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Tregurtha

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[54] **COMBINED ELECTRICAL SWITCH AND LOCK ASSEMBLY**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** ..... **307/10 R,** 70/248, 200/153 L

[51] **Int. Cl.** **H01h 3/00**

[58] **Field of Search** ..... 200/44, 42 R, 42 A, 153 L, 200/153 LA; 70/239, 251, 248; 307/10 R

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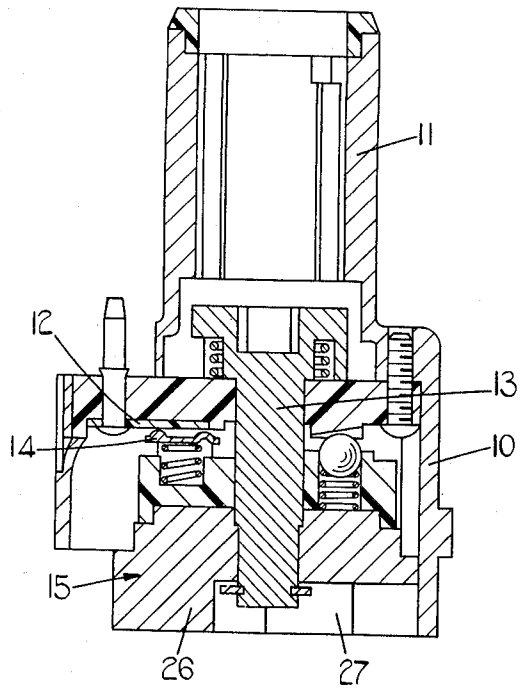
Assistant Examiner—M. Ginsburg
Attorney, Agent, or Firm—Holman & Stern

[57] **ABSTRACT**

A combined electrical switch and lock assembly including fixed contacts and a movable contact which is carried by a rotor of the assembly. A key operated mechanism is provided for moving the rotor and moving with the rotor is a cam member. A pair of locking elements are resiliently biassed into engagement with the cam member, the shape of the cam member being such that in a first angular position of the rotor one locking element is urged by the cam member to a position in which it resists operation of a control of a machine with which the assembly is associated. In a second angular position of the rotor the rotor is held against movement into a third angular position by the other locking element unless the other locking element is free to move against the action of its resilient bias. The other locking element will be held against movement in certain circumstances by a control of the machine with which the assembly is associated. Particularly the assembly is intended for use in a road vehicle where the electrical switch controls the starting of the engine of the vehicle and the mechanical lock mechanism controls operation of the gear box of the vehicle.

3 Claims, 7 Drawing Figures



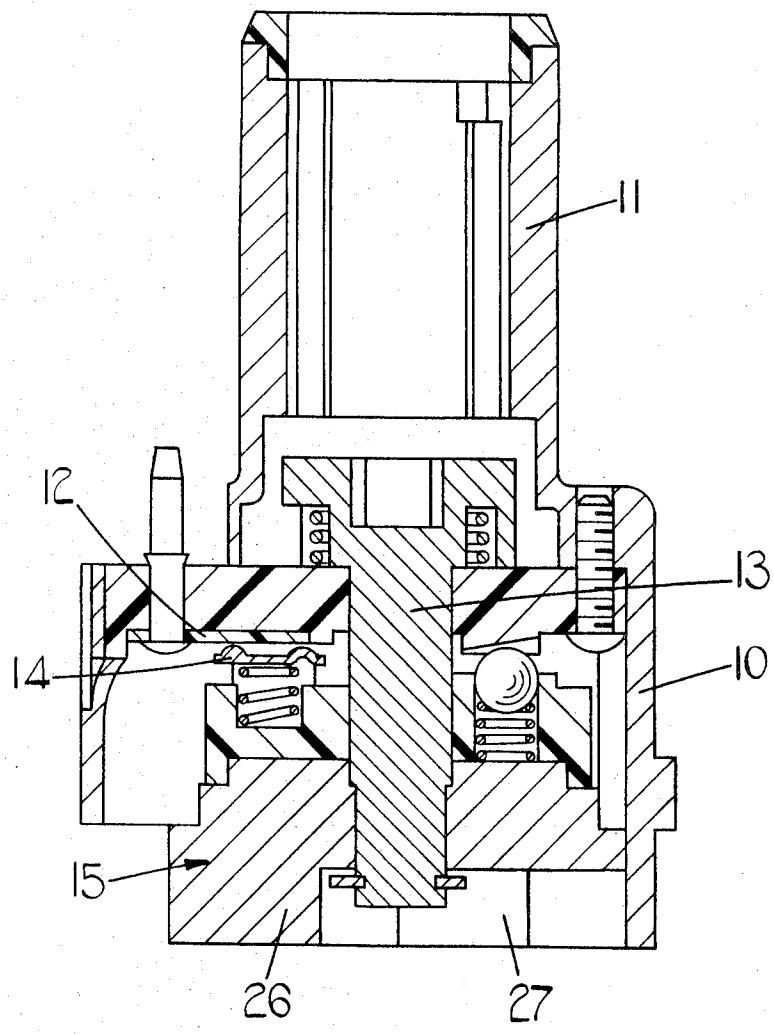


FIG. 1.

