July 5, 1960 J. B. GAIDA 2,944,123

DOOR-LOCKING SWITCH

Filed March 14, 1957

Fig. 1

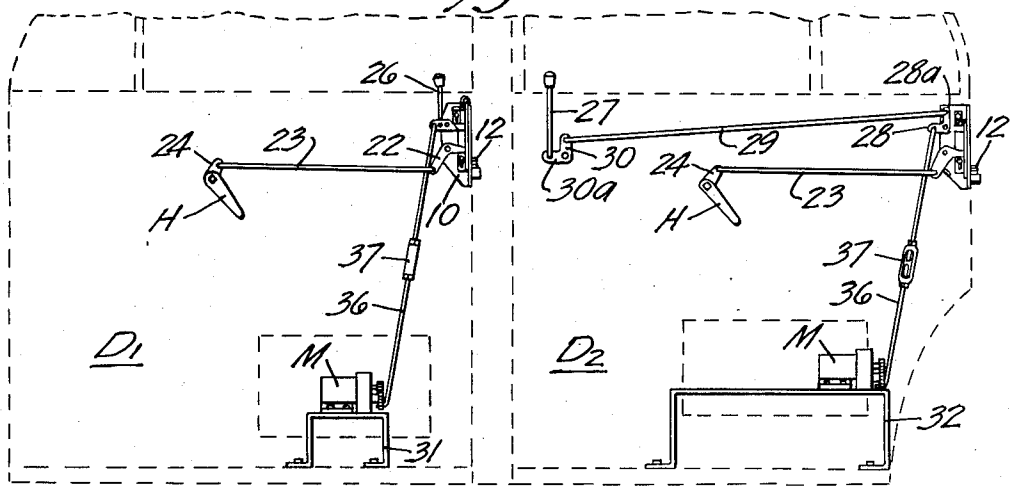


Fig. 2

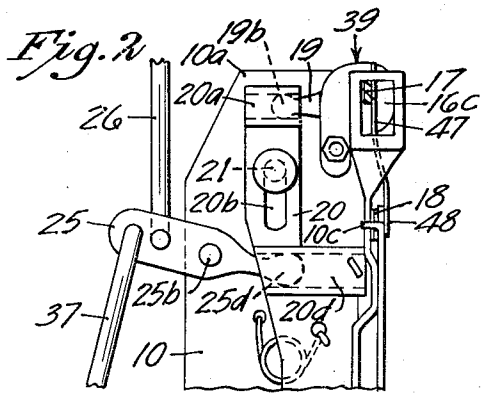


Fig. 3

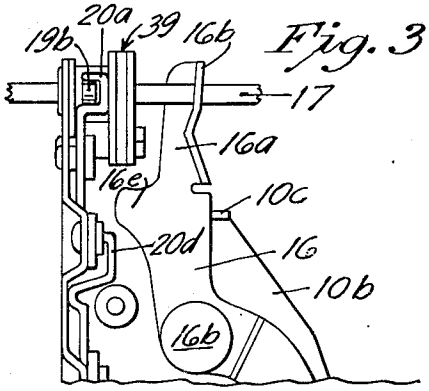


Fig. 4

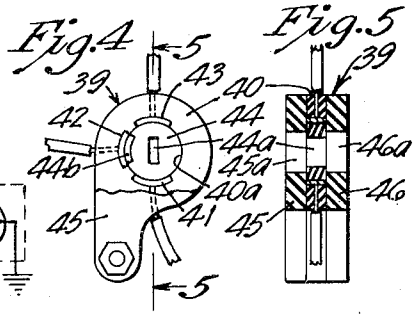
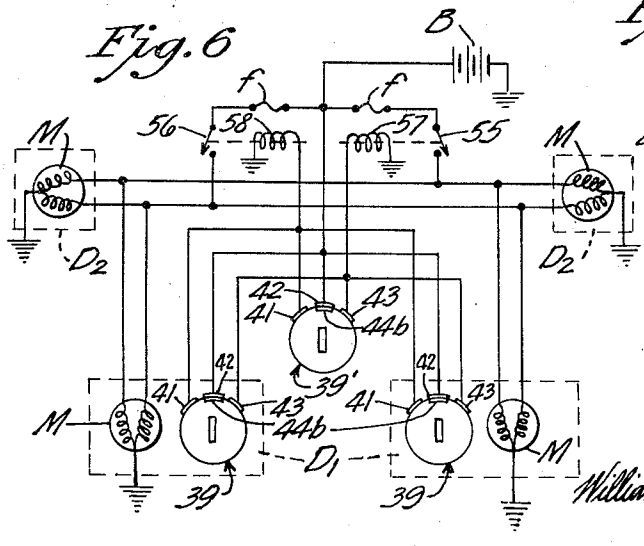


Fig. 5

Fig. 6



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DOOR-LOCKING SWITCH

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3 Claims. (Cl. 200—44)

This invention relates to electrical switching apparatus and more particularly to a multi-position switch for operating reversible door-locking and unlocking motors and the like.

This is a continuation-in-part invention previously disclosed in my co-pending application for United States Letters Patent S.N. 527,090, filed August 8, 1955, now Patent No. 2,904,988, and entitled, Power Door Locking System.

An object of my invention is to provide a new and improved multi-position electric switch of simple and inexpensive construction and operation.

Another object of my invention is the provision of a novel rotary multi-position switch adapted for use with a reversible motor or the like which operates the locking apparatus of a door-latching mechanism.

A further object of my invention is the provision of an improved rotary, multi-position switch which is applicable to many different types of automobile door-locking mechanisms for operating an electric motor drive for the mechanism with only a minute movement of the key in one direction or the other.

These and other objects and advantages of my invention will more fully appear from the following description made in connection with the accompanying drawings wherein like reference characters refer to the same or similar parts throughout the several views and in which:

Fig. 1 is a diagrammatic view of power-operated door mechanisms applied in front and rear doors of an automobile;

Fig. 2 is a front elevation detail view of a portion of a door latching mechanism of the type common to many automobiles;

