

[54] **CONTROL APPARATUS FOR THE STARTER MOTOR FOR AN AUTOMOBILE ENGINE**

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[52] U.S. Cl. .... **123/179 BG; 123/179 R; 290/37 R; 290/DIG. 1**

[51] Int. Cl.<sup>2</sup> ..... **F02N 17/00**

[58] Field of Search..... **123/179 BG, 179 K, 179 R; 290/37 R, 38 R, 38 D, DIG. 1**

[56] **References Cited**

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*Primary Examiner*—Wendell E. Burns

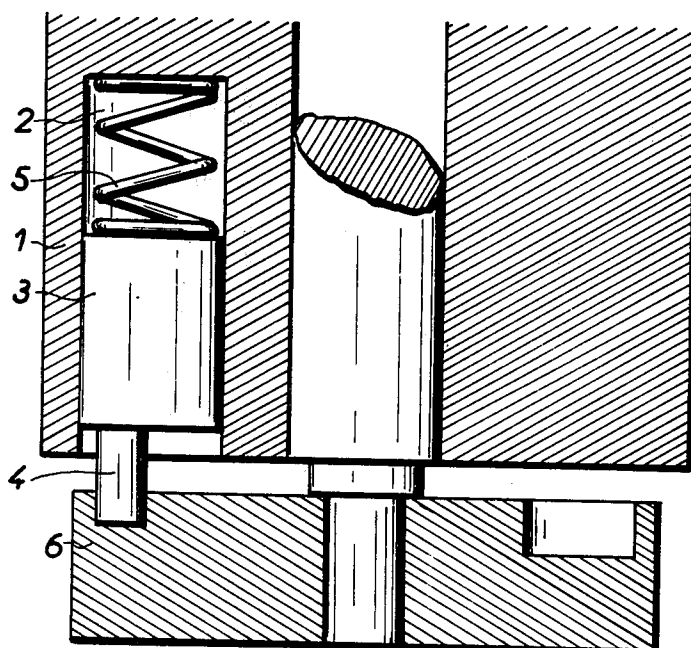
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[57] **ABSTRACT**

Apparatus for starting the engine of an automotive vehicle and only permitting the reengagement of the starter after interrupting the ignition and/or the feed of an injection pump associated with a switch provided with at least three successive positions inclusive

of stop, ignition on and start positions, and opposing a second movement towards start position without first going towards the stop position. The apparatus comprises a turnable plate having an axis of rotation and adapted for controlling the operation of the switch of the starter circuit, the turnable plate having a circumferential groove therein extending substantially concentrically with respect to its axis. A stator faces the plate and has a blind bore therein in which a guide member is supported for free slidable and rotatable movement. An eccentric pin is secured to the guide member and extends therefrom into the groove. The groove has a widened terminal zone with three levels thereat, and the pin is engaged in the groove at the highest level in the stop position which is remote from the terminal zone. The pin travels at the highest level from one end of the groove to the other as the plate is rotated and passes successively from the stop position, to the ignition position and then to the start position. The plate then rotates in opposite direction whereupon the pin descends to the lowest level at a "running" position where the ignition remains on. A shoulder is provided between the lowest and middle levels to prevent return rotation of the plate from the lowest level to the middle level and hence direct return to the start position. The plate is turnable further in this opposite direction towards the stop position whereupon the ignition is cut and the pin rides onto the highest level of the groove so that the plate can new be returned to the start position.

