Dec. 6, 1949 S. W. BRAMLEY 2,490,013

ELECTRICAL SWITCH

Filed March 5, 1945 2 Sheets-Sheet 1

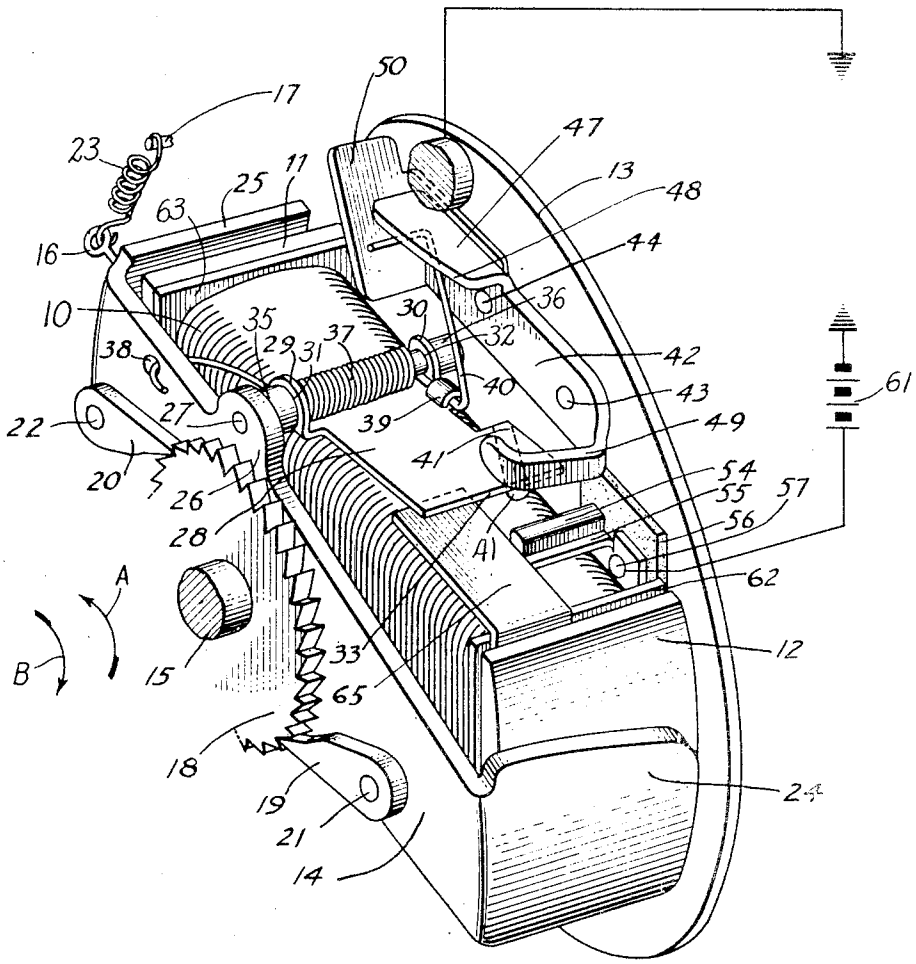

Fig. 1.

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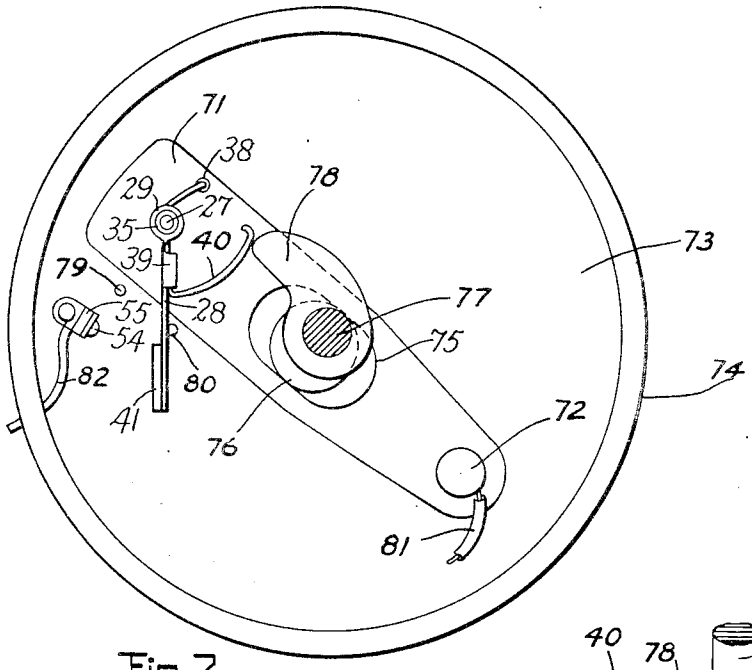

Fig. 2.

