United States Patent

[11] 3,622,716

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[21] Appl. No. **18,632**
[22] Filed **Mar. 11, 1970**
[45] Patented **Nov. 23, 1971**

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[32] Priority **Mar. 17, 1969**
[33] **Great Britain**
[31] **13,790/69**

[54] **IGNITION SWITCH WITH PLATE-LATCHING MEANS PREVENTING MOVEMENT FROM ON TO START ONCE STARTED**
4 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** ..... **200/42 R,** 200/44
[51] **Int. Cl.** **H01h 21/50,** H01h 27/06
[50] **Field of Search** ..... 200/44, 42 R, 166 SD, 169 R, 11 R

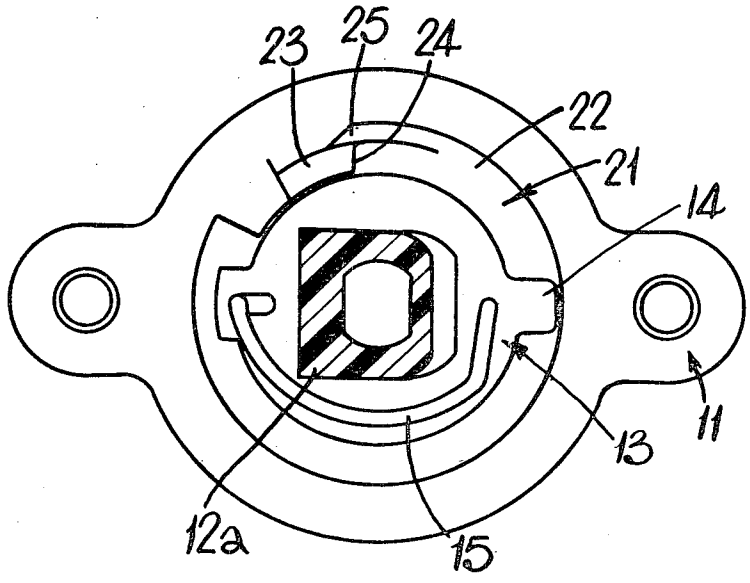
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ABSTRACT: An ignition switch includes a casing and a rotor mounted for rotation within the casing from a stable first position to a stable second position and from the stable second position to an unstable third position from which it is resiliently urged back to the stable second position. An arcuate cam track is provided on the inner surface of the casing and includes surfaces which extend generally at right angles to the axis of rotation of the rotor. A latch member is rotatable with the rotor and includes a finger which extends radially into engagement with the cam track, a resilient member acting on the latch member urging the finger into engagement with the cam track and being capable of urging the finger radially outwardly when the finger is moved radially inwardly by the cam track during rotation of the rotor. The arrangement for the finger and the cam track is such that the rotor is prevented from movement from its second position to its third position unless the preceding movement of the rotor was from its first position to its second position.



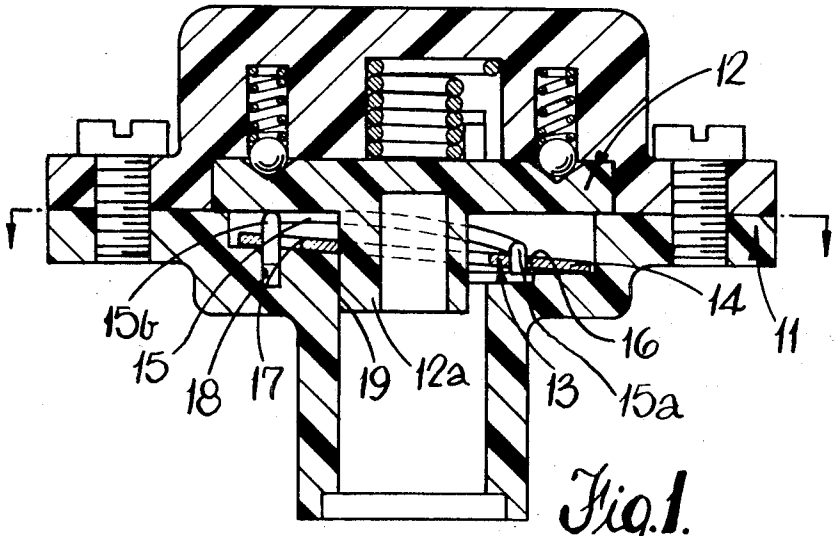


Fig. 1.