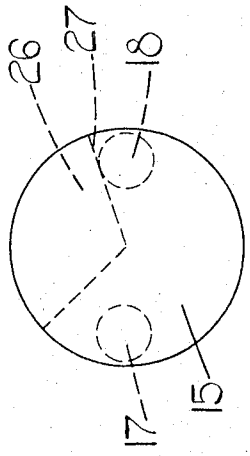


FIG. 4.

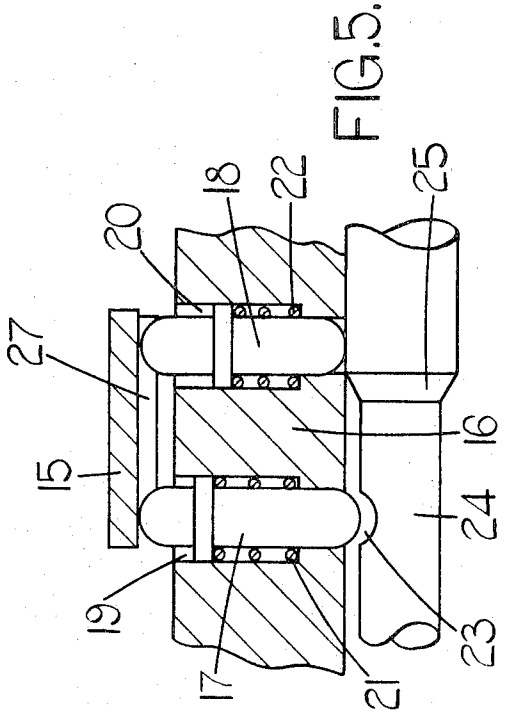


FIG. 5.

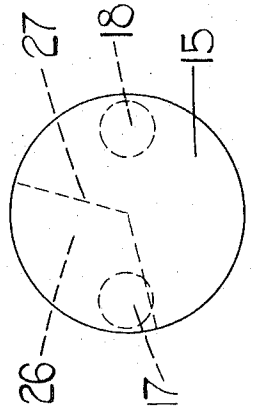


FIG. 2.

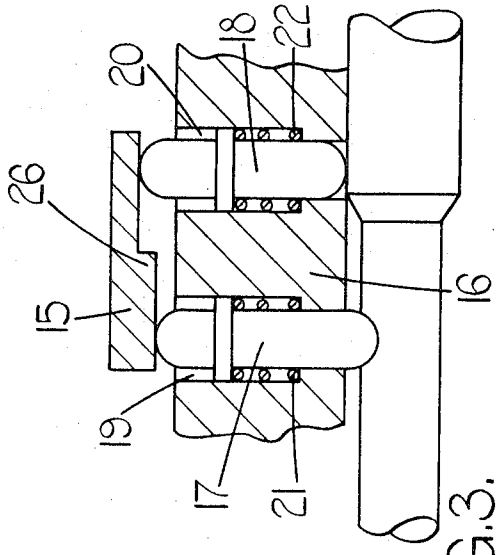


FIG. 3.

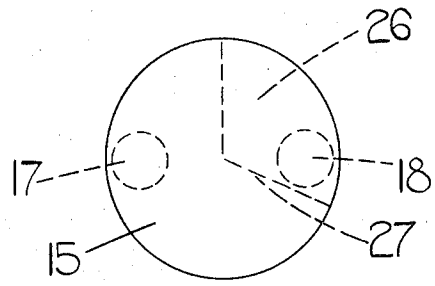


FIG.6.

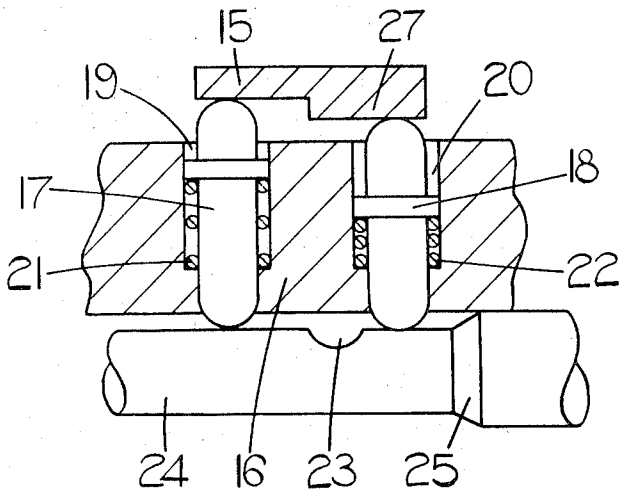


FIG.7.

