July 26, 1938. E. J. GACHET ET AL 2,124,694

ELECTRIC SWITCHING DEVICE

Filed Nov. 13, 1936

Fig. 1.

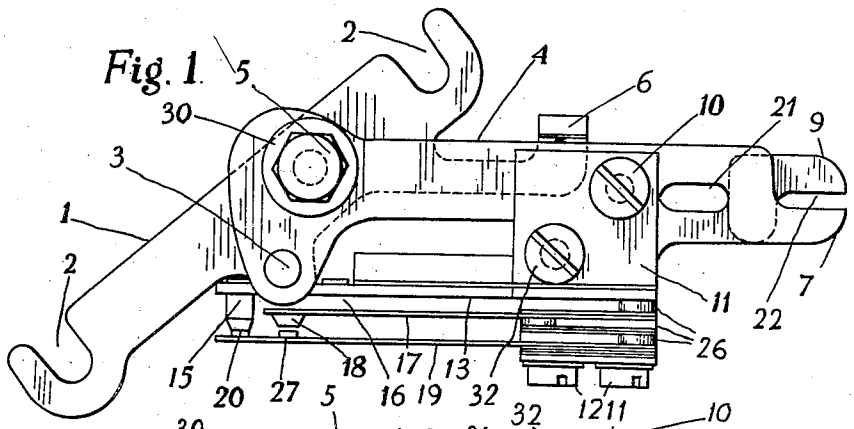


Fig. 3.

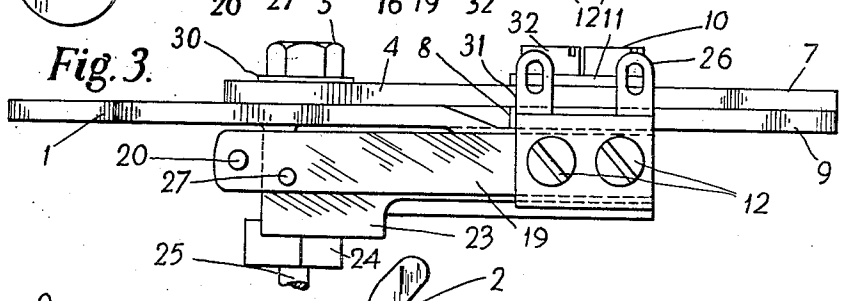


Fig. 2.

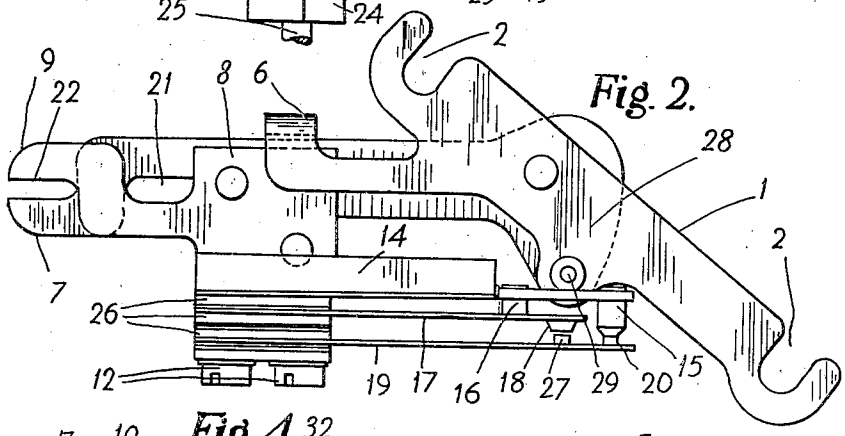
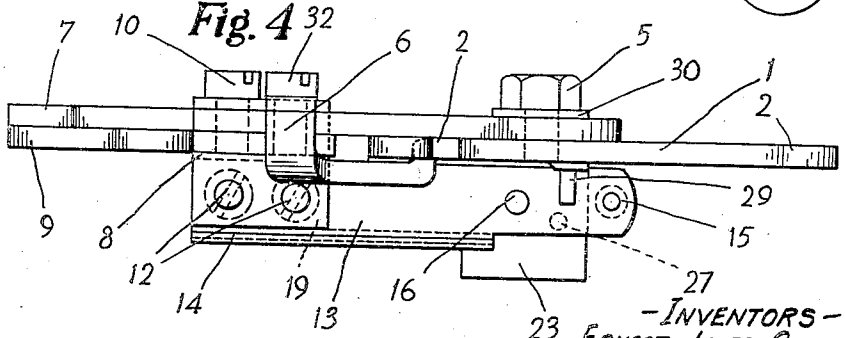