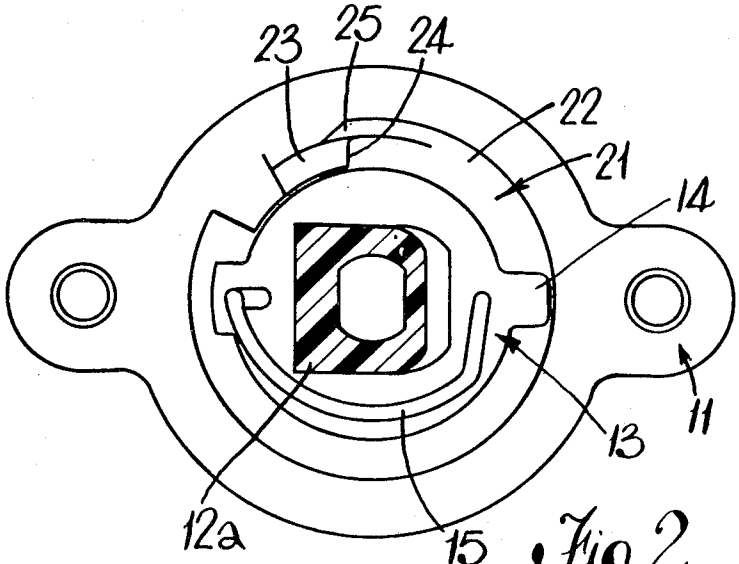


Fig. 2.

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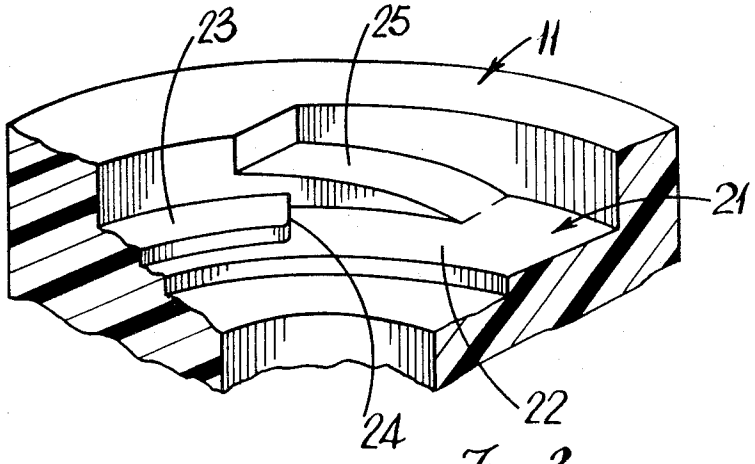


Fig. 3.

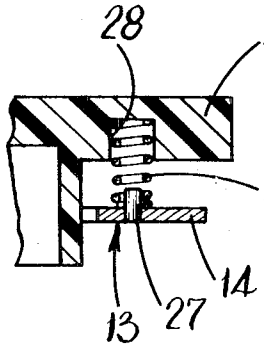


Fig. 4

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IGNITION SWITCH WITH PLATE-LATCHING MEANS PREVENTING MOVEMENT FROM ON TO START ONCE STARTED

This invention relates to ignition switches for road vehicles.

An ignition switch according to the invention includes a casing, a rotor mounted for rotation within the casing from a stable first position to a stable second position and from the stable second position to an unstable third position from which it is resiliently urged back to the stable second position, an arcuate cam track on the inner surface of the casing and including surfaces which extend radially of the casing planes generally at right angles to the axis of rotation of the rotor, a latch member rotatable with the rotor and including a finger which extends radially into engagement with said cam track, and a resilient member acting on said latch member, said resilient member acting to urge said finger into engagement with said cam track and being capable of urging the finger radially outwardly when the finger is moved radially inwardly by the cam track during rotation of the rotor, and the arrangement of the finger and the cam track being such that the rotor is prevented from movement from its second position to its third position unless the preceding movement of the rotor was from its first position to its second position.

In the accompanying drawings:

FIG. 1 is a sectional view of an ignition switch according to one example of the invention,

FIG. 2 is a sectional plan view of FIG. 1,

FIG. 3 is a fragmentary, inverted perspective view of the casing of the ignition switch shown in FIG. 1,

FIG. 4 is an inverted fragmentary sectional view of the rotor of an ignition switch according to a second example of the invention.

The ignition switch illustrated in both examples is of the key-operated type having three operative positions, a first, off position in which the key may be removed from the switch, a second, ignition position in which the ignition and auxiliary circuits of the road vehicle are energized and a third, start position achieved by turning the key beyond the second position, and in which the starter motor circuit of the road vehicle utilizing the switch is energized, in addition to the ignition circuit.

