the shaft.

In order to facilitate the mounting of the cam shaft assembly, which extends the entire length of the device, the extreme ends of the shaft 25 are machined to fit into the bearing 20. The side plates 2 of the mounting frame 1 are provided with tapped holes which receive the bearing 20 to hold the cam assemblies on shaft 25 pivotally suspended in contact relation with their associated pairs of contact wires. The locking cup 21 and the coil retaining pad 22, placed inside the locking cup 21, fits over the bearing 20. By means of the slotted portion 23 and the screw 24, the locking cup 21 can be fitted over the head of the bearing 20 to lock it in place after the cam shaft assembly has been mounted.

The operating means in the particular embodiment shown comprises an electromagnet 5, but it is to be understood that any well known operating means may be used without departing from the spirit of the invention. Referring now to Fig. 3, it will be noted that four short contact wires 46, 47, 48, and 49 are shown to the left of the electromagnet 5. The electromagnet terminals 50 and 51 are connected by means of wire, to the tip end of contact wires 46 and 47 respectively. If the electromagnet should require two coils on a single spool, each coil would require two terminals, therefore, four contacts 46 to 49 have been provided for connecting the coil wires thereto. The external wiring for all contact wires, such as 14 and 15, 46-49, are soldered to the lower ends of the contact wires. The armature 30 is secured by means of a shaft 32, in free engagement with the yoke 33, which is mounted on frame 1 by means of screws 34. In order that the air gap between the armature and the core of the electromagnet 5 may be varied, slots have been provided in the yoke 33 where the screws 34 secure the yoke to the frame 1. The forked end of armature 30 is adapted to engage the pin 29 of the thrust arm 27. The restoring spring 31 is tensioned sufficiently to normally hold armature 30 against the adjustable armature 52.

Upon energization of the electromagnet 5, the armature 30 is attracted to the core of the magnet and, in its movement (against the restoring spring 31), rotates the cam assemblies which are keyed to the shaft 25 through an angular displacement of approximately twenty degrees in the direction of the arrows shown in Figs. 5 and 6. Depending upon the relation of the cam assemblies to the key 38 in the shaft 25, the V-shaped grooves of the cam assemblies either engage or disengage the pair of associated contact wires when the shaft is rotated sufficiently, thereby closing or opening the electrical circuit between

associated pairs of contact wires. The rotation of the cam shaft causes the V-shaped grooves of each cam assembly to brush its associated contact wires in two places, and, as a result, a good self-cleaned contact is assured. When the electromagnet 5 is deenergized, the restoring spring 31 retracts the armature 30, and consequently the cam shaft, to its normal unoperated position against the armature stop 52. The contact wires 14 and 15, which are normally tensioned against the V-shaped grooves of the guide 18, restore to normal when they are disengaged from the V-shaped grooves of the cam assemblies.

Having described the invention, what is considered to be new and is desired to be protected by Letters Patent will be set forth in the following claims.

What is claimed is:

1. In a switching device, a mounting frame, contact wire banks arranged in parallel rows on said frame, means for holding said contacts against movement in said banks, said means comprising a plurality of slots and depressions in each of said slots, a crimped portion on each of said contact wires adapted to fit in said slots and in any one of said depressions of said slots, an insulating strip for holding all of said contact wires in said banks collectively, a conducting wiper for each contact wire in one of said rows, each of said wipers adapted to simultaneously engage a contact wire in each of said rows to complete individual circuits, and means for simultaneously controlling said wipers to engage or disengage their associated contact wires.

2. A circuit controller comprising a plurality of metallic cams occupying parallel planes and mounted on a common shaft extending at right angles thereto, said cams being movable in unison in their own planes, wiper arms located diametrically opposite each other on each of said cams, insulating members separating said cams from one another, a pair of contact wires for each of said cams normally disengaged therefrom, and means for actuating said shaft sufficiently to control said cams and wiper arms to engage each contact wire of its associated pair individually.

3. A circuit controller comprising a series of interposed conducting wipers and insulating members mounted on a common shaft and movable in unison in their own plane, each conducting wiper comprising a pair of diametrically opposite wiper arms forming a V-shaped groove at their extreme ends, a pair of circuit wires for each of said wipers, a guide against which wires are normally tensioned, and means for actuating said shaft sufficiently to enable each wire of a pair to be engaged by the V-shaped groove of each wiper arm to complete a circuit between

each of said pair of wires and for disengaging said wires from said guide.

4. In a cam assembly, a shaft, a plurality of conducting cams mounted on said shaft and insulated therefrom, insulating washers for insulating said cams from one another, each of said cams comprising a pair of like segments, two concaved lobes located diametrically opposite each other on each of said segments, and each of said pair of segments mounted on said shaft with their respective concaved lobes facing in opposite directions to form V-shaped grooves diametrically opposite each other.

5. In a multi-contact device, a plurality of wipers and insulators alternately placed on said shaft and insulated therefrom, each wiper having two V-shaped grooves located diametrically opposite each other, a pair of contacts for each of said wipers located on either side of said shaft, a guide for each of said contacts, means for rotating said shaft to enable each of said wipers to engage its corresponding pair of contacts, said contacts being brushed and aligned by said grooves.

6. In a multi-contact device, a shaft, a split insulating tube mounted on said shaft, a plurality of wipers and insulators alternately placed on said tube, an insulating key strip mounted in said split insulating tube keyed to said shaft and said wipers and insulators, each of said wipers having two V-shaped grooves formed thereon diametrically opposite each other, a pair of contact wires for each of said wipers, each contact of a pair mounted on opposite sides of said shaft, and means for rotating said shaft sufficiently to enable each V-shaped groove of each of said wipers to engage its contact wire with brushing dual contacting surfaces.

7. In a multi-contact device, a mounting frame having a bearing on opposite ends, a rotatable shaft mounted in said bearings, a nut and locking cap for holding each end of said shaft in said bearings, said cap adapted to hold a lubricant for said shaft and bearing, a plurality of metal cams and insulating washers interposed on said shaft and insulated therefrom, each of said cams being formed of two like segments in such a manner that when they are mounted face to face on said shaft they form two V-shaped grooves diametrically opposite each other, a plurality of pairs of contact wires insulatingly mounted on said frame, each contact wire of a pair being mounted on opposite sides of said shaft and adapted to be engaged by one of said cams, and means for rotating said shaft sufficiently to enable each V-shaped groove of each cam to engage each wire of each pair with double contacting surfaces.

HERBERT F. OBERGFELL.