Fig. 4



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ELECTRIC SWITCHING DEVICE

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4 Claims. (Cl. 200—30)

This invention relates to electric switching devices, and more particularly to cam-operated switching devices in which contact points are mounted on cantilever members.

The invention has especially in view the provision of an improved switching device for an electromotor of a kind which is used to drive selecting switches in automatic telephone systems and in which a switching device operated by the movement of the rotor energizes two stator windings alternately. An electromotor of of the kind referred to is described in British specification No. 388,173.

According to one feature of the invention, a switching device of the kind in which cantilever members carrying contact points form a switch adapted to be operated by a cam mounted on a shaft comprises a cantilever member assembly, a primary supporting member forming part of or adapted to be attached to a framework occupying a fixed position with reference to the axis of the shaft, a secondary supporting member fixed to the primary supporting member in such a manner that it can for purposes of adjustment be swivelled about a pivot arranged with its axis coincident with that of the shaft, and a tertiary supporting member to which the cantilever assembly is directly attached and which is fixed to the secondary supporting member in such a manner that it can be moved relatively thereto for the purpose of adjusting the distance between the axis of the shaft and that part of the cantilever assembly which is arranged to be engaged by the cam. The provisions for making adjustments referred to enable the part of the cantilever assembly which is arranged to be engaged by the cam to be brought into the best position relative to the cam.

This and various subordinate features of the invention are exemplified in the specific embodiment of the invention which will now be described with reference to the accompanying drawing.

The embodiment in question takes the form of a switching device for controlling the energization of the stator windings of an electromotor of the kind previously mentioned, and is designed to be operated by a cam mounted on the rotor shaft or on a shaft geared to the rotor shaft. Fig. 1 of the drawing shows a front elevation of the device, Fig. 2 shows a corresponding rear elevation, Fig. 3 shows an inverted plan, and Fig. 4 shows a plan. The cam, which is indicated at **24** in Fig. 3, is a substantially elliptical member mounted on its shaft **25** so that it has two operating "noses" which are symmetrically and oppositely situated with respect to the axis of the shaft. It has not been considered necessary to show the cam in Figs. 1, 2, and 4. The switching device comprises an assembly of three cantilever members **13**, **17**, and **19**, a primary supporting member **1**, a secondary supporting member **4**, and a tertiary supporting member **8** to which the cantilever assembly is directly attached.

The assembly of cantilever members is similar in general form to the spring assemblies or "packets" commonly employed on the electromagnetic relays used in telephone systems. The fixed ends of the three cantilever members are separated by the usual insulating spacers and by terminal members **26**, and the free ends carry the necessary contact points **15**, **18**, **20** and **27**. The central member **17** has a side extension **23** adapted to be engaged by the "noses" of the cam. The tertiary supporting member **8** is carried by the secondary supporting member **4**, and this in turn is carried by the primary supporting member **1**, which is adapted to be attached to the electromotor framework. The tertiary supporting member **8** is fixed to the secondary supporting member **4** in a manner which allows the position of the one member with respect to the other to be adjusted, the arrangement being such as to allow the distance between the axis of the shaft **25** and the side extension **23** readily to be set to the best value. Similarly, provision is made for adjusting the position of the secondary supporting member **4** with respect to the primary supporting member **1**, the arrangement in this case being such as to enable the side extension **23** readily to be moved without altering its distance from the axis of shaft **25**. Movement of the side extension in the manner just referred to has of course the same effect as regards the timing of the switching device as moving the cam round the shaft.