COMBINED ELECTRICAL SWITCH AND LOCK ASSEMBLY

This invention relates to combined electrical switch and lock assemblies for machines, for example motor vehicles, and also to motor vehicles including such assemblies.

According to one aspect of the present invention, there is provided a combined electrical switch and lock assembly comprising a plurality of fixed electrical contacts, a rotor member adapted to be rotated by a key-operated lock mechanism, an electrical contact mounted for movement with the rotor member between a plurality of angular positions relative to the fixed contacts, and the locking device including a cam member rotatable with the rotor member and a pair of locking elements resiliently biased into engagement with a cam member, the cam member being profiled so that, in a first angular position of the rotor member, one of the locking elements is urged by the cam member into a position in which, in use, it resists operation of a control of a machine equipped with the assembly and, in a second angular position of the rotor member, movement of the rotor member into a third angular position is prevented if the other locking element is fixed against movement opposing the resilient bias, in use, by the or a control of the machine.

Also according to the present invention, there is provided a motor vehicle including a combined electrical switch and lock assembly as defined in the last preceding paragraph, wherein the fixed contacts are connected into ignition and starter motor circuits on the motor vehicle so that, in the first angular position of the rotor member, the ignition and starter circuits are open, in the second position of the rotor member the ignition circuit is closed and the starter member circuit is open and, in the third angular position of the rotor member, both the ignition and the starter motor circuits are closed, and wherein said locking elements extend through a gear-box casing of the vehicle and cooperate with one or more movable parts therein so that, in the first position of the rotor member, said one locking element locks the gearbox in a predetermined gear and, in the second position of the rotor member, the said other locking element is fixed against movement opposing the resilient bias by engaging with the or one of the movable parts when such movable part is in one position but is permitted to move in a direction opposing the resilient bias when the aforesaid movable part is moved into another position whereby movement of the rotor member into its third position is permitted.

Preferably, the arrangement is such that the gearbox can be locked in reverse gear when the rotor member is in its first position and movement of the rotor member from its second position into its third position is prevented when reverse gear is selected but is permitted when the gearbox is moved out of reverse gear.

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is a longitudinal sectional view of an electrical switch and cam member forming part of a combined electrical switch and lock assembly according to the present invention,

FIG. 2 is a diagrammatic illustration of the cam member of FIG. 1 in a first position,

FIG. 3 is a scrap sectional view through a gearbox casing showing a pair of locking elements forming part of the assembly according to the present invention with the cam member in the position shown in FIG. 2,

FIGS. 4 and 5 are views corresponding to FIGS. 2 and 3, respectively, in which the cam member is shown in a second operating position and

FIGS. 6 and 7 are views corresponding to FIGS. 2 and 3 respectively in which the cam member is shown in a third operating position.

Referring firstly to FIG. 1 of the drawings, the electrical switch comprises generally a body **10** having a cylindrical upper portion **11**, a plurality of fixed contacts **12** only one shown mounted within the body **10**, a rotor member **13** and a contact **14** carried by the rotor member **13**. The rotor member **13** carries a cam member **15** for rotation therewith, said cam member **15** forming part of a locking device.

The rotor member **13** is adapted to be rotated by the key-operated lock mechanism between first, second, and third angular positions, as will be described hereinafter.

The above described electrical switch is adapted to be mounted adjacent a gearbox casing **16** (see FIGS. 3 and 5) of a motor vehicle so that the cam member **15** lies adjacent the casing **16**.

The locking device, in addition to the cam member **15**, includes a pair of axially movable locking elements **17** and **18** which are lodged in recesses **19** and **20**, respectively, in the casing **16**. Springs **21** and **22** respectively urge locking elements **17** and **18** into engagement with the cam member **15**. The locking element **17** can be moved into and out of engagement with a recess **23** in a selector shaft within the gearbox. The locking element **18** engages the surface of the selector shaft **24** which also has a shoulder **25** thereon.

The cam member **15** is profiled on its surface against which the locking elements **17** and **18** abut so as to provide a segment shaped projection **26** defining an abutment **27** thereon.

In use, the combined electrical switch and lock assembly is mounted on the gearbox casing **16** with the cam member **15** overlying the locking elements **17** and **18** which are axially urged by springs **21** and **22**, respectively, against the profiled surface of the cam member **15**. The fixed contacts are connected into ignition and starter motor circuits, (not shown) of the motor vehicle so that, in the first angular position of the rotor member **13**, the ignition and starter motor circuits are open, in the second angular position of the rotor member **13**, the ignition circuit is closed and the starter motor circuit is open and, in the third angular position of the rotor member **13**, both the ignition and the starter motor circuits are closed.