Referring to FIGS. 1–2, and 3, the switch includes a cylindrical casing 11 housing a rotor 12, the rotor being mounted for rotation within the casing 11 by a hollow spigot 12*a* integral with the rotor 12. The spigot 12*a* is coupled to the barrel of a cylinder lock, the cylinder of which is defined by part of the casing 11, and so the rotor 12 can be rotated relative to the casing 11, by means of an operating key. One end of the casing is closed by a contact board (not shown) carrying a plurality of fixed contacts and associated external terminals, and the rotor 12 carries a bridging member (not shown), which cooperates with the fixed contacts on the contact board, in various angular positions of the rotor, to complete electrical circuits between the external terminals. In the first position of the rotor, the off position of the switch, no circuits are completed, in the second position of the rotor, the ignition position of the switch, the circuits between the terminals associated with the ignition circuit of the vehicle, and auxiliary circuits of the vehicle are completed, and in the third position of the rotor, the start position of the switch, the ignition circuit remains completed, and a circuit between the external terminals associated with the starter motor circuit of the vehicle is completed. The rotor and the casing include cooperating detent means (not shown) which serve to retain the rotor in its first or second position relative to the casing, and the switch further includes resilient means (not shown) which is stressed during movement of the rotor from its second position to its third position, and which when the rotor is released in its third position, returns the rotor from its third position to its second position.

Mounted for rotation with the rotor 12 is a latch member 13 in the form of an annular plate having a radially outwardly extending integral finger 14. The latch member 13 is mounted

on the rotor 12 for rotation therewith, but is capable of both axial, and transverse movement relative to the rotor 12. A substantially U-shaped spring strip 15 is engaged with the latch member 13 by a pair of integral projections 15*a*, 15*b* formed at the ends respectively of the strip 15. The projection 15*a* is engaged in a complementary aperture 16 in the member 13 adjacent the finger 14 and the projection 15*b* is engaged in a radially extending slot 17 in the member 13 remote from the finger 14 so that the limbs of the U-shaped strip 15 extend on diametrically opposite sides of the spigot 12*a*.

The casing 11 is formed with an arcuate slot 18 in which is received the projection 15*b* of the spring strip 15, the arcuate length of the slot 18 being sufficient to allow angular movement of the rotor 12 between the first and third positions. Further the casing 11 adjacent the slot 18 is formed with an integral, angularly extending shoulder 19, the end of the member 13 adjacent the slot 17 resting on the shoulder 19 during rotation of the rotor between its first and third positions so that said end of the member 13 is normally tilted towards the rotor 12. Also the height of the shoulder 19 is such that the end of the strip 15 adjacent the projection 15*b* is trapped between the rotor 12 and the end of the slot 17 remote from the spigot 12*a* so that movement of the finger 14 in a direction to tilt the end of the member 13 adjacent the finger 14 towards the rotor 12 flexes the spring strip 15. Thus the spring strip 15 acts principally in a direction parallel to the rotational axis of the rotor to urge the finger 14 away from the rotor 12. However, in the event that the finger 14 is moved radially inwardly then, since the projection 15*b* of the strip 15 is engaged in the arcuate slot 18, the radially extending slot 17 will be moved relative to the projection 14 thereby flexing the strip 15. Thus if the finger 14 is moved radially inwardly the spring strip 15 urges the finger radially outwardly back to a position wherein the spring strip is unstressed.

The finger 14 of the latch member 13 extends radially towards the inner wall of the casing 11, and is engaged with a cam track 21 provided on the wall of the casing. The cam track 21 includes a flat arcuate surface 22 which extends in a plane generally parallel to the plane of rotation of the rotor 12. At one end of the surface 22 the cam track 21 includes a plateau 23 raised from the surface 22, a shoulder 24 being defined between the surface 22 and the upper surface of the plateau 23. Extending from the end of the surface 22 remote from the plateau 23 to a point adjacent the plateau 23 is a ramp 25, the ramp 25 terminating at a point above the plateau 23. The width of the ramp 25 is substantially constant throughout the first portion of the ramp, from the point at which the ramp merges with the surface 22, to a point adjacent the shoulder 24. Between the point on the ramp adjacent the shoulder 24, and the end of the ramp, the width of the ramp decreases to zero.

When the rotor is in its first position, the finger 14 of the latch member 13 is engaged with the surface 22 adjacent the lower end of the ramp 25, and during movement of the rotor 12 from its first position to its second position the finger 14 is moved along the ramp surface 25. Thus, during movement of the rotor 12 from its first position to its second position, the latch member 13 is tilted towards the rotor 12, thereby flexing the spring strip 15. When the rotor is in its second position, the finger 14 is at the point on the ramp surface 25 where the width of the ramp surface 25 begins to decrease. Movement of the rotor 12 from its second position to its third position against the action of said resilient means moves the finger 14 over the final part of the ramp surface 25, and in so doing, since the width of the ramp surface 25 decreases, the latch member 13 is moved laterally relative to the rotor 12 thereby further flexing the spring strip 15. As the rotor 12 reaches its third position, the finger 14 rides off the end of the ramp surface 25 and is urged by the spring strip 15 into engagement with the upper surface of the plateau 12.