Referring now in more detail to the component parts of the switching device, the primary supporting member **1** is in the form of a metal bar having slots **2** at each end adapted to be engaged by screws threading into pillars which form part of the electromotor framework. On one of the edges of the bar and about halfway between the ends is a small projecting portion **28** into which is riveted a short pin or pivot **3**. It is intended that, in fixing the primary supporting member **1** to the electromotor framework, this pin or pivot shall be set in line with the shaft **25** on which the operating cam **24** is mounted. In or-

der to facilitate such setting into line the pivot is provided with a portion 29 of restricted cross-section on the rear side of member 1. The pin or pivot passes (see Fig. 1) through a hole of corresponding size in the secondary supporting member 4, the arrangement being such that, when a fixing screw 5 passing through a slot in member 4 and threading into the primary supporting member 1 is loosened, member 4 can be swivelled about the pivot through an angle limited by the size of the said slot and by an arm 6 formed integral with member 1. This provision for adjustment is the one which enables the side extension 23 to be moved without altering its distance from the axis of the cam shaft. An annular washer 30 intervenes between the head of the fixing screw and member 4.

The secondary supporting member 4 is in the form of a flat metal bar which has a wide portion at one end in which the previously mentioned hole for the pin or pivot 3 and slot for the fixing screw 5 are situated, and which has at its other end a prong 7 having a shape suitable for a purpose that will appear later. At the base of the prong there is a wide portion 31 which forms a rectangular plate. Situated on a diagonal of this plate are clearance holes for two fixing screws 10 and 32, the hole for screw 10 being an oversize one to allow for adjustment. The screws thread into holes in a rectangular plate which forms part of the tertiary supporting member 8, and a rectangular faceplate 11 intervenes between the heads of the screws and the secondary supporting member 4. It should be noted that the corresponding straight edges of the bars which respectively form the primary and secondary supporting members are at an angle of between 30° and 45° with each other.

The tertiary supporting member 8 is in the form of a bracket comprising a metal plate bent to form two rectangular plates set at right angles to each other. One of these rectangular plates is the one already mentioned as having screws 10 and 32 threading into holes in it, and this one has a prong 9 formed integral with it similar to the prong 7 on member 4. The two prongs lie side by side when viewed along the planes containing member 4 and the last-mentioned rectangular plate, and cross each other when viewed in a direction perpendicular to these planes. The crossing of the prongs forms two slots 21 and 22 into either of which the blade of a tool such as a screw driver may be inserted for the purpose of adjusting the relative positions of the tertiary and secondary supporting members. It is intended that such adjustment should be carried out by loosening the two fixing screws 10 and 32 (screw 32 being only very slightly loosened), and then inserting the blade of the tool in the appropriate one of the slots and twisting it until the side extension 23 is at the correct distance from the axis of the cam shaft. The direction in which the twisting referred to causes the tertiary supporting member 8 to be swivelled about the pivot formed by screw 32 clearly depends upon in which of the slots 21 and 22 the blade of the tool is inserted.

The assembly or packet of cantilever members is fixed by means of fixing screws 12 to the rectangular plate of the tertiary supporting member 8 other than that having prong 9 protruding from it, the arrangement being such that the wide surfaces of members 17 and 19 lie in planes perpendicular to the plane of the secondary supporting member 4 but have their long edges substantially parallel to the long edges of that member. It should be noted that the arrangement is also such that the side extension 23 on the central cantilever member 17 is near to the shaft 25 on which the operating cam 24 is mounted, the cam being of dimensions which are small in comparison with the overall dimensions of the switching device.