In the first position of the rotor member **13**, the cam member **15** is in the position shown in FIGS. 2 and 3. In this first position of the rotor member **13**, the projection **26** on the cam member **15** urges the locking element **17** against the action of the spring **21** into the recess **23** in the selector shaft **24**. The recess **23** is so arranged, in the present embodiment, that the position of the selector shaft **24** in which the recess **23** lies on the axis of the locking element **17** corresponds to a position in which reverse gear is engaged. It will thus be appreciated that, in the first position of the rotor member **13** i.e., in the "off" position of the switch, the vehicle is locked in reverse gear.

When the rotor member **13** is rotated into its second position to close the ignition circuit of the motor vehicle, the cam member **15** is moved into the position shown in FIGS. **4** and **5.** In this position of the cam member **15,** the projection **26** no longer engages the locking element **17** which is moved under the action of spring **21** to a position in which it is no longer engaged with the recess **23.** In this position, therefore, the selector shaft **24** is freed so that reverse gear can be disengaged. However, if the selector shaft **24** is not moved to disengage reverse gear, the locking element **18** is fixed, due to the inherent shape of the selector shaft **24,** against movement thereof in a direction opposite to the biasing of spring **22.** The locking element **18** is thus locked in a position in which it is engaged with abutment **27** so that the rotor member **13** cannot be moved into its third position from the second position. In this manner, the starter motor circuit cannot be closed with the selector shaft **24** in a position corresponding to reverse gear. In order to move the rotor member **13** into its third position to start the motor vehicle, it is necessary to move the selector shaft **24** to the right as viewed in FIG. **5** so that the gearbox is in neutral. Movement of the selector shaft **24** from reverse to neutral causes the shoulder **25** to move under the locking element **18** and thereby allow movement of the latter against the bias of spring **22.** Such movement of the locking element **18** occurs when the rotor element **13** is moved into its third position to start the motor vehicle. During such movement, the abutment **27** passes over the locking element **18** which is urged in a direction opposite to the bias of spring **22.** As is conventional in electrical ignition switch assemblies, the rotor member **13** is biased to return into its second position when the key is released so that the starter motor circuit is broken and the ignition circuit maintained. In the second position of the rotor member **13,** the locking element **18** is no longer engaged with the projection **26** so that the spring **22** urges the locking member **18** into a position in which it does not hinder the selection of reverse gear whilst the motor vehicle is running.

I claim:

1. A combined electrical switch and lock assembly comprising in combination, a plurality of fixed electrical contacts, a rotor member, means mounting said rotor member for rotation, a key operated lock mechanism, means coupling said key operated lock mechanism to said rotor member whereby said rotor member can be rotated by said key operated lock mechanism, a movable electrical contact, means mounting said movable electrical contact for movement with said rotor member between a plurality of angular positions in relation to said fixed electrical contacts, a cam member, means mounting said cam member for rotation with said rotor member, to first, second, and third angular positions, first and second locking elements, means resiliently biassing said first and second locking elements into engagement with said cam member, said cam member having a profiled surface such that in said first angular position of said rotor member, said first locking element is urged by said cam member into a position in which, in use, it is adapted to resist operation of a control of a machine which is equipped with the combined electrical switch and lock assembly, and, said profiled surface of said cam member being such that when said cam member is in said second position then, in use, said first locking element is adapted to no longer resist operation of said control of said machine, and said profiled surface further being such that further movement of said cam member, into said third angular position, is resisted by said second locking element if said second locking element is held against movement in a direction opposite to that in which it is biassed by said biassing means.

2. The assembly as claimed in claim **1** in combination with said machine, said machine comprising a motor vehicle, and wherein said fixed contacts are connected into ignition and starter motor circuits of said motor vehicle so that, in first angular position of the rotor member said ignition and starter circuits are open, in said second position of said rotor member said ignition circuit is closed and said starter motor circuit is open and in said third angular position of said rotor member both said ignition and said starter motor circuits are closed, and wherein said first and second locking elements extend through a casing portion of the gear box of the vehicle and co-operate with at least one movable part therein so that, in said first position of said rotor member, said first locking element locks the mechanism of the gear box in a predetermined gear and, in said second position of said rotor member, said second locking element is fixed against movement opposing the resilient bias by engaging with said movable part when such movable part is in one position but is permitted to move in a direction opposing said resilient bias when said movable part is moved into another position whereby movement of said rotor member into its third position is permitted.

3. The combination as claimed in claim **2** wherein means are provided such that said gear box mechanism can be locked in reverse gear when said rotor member is in its first position and movement of said rotor member from its second position into its third position is prevented when reverse gear is selected, but is permitted when said gear box mechanism is moved out of reverse gear.

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