**3 Claims, 8 Drawing Figures**



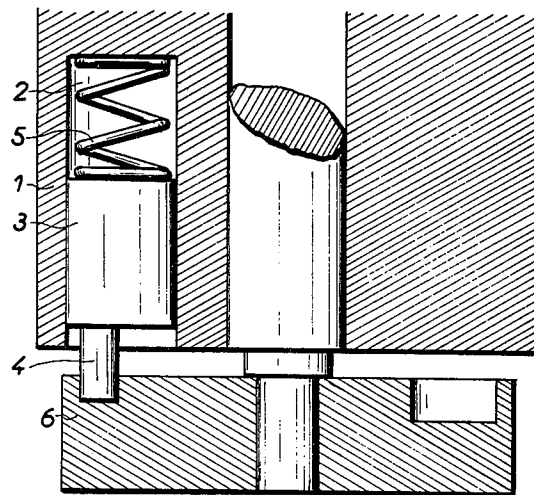


FIG. 1

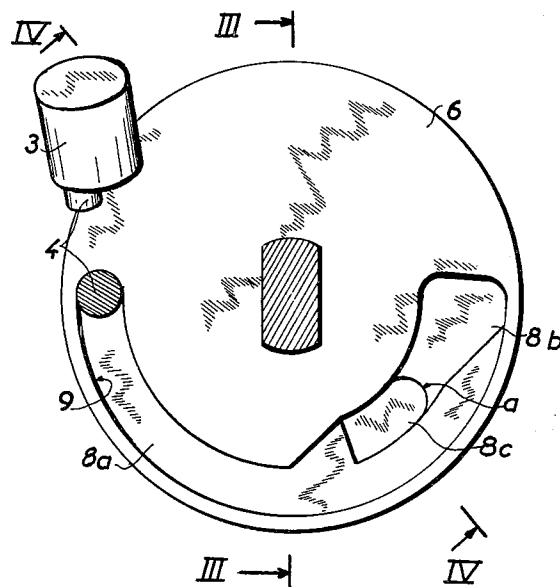
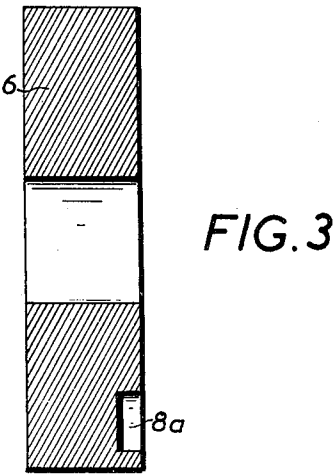
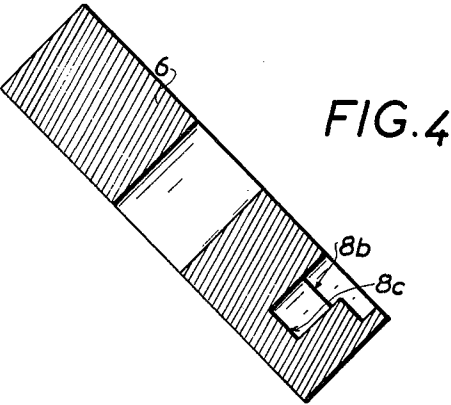