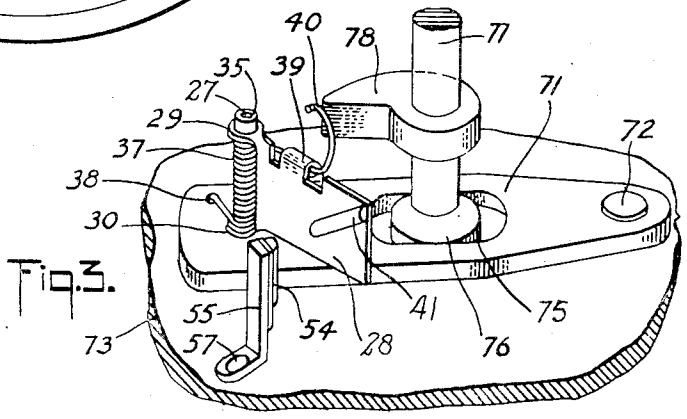

Fig. 3.

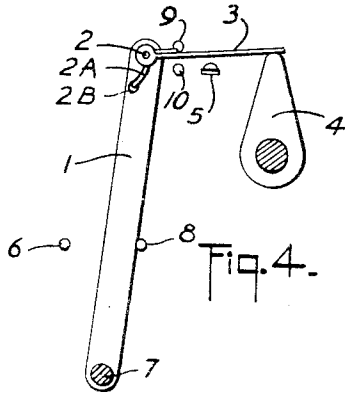

Fig. 4.

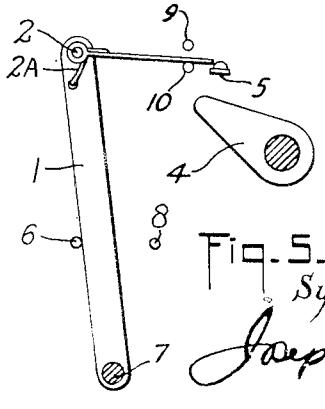

Fig. 5.

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Patented Dec. 6, 1949

2,490,013

UNITED STATES PATENT OFFICE

2,490,013

ELECTRICAL SWITCH

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Application March 5, 1945, Serial No. 580,951

4 Claims. (Cl. 200—87)

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This invention relates to electrical switch mechanism and application of that mechanism to various specific uses thereof.

In switching mechanism particularly of the spring actuated type, difficulty has been experienced in making positive contacts free from vibration or "chattering."

It is an object of the invention to provide a contact free from these difficulties.

It is a further object of the invention to provide certain specific structures embodying and applying the generic principle of the invention.

The invention will be further described and illustrated by reference to the accompanying drawings in which

Fig. 1 is a partly diagrammatic view of an electromagnetic clock mechanism;

Fig. 2 shows a plan view of a make and break mechanism intended as part of an ignition system for an internal combustion engine;

Fig. 3 is a perspective view of the device shown in Fig. 2;

Figs. 4 and 5 show diagrammatic analyses of a generic movement common to the devices of Figs. 1 to 3, inclusive.

In Fig. 1, an electromagnet 10 having pole pieces 11 and 12 is mounted on a metallic plate 13. An armature 14 is rotatably mounted on a shaft 15 carried by clock mechanism and structure not specifically shown because it may be conventional. The axis of rotation of armature and shaft passes through the midpoint of the electromagnet 10 and at right angles to the longitudinal axis thereof so that during rotation of the armature, the end pieces 24, 25 thereof sweep over the pole pieces 12, 11 of the magnet in spaced relation thereto. Rotation of the armature 14 in the direction of arrow A caused by the pull of the magnet biases and stores energy in a spring 23 which causes rotation of the armature in the direction of arrow B when the magnet is de-energized by the opening of the circuit. Rotation of the armature 14 in the latter direction imparts movement to the ratchet wheel 18 by means of pawls 19 and 20 mounted on pins 21, 22. The wheel 18 is mounted on shaft 15 and rotates independently of the armature. Movement of the wheel imparts motion to a train of clock mechanism which may be conventional and is therefore not shown. One end of spring 23 is joined to the armature 14 at point 16 and the other end may be anchored to the body of the clock mechanism at any suitable point indicated by 17.