The three cantilever members together with the contact points carried by them constitute a make-before-break changeover contact. The two outer members 13 and 19 are longer than the central member 17, and when the central member is occupying its unoperated position as shown in the drawing it rests against an insulating pip or stop 16 carried by member 13. The member 13 is a thick rigid member reinforced along part of its length by a turned-up portion 14. Members 17 and 19 are spring or "moving" members. When the central member 17 is occupying its unoperated position, contact is made between the pair of contact points 15 and 20 fixed to the extreme ends of the two outer members 13 and 19, and no contact is made between the second pair of opposing contact points 18 and 27 fixed respectively on the extreme end of member 17 and at a corresponding position on member 19. As the central member 17 is moved by the cam to its operated position, the pair of contact points 18 and 27 are first brought into contact and then after further movement of the cam the pair of contact points 15 and 20 are separated. As soon as the pair of contacts 18 and 27 touch, further downward movement of the central member 17 is opposed by the upward force exerted by the bottom member 19. Since the point of application of this upward force on the central member 17 is laterally offset in relation to the point of application of the operating force due to the cam, movement of the cam for a brief period after the points 18 and 27 have touched simply results in a twisting of the central member without causing any separation of contact points 15 and 20. This arrangement ensures that the cam does a certain angular movement with both pairs of contact points in the "make" condition, that is, it ensures that there is a definite "make through" period. Further control of the "make through" period is obtained by arranging that the two pairs of contact points (15, 20 and 18, 27) are not in line when viewed in the lengthwise direction of the cantilever members, but appear with the pair 18 and 27 appreciably nearer the side extension 23 on the central member 17 than the other pair.

We claim:—

1. An adjustable mounting for a set of cam operated springs comprising a main plate, a second plate carrying a set of spring contacts, said second plate pivotally mounted on said main plate, each of said plates having extending ends crossing over each other to form a pair of slots, the insertion of a tool in one of said slots causing relative movement of the plates to move the spring contacts closer to the cam, and the insertion of the tool in the other slot causing relative movement of the plates to move the spring contacts farther away from the cam.

2. A cam operated switching device comprising a plurality of spring members adapted to be controlled by a cam mounted on a rotating shaft, a main support, an adjustable support for said spring members pivotally mounted on said main support, said supports each having an extending Z shaped member, said members be-

ing adjacent one another and reversed with respect to one another to form a slot on each side of the vertical portion of the Z, each of said slots adapted to receive a tool for adjusting purposes, one of said slots being used to move said adjustable support in one direction and the other of said slots being used to move said adjustable support in another direction to adjust the distance between the axis of the cam shaft and said spring members.

3. In a switching device, a plurality of spring members adapted to be actuated by a cam rotating on a shaft, a stationary support, an adjustable support, supporting said spring members, pivotally mounted on said stationary support, a Z shaped member for each of said supports extending in parallel planes adjacent one another, one of said supports being reversed so that the Z shaped member thereof is inverted with respect to the other and the vertical bar of each of the Z shapes are in line thereby forming a slot on each side of the vertical bar, each of said slots adapted to receive a tool whereby said spring members may be moved in either of two directions, dependent upon the slot in which the tool is inserted, to adjust the distance between the axis of the cam shaft and said spring members.

4. A switching device comprising a main support, a first adjustable support pivotally mounted on said main support, a second adjustable support pivotally mounted on said first adjustable support, a spring assembly mounted on said second support, said first adjustable support adjustable to move said spring assembly in a definite arc around its pivot, said first and second adjustable supports having adjacent projecting members extending outward therefrom, said members being formed in such a manner that they transpose positions as they are extended and form a slot on each side of the place the transposition is made, the top and bottom of each slot being formed by the projecting member of each adjustable support, each of said slots adapted to receive a tool for adjusting purposes, one of said slots controlling said second adjustable support to reduce the radius of said definite arc and the other of said slots controlling said second adjustable support to increase the radius of said definite arc.

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