FIG. 2



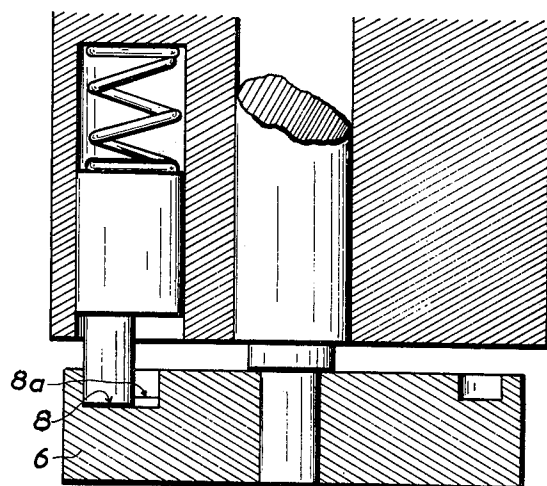


FIG. 5

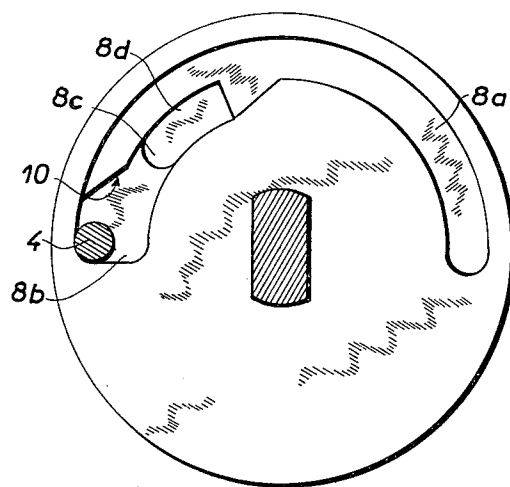


FIG. 6

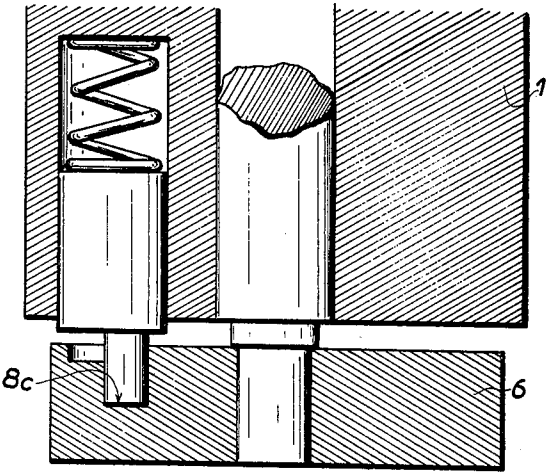


FIG. 7

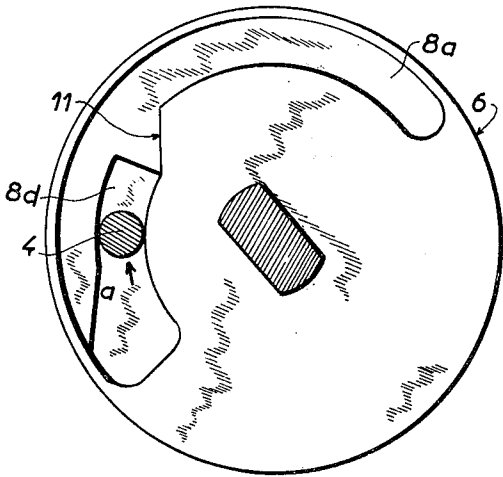


FIG. 8

# CONTROL APPARATUS FOR THE STARTER MOTOR FOR AN AUTOMOBILE ENGINE

## FIELD OF THE INVENTION

The present invention relates to apparatus for starting the engine of a vehicle and only permitting the re-engagement of the starter after cutting the ignition or the feed of the injection pump.

## PRIOR ART

In electric apparatus mounted on automobile vehicles, it is known to employ a switch element (associated or not with an anti-theft device) for permitting a conductor after leaving a "stop" position to realize successively the positions of "ignition" (or actuation of the injection pump) "running", "starting" by momentary closure of a special circuit.

A recall spring returns the switch element from the starting position to the running position whereat the ignition remains on. If the engine does not start readily, the conductor has the tendency to return the switch to the starting position which can produce undesirable interference between the teeth of the drive gear of the engine and the pinion of the starter.

To avoid this inconvenience, numerous mechanical and electronic devices have been developed in order to require the conductor to effect a new movement for starting viz. coming back rearwardly from the running position and cutting all feed to said engine and thus effectively stopping it.

The known apparatus has the serious disadvantage that it is complicated and does not always insure great reliability of operation.

## SUMMARY OF THE INVENTION

An object of the invention is to provide simplified apparatus which avoids the above-noted disadvantages while permitting it to operate with all types of switches (with or without a mechanical anti-theft device). This apparatus can be connected at any point in the mechanical transmission of a manipulation key or button, either with the electrical switch or with the mechanical anti-theft device without modifying the internal structure of these particular devices.

According to a first characteristic feature of the invention, the apparatus comprises in the mechanical transmission of the starter button, a turnable plate provided with a groove therein in the form of a sector forming a cam groove for receiving an eccentric pin fixed to a push guide received in a stator, said push guide being axially rotatable and/or freely slidable in the stator and accommodating itself to the groove in the plate and the direction of displacement of the plate to meet an abutment, or a ramp to require the switch to return from the running position to the stop position before attempting a new starting manipulation.

This apparatus has no effect whatsoever on the other apparatus activated by the rotor, particularly the automatic return to the running position from the start position as soon as the ignition key or the switch button is released.

The invention therefore contemplates two essential elements; namely the plate and the pin of the push guide, and the elastic means acting on the pin to press the same into the cam groove formed in the plate.

## BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a diametral cross-section of the apparatus according to the invention in the stop position, and for purposes of clarity the switch and/or the anti-theft blocking mechanism to which it is attached are not shown;

FIG. 2 is a front view of the apparatus of FIG. 1,

FIG. 3 is a sectional view taken on line III—III in FIG.

FIG. 4 is a sectional view taken on line IV—IV in FIG. 2,

FIG. 5 is a diametral cross-section of the apparatus according to the invention in starting position,

FIG. 6 is a front view of the apparatus of FIG. 5,

FIG. 7 is a diametral cross-section of the apparatus according to the invention in the immediate vicinity of the running or ignition position, and

FIG. 8 is a front view of the apparatus in FIG. 7.

## DETAILED DESCRIPTION

Referring to the apparatus of FIG. 1, therein is seen a stator 1 having a longitudinal blind bore 2 which is eccentrically located in the stator. A push guide 3 is freely supported in bore 2 for slidable and rotatable movement therein. The push guide has a fixed, eccentric pin 4 at its exterior face. A spring 5 is mounted in the bore 2 and acts on the push guide 3 to urge the same outwardly from the bore.

A turnable plate 6 is coaxially disposed with respect to the stator 1 and has a groove 8 in the surface facing the stator. The groove 8 extends circumferentially in the plate 6 and is formed as a semi-circular sector serving as a guideway for the pin 4 in the fashion of a cam groove. The groove 8 has a variable profile as evident from the sectional views in FIGS. 3 and 4. The groove 8 is formed, at the beginning of its profile, as a concentric circle at a radius to receive the pin 4.