At a position intermediate between the axis of the armature and one of the end pieces, the armature carries on one side thereof a lug 26, to which is secured a pin 27 on which is pivotally mounted a spring-actuated switch pole in the form of a strip or palette 28 having upstanding wings or ears 29, 30 which have circular openings 31, 32 through which the pin 27 passes. Bushings 35, 36 are provided to properly position the palette 28. A coil spring 37 is mounted on the pin 27 between the ears 29, 30. One end of the spring is anchored to the armature by passing through the hole 38 therein. A portion of the palette or contact strip 28 is formed into a hook 39. The other end of the spring 37 passes under this hook 39 and is bent upwardly to form an arm 40. The palette may be a thin strip of magnetic steel, to the under side of which is secured a diagonally positioned bar 41 preferably made of pure silver or other highly conductive and inert metal. The palette 28 may also be a strip of soft iron joined to a resilient strip of brass, bronze or steel.

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To the plate 13 is joined a strip 42 by means of rivets 43, 44. A portion of this plate is turned transversely to the surface of the plate to form a detent 47 for the spring arm 40, this detent having an inclined edge 48. Another part of the strip is bent to form the hook-shaped stop and guide 49.

Rearwardly of the detent arm, an inclined guide 50 is provided which may be a part of the strip 42 secured to plate 13 by the same rivet 44 which aids in securing the strip 42 to said plate. The inclined guide 50 is spaced from the detent 47.

The fixed switch pole 54 preferably made of pure silver or other highly conductive and inert metal is brazed or otherwise suitably secured to bracket 55 mounted on plate 13 and insulated therefrom by means of insulation 53, the bracket and insulation being secured to the plate by a rivet 57.

In the electrical circuit, shown diagrammatically in part, the coils of the magnet 10, bracket 55, fixed switch pole 54, bar 41 (joined to the palette 28) palette 28 and plate 13 are connected in series, when the switch is closed, with a source of current such as battery 61. The plate 13 and battery 61 may be grounded as shown. The bar 41 and palette 28 secured thereto are in electrical connection with the plate 13 (and grounded) through the body of the mechanism.

Insulation pieces 62, 63 are inserted between the pole pieces 12, 11 and the magnet coils and a soft iron shoe piece 65 extends from the pole piece 12 to cooperate magnetically with the palette.

The drawing shows the armature in one position of its limited movement with the switch

poles 26 and 54 separated, i. e., with the switch in open position and the spring 23 fully tensioned. The armature 14 is then biased for rotation in the clockwise direction as indicated by arrow B and the energy thus available applies rotative force to the ratchet wheel 18 through pawls 19, 20 to operate the clock mechanism. Rotation of the armature causes rotation of the pin 27 in the same direction (arrow B) and tensions the spring 37 because the arm 40 is confined by the detent 47. As the pin 27 continues to rotate, the arm 40 is finally dragged past the edge 48 of the detent 47. By this time the palette 28 has reached a position where the leading edge 33 is at a point about opposite the edge of the pole piece 12. The energy stored in the spring 37 then snaps the palette 28 into switch closing position with the diagonal bar 41 in contact with the bar 54. The armature is then at its second position of limited movement and in contact with any suitable stop member (the inclined member 50 may serve this purpose) and the spring 23 is at a condition of minimum tension. Contact of the bars 41, 54 closes the electrical circuit and the energized magnet then immediately pulls the armature into the position shown in the drawings, i. e., the armature is rotated in the direction of arrow A. During this movement a maintaining pawl (not specifically shown) prevents rotation of wheel 18 in the direction of arrow A.

During this movement (in the direction of arrow A) the palette 28 and attached bar 41 are held in firm electrical contact with the bar or fixed switch pole 54 by the tension on the coil spring 37 and the electro-magnetic attraction between the palette 28 and the extension piece or shoe 65, and the bar 41 is wiped diagonally across the bar 54.

Near the end of this movement the rotation of the armature (arrow A) drags the bar 41 away from the bar 54 and opens the switch by separating said bars or contacts.