When the rotor is released in the third position, the resilient means urges the rotor 12 to rotate back to its second position. The movement of the rotor back to its second position moves

the finger 14 along the upper surface of the plateau 23 towards the shoulder 24, and when the rotor 12 reaches its second position, the finger 14 leaves the upper surface of the plateau 23 and engages the surface 22 adjacent the shoulder 24, under the action of the spring strip 15. Thus, if an attempt is now made to return the rotor 12 from its second position to its third position the finger 14 engages the shoulder 24, and since the latch member 13 is rotatable with the rotor 12, then movement of the rotor 12 to its third position is prevented.

In order to move the rotor to its third position, the rotor must first be moved back to its first position. During movement of the rotor from its second position to its first position the finger 14 rides on the surface 22, and the free end of the finger 14 is engaged with the vertical surface of the ramp 25, the free end of the finger 14 being maintained in engagement with the vertical surface of the ramp 25 by the action of the spring strip 15. When the rotor 12 achieves its first position, the finger 14 is at the lower end of the ramp 25, where the ramp 25 merges with the surface 22, and so the latch member 13 is moved laterally under the action of the spring strip 15 so that the finger 14 is again aligned with the ramp surface 25, thus the rotor can now be moved from its first position, through its second position back to the third position, the latch member 13 following the sequence of movements described above.

Referring to FIG. 4, which illustrates an ignition switch according to a second example of the invention, the spring strip 15 is replaced by a compression spring 26 which extends between the latch member 13 and the rotor 12. The latch member 13 is also now provided adjacent the finger 14 with a metal pin 27 which extends towards the rotor 12, and which is surrounded by the end convolutions of the helical compression spring 26. The end of the compression spring 26 remote from the latch member 13 is secured in a bore 28 in the rotor 12, there being several convolutions of the spring 26 between the latch member 13 and the rotor 12, which are not engaged by the pin 27. Thus, the spring 26 principally acts in a direction parallel to the rotational axis of the rotor 12, to urge the latch member 13 away from the rotor 12. However, in the event that the latch member 13 is moved laterally with respect to the rotor 12, then the convolutions of the spring 26 between the rotor 12 and the latch member 13 will be deformed, so that the latch member 13 is urged to move laterally back to the position wherein the spring 26 is unstressed.

From the foregoing description, it will be appreciated that the cam track 21 and the latch member 13 cooperate to prevent the starter motor circuit being completed until the ignition circuit has been broken. Thus considering the switch in use in an automobile, the driver of the vehicle cannot energize the starter motor of the vehicle with the engine running, since the ignition circuit must be broken by moving the switch to its first position before the third position of the switch can be achieved to complete the starter motor circuit.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. An ignition switch including a casing, a rotor mounted for rotation within the casing from a stable first position to a stable second position and from the stable second position to an unstable third position from which it is resiliently urged back to the stable second position, an arcuate cam track on the inner surface of the casing and including surfaces which extend radially of the casing in planes generally at right angles to the axis of rotation of the rotor, a spigot projecting from one face of the rotor and rotatable with the rotor, a latch member rotatable with the rotor the latch member being in the form of a rigid plate having therein an aperture through which said spigot extends to drivingly couple the rotor and the latch member, the latch member including an integral finger which extends radially into engagement with said cam track, and a resilient member acting on said latch member, said resilient member acting to urge said finger into engagement with said cam track and being capable of urging the finger radially outwardly when the finger is moved radially inwardly by the cam track during rotation of the rotor and the arrangement of the finger and the cam track being such that the rotor is prevented from movement from its second position to its third position unless the preceding movement of the rotor was from its first position to its second position.

2. A switch as claimed in claim 1 wherein said cam track includes an integral upwardly projecting shoulder, said finger moving over said shoulder when said rotor is resiliently urged from the third position to the second position and the arrangement being such that said shoulder prevents further movement of the rotor from the second position to the third position unless the rotor is first moved through the first position.

3. A switch as claimed in claim 1 wherein said resilient member is a compression spring acting between the rotor and said latch member.

4. A switch as claimed in claim 1 wherein said resilient member is a substantially U-shaped spring strip carried by the rotor and engaged at one end in an arcuate slot in the casing.

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