The groove 8 is not of the same depth and width over its entire length. At the beginning of its length, the bottom of groove 8 corresponds to the stop position as illustrated in FIGS. 1 and 2 and permits abutment over its entire depth of pin 4 along portion 8a extending substantially over one quadrant i.e. an arc of 90°. The portion 8a is of constant depth and width and at section line III in FIG. 2, the profile of the bottom of the groove forms two transverse concentric zones, the outermost of which extends about 90°, while the inner descends via a ramp to a maximum depth at 8c which is bounded by a rounded shoulder a. A portion 8b extends in continuation of 8c and has a depth intermediate the maximum depth at 8c and the depth of 8a.

The operation of the described apparatus is as follows:

In the stop position of FIGS. 1 and 2, the pin 4 engages portion 8a of groove 8. When plate 6 is turned clockwise during an engine starting operation, as for example, by turning the ignition key, the pin 4 situates itself ahead of the axis of the push guide 3 while remaining externally disposed. The friction resulting from the pressure of the push guide 3 on its guideway tends to return to pin 4 towards the rear by pivoting around the axis of the push guide 3. The pin 4 is therefore thrust towards the lateral external wall 9 of the groove 8 which forms a stop and whose radius is less than the radius corresponding to the maximum eccentric position of the pin 4. It follows that after each rota-

tion in one direction of the other of the plate 6, the pin 4 engages and slides in the portion 8a of the groove 8.

Driven by wall 9 and following portion 8a, the pin 4 reaches the "ignition on" or energization position (immediately before the angular position in FIG. 8) and continues to the extreme position in FIGS. 5 and 6, which corresponds to the starting position. At this moment, the extremity of pin 4 is engaged at the intermediate depth 8b.

When starting of the engine has been effected, an elastic means (not shown) acts on plate 6 to bring the plate 6 in reverse direction of rotation i.e. counter clockwise, to the running position (in which ignition remains on or the feed of the injection pump continues). Thereby, the pin 4 lodged in portion 8b comes into contact with lateral ramp 10 which orients it and engages it in the deepest portion 8c at the time when the running position is reached. This is shown in FIGS. 7 and 8.

It is seen that if, from this position, it is attempted to return to the start position, the end of pin 4 abuts shoulder a to prevent such undesirable action.

To return to the start position, it is necessary to return to an intermediate position between running and stop by turning plate 6 so that pin 4 travels towards the initial stop position without necessarily attaining it, before again rotating the plate in clockwise direction. This operation cuts the ignition and thanks to the ramp 8d and 11 serves to return the pin 4 to its raised position in order to orient the same (in the course of the aforesaid movement of the plate) towards the wall 9 where it will remain until it passes the ignition on position before falling to the bottom of portion 8b which corresponds to start.

Thus, any return to start position is rendered impossible if one has not previously cut the ignition by a return towards the stop position of FIGS. 1 and 2.

The invention is not limited to the disclosed embodiment nor the specific utilization disclosed therefore but includes all variations and modification thereof within the bounds of the appended claims.

What is claimed is:

1. Apparatus for starting the engine of an automotive

vehicle and only permitting the reengagement of the starter after interrupting the ignition and/or the feed of an injection pump associated with a switch provided with at least three successive positions inclusive of stop, ignition on, and start positions, the apparatus opposing a second movement to the start positions, without first going towards the stop position, said apparatus comprising a turnable plate having an axis of rotation for controlling the operation of the starter circuit of an automotive vehicle, said turnable plate having a circumferential groove therein extending substantially concentrically with respect to said axis, a stator facing said plate and having a blind bore therein, a guide member supported in said bore for free slidable and rotatable movement therein, an eccentric pin secured to said guide member and extending therefrom into said groove, said groove having a widened terminal zone with three levels thereat, said groove being at the highest level outside said terminal zone, said pin being engaged in the groove at the highest level in the stop position which is remote from said terminal zone, said pin traveling at said highest level from one end of the groove to the other as the plate is rotated and passing successively from the stop position, to the ignition on position and then to the start position, said plate then returning in opposite direction to an intermediate angular running position in which the ignition remains on and said pin descends to the lowest level, said groove having a shoulder between the lowest and middle levels to engage said pin and prevent return rotation of the plate directly from the running position to the start position, said plate being turnable further in said opposite direction from said running position towards said stop position whereupon the ignition is cut and said pin rides onto the highest level of the groove so that the plate can now be returned to the start position.

2. Apparatus as claimed in claim 1 wherein said groove has a ramp portion between said lowest level and the highest level.

3. Apparatus as claimed in claim 1 comprising elastic means acting on said guide member to urge the pin outwardly from said blind bore.

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UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,921,613 Dated November 25, 1975

Inventor(s) Andre Thirion

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the Cover Sheet, the following should be added:

--[30] Foreign Application Priority Data

August 3, 1973      France      73.29082 --.

Signed and Sealed this

twentieth Day of April 1976

[SEAL]

*Attest:*

**RUTH C. MASON**  
*Attesting Officer*

**C. MARSHALL DANN**  
*Commissioner of Patents and Trademarks*



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