At the same time, the arm 40 moves along the inclined edge 48 of the detent 47 and is finally secured in the position shown in the drawings, thereby raising the pivoted switch pole comprising the palette and bar 41 and effecting a positive separation of the switch poles. The armature 14 is then free to rotate in the direction of arrow B under the urge or bias of the spring 23.

Referring to Figs. 2 and 3, a pivoted spring actuated switch pole comprising the strip or palette 28 is pivotally mounted on pin 27 by means of wings 29, 30 and bushing 35, the pin 27 passing through holes in the wings. A coil spring 37 is mounted on pin 27 between the wings 29, 30. One end of the spring is anchored to the lever 71 by passing through hole 38 therein. A portion of the strip or palette 28 is formed into a hook 39. The other end of the spring 37 passes under this hook 39 and is bent upwardly to form an arm 40. The palette may be a thin strip of magnetic steel, to the under side of which is secured a diagonally positioned bar 41 of pure silver or other highly conductive and inert metal.

Pin 27 is mounted near one end of lever 71 pivotally mounted to oscillate or swing about pivot 72 mounted on plate 73 which may form part of a housing 74 (shown diagrammatically in Fig. 2 with the cover removed). Lever 71 carries a slot 75 in which cam 76 mounted on shaft 77 rotates. Shaft 77 also carries cam 78. Stops 79, 80 serve to limit the movement of the pivoted switch pole.

The fixed switch pole comprises bracket 55 mounted on plate 73 (which in this case is made of insulating material) by means of rivet 57. To the bracket 55, which may be made of brass, bronze or the like (as in Fig. 1), there is brazed or otherwise suitably secured a bar 54 made of pure silver or other conductive and inert material.

Shaft 77 is rotated by conventional motor means and a continuation of said shaft carries a conventional rotor for distribution of current to the cylinders of an internal combustion engine. The electrical circuit includes, in series, the fixed switch pole (including bracket 55 and bar 54), the pivoted spring actuated pole (including palette 28), the lever 71 (which is metallic), the pivot 72 and leads 81, 82. The circuit also includes an induction coil or transformer and a source of current such as a battery. The parts not shown in the drawing are, or may be, conventional.

With the parts as shown in Figs. 2 and 3, the free end of the pivoted palette 28 projects some distance beyond the fixed terminal or contact 54, 55 and the spring 37 has been tensioned by action of the cam 78 on arm 40. As the cam 78 rotates further in the direction of arrow B, the arm 40 is released and the pivoted switch pole is snapped into switch closing position, with bar 41, in contact with bar 54. Cam 76 then swings lever 71 about pivot 72 and wipes the bar 41 (attached to palette 28) across the bar 54. When movement of the lever 71 has dragged the free end of palette 28 just beyond the fixed switch pole, cam 78 has rotated through an angle of about 360 degrees and has again engaged the arm 40, tensioned spring 37, and caused opening of the switch by separating the fixed and pivoted switch poles. Synchronized with this movement, the lever has swung in the direction of arrow A and has moved the parts back into the position shown in Fig. 2.

Referring to Figs. 4 and 5 the member 1 is pivoted on pivot 7 and swings from one position of limited movement to another between stops 6 and 8. The member 1 carries a pin 2 about which is wound a coil spring 2A, one end of which is anchored to 1 at point 2B with the other end secured to a switch pole 3 pivoted on pin 2, the spring 2A normally biasing the pivoted switch pole into contact with fixed switch pole 5. The pivoted swtich pole 3 extends over and beyond the fixed switch pole 5 in the position shown in Fig. 4. Element 4 is any means of biasing the member 3 away from pole 5 (member 3 being normally biased toward 5) and releasing it in timed relation to the movement of member 1 so that the pole 3 is snapped into contact with 5 and wipes it during movement of member 1. 9 and 10 are movement limiting stops.

The embodiment of the generic principles, illustrated in Figs. 4 and 5, in the specifically different structures shown in Figs. 1, 2 and 3 is indicated as follows: In Fig. 1, the pivoted member 1 is embodied in the armature 14 and lug 26. The fixed switch pole 5 is embodied in the bar 54. The pivot 7 is embodied in the shaft 15. The spring actuated switch pole 3 is embodied in the palette 28. The means 4 for biasing the pole 3 away from pole 5 is embodied in the detent 47.

In Figs. 2 and 3, the pivoted member 1 (of Figs. 4 and 5) is embodied in lever 71. Fixed switch pole 5 (of Figs. 4 and 5) is embodied in the bar 54, of Figs. 2 and 3. The pivot 7 of Figs. 4 and 5 is embodied in pivot 72 of Figs. 2 and 3. The spring-actuated switch pole 3 (of Figs. 4

and 5) is embodied in the palette 28 of Figs. 2 and 3. The means 4 of Figs. 4 and 5 is embodied in the cam 78 of Figs. 2 and 3.

What is claimed is:

1. Electric switch mechanism comprising a fixed switch contact pole, an armature member adapted to swing from one position of limited movement to another position of limited movement about an armature pivot spaced from said pole and toward and away from said fixed pole during said movement; a spring-actuated switch contact pole pivoted on said armature member to swing about a pivot spaced from the armature pivot and normally biased toward and into engagement with said fixed pole and having a wiping contact portion extending beyond said fixed pole in one position of limited movement of said armature, and a detent cooperating with said pivoted member and spring-actuated pole to bias the spring actuated pole away from the fixed pole and then release said spring actuated pole, whereby the spring-actuated pole is snapped into contact with the fixed pole and is maintained in wiping contact with the latter during a portion of the movement of the armature from one position of limited movement to another.

2. In electromagnetic clock mechanism, switch mechanism comprising a fixed switch contact pole, an electromagnet and armature, said armature being mounted to swing from one position of limited movement to another about a pivot spaced from said pole, and toward and away from said fixed pole during said movement of said armature; a spring-actuated switch contact pole pivoted on said armature member to swing about a pivot spaced from said armature pivot and normally biased toward and into engagement with said fixed pole, and having a wiping contact portion extending beyond said fixed pole in one position of limited movement of said armature, and a detent cooperating with said armature and spring-actuated switch pole to bias the spring-actuated pole away from the fixed pole and then release said spring-actuated pole, whereby the spring-actuated pole is snapped into contact with the fixed pole and is maintained in wiping contact with the latter during a portion of the movement of the armature from one position of limited movement to another.

3. In electromagnetic clock mechanism, switch mechanism comprising a fixed switch contact pole, an electromagnet having pole pieces at opposite ends of said magnet and an armature having an elongated body portion and end pieces extending laterally therefrom and arranged to sweep over said magnet pole pieces in spaced relation thereto, said armature being mounted to swing from one position of limited movement to another about a pivot spaced from said fixed switch pole, and toward and away from said fixed pole during said movement of said armature; a pin mounted on said armature body portion intermediate between the armature pivot and one of the end pieces of the armature, said pin extending transversely of the body portion of said armature and being spaced from the armature pivot, a switch contact pole pivotally mounted on said pin and a coil spring also mounted on said pin and normally biasing said pivoted switch pole toward and into engagement with said fixed switch pole, said coil spring having an extended portion constituting an arm, said pivoted switch pole having a wiping contact portion extending beyond said fixed switch pole in one position of limited movement of said armature; and a detent mounted separately from said armature and magnet and co-operating with the arm on the coil spring to bias the spring-actuated pole away from the fixed switch pole and then releasing said spring-actuated pole whereby the latter is snapped into contact with the said fixed switch pole and is maintained in wiping contact with the latter during a portion of the movement of the armature from one position of limited movement to the other.

4. Electric switch mechanism comprising a fixed switch contact pole, a swingable member adapted to swing from one position of limited movement to another position of limited movement about a first pivot spaced from said fixed contact pole and toward and away from said fixed contact pole during said movement; a spring-actuated switch contact pole pivoted on said swingable member to swing about a second pivot spaced from the first pivot said spring-actuated contact pole being normally biased toward and into engagement with said fixed contact pole and having a wiping contact portion extending beyond said fixed pole in one position of limited movement of said swingable member, and a detent cooperating with said swingable member and spring-actuated contact pole to bias the said spring-actuated contact pole away from the fixed contact pole and then release the said spring-actuated contact pole, whereby the said spring-actuated pole is snapped into contact with the fixed contact pole and is maintained in wiping contact with the latter during a portion of the movement of the said swingable member from one position of limited movement thereof to another.

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