Fig. 3 is a side elevation detail view of the mechanism shown in Fig. 2;

Fig. 4 is a front elevation assembly view of the switching apparatus operable with the door-latching mechanism;

Fig. 5 is a section view taken on a substantially vertical plane as indicated at 5—5 in Fig. 4; and

Fig. 6 is a schematic view of the circuit diagram of the power door-locking system.

The present invention is well adapted for use in a power door-locking system of the type shown in the drawings. In Fig. 1, the front and rear doors D_1 and D_2 are shown with the door-latching and locking mechanisms therein. The door-latching mechanism of doors D_1 and D_2 are substantially identical and include a mounting plate **10** having a side flange **10***a* and a rear flange **10***b* which are disposed in substantially normal relation to each other. Of course the door-latching mechanisms include rotary latching members **12** which are common to many types of latching mechanisms and are clearly pictured in application S.N. 527,090 and these rotary latching members **12** are adapted to be released upon operation of the release lever indicated by the numeral **16** and having an upstanding arm **16***a* which is provided with a flange **16***b* against which the external thumb button (not shown) of the door handle presses for operating the release lever

16 so as to permit the rotary latching member **12** to release the door. Release lever **16** is mounted on a pivot pin **16***b*, and the lever **16** has a third, very short arm **16***e* projecting outwardly therefrom to comprise a locking abutment, which when engaged, will preclude shifting of the lever **16** in a counter-clockwise direction. The flange **16***b* of the release lever **16** has an enlarged opening **16***c* therein which receives the conventional key bar **17** therethrough which is also connected to the conventional rotary key cylinder, to be turned by the key to lock and unlock the mechanism. The lever arm **16** is normally urged in a clockwise direction by means of a torsion spring **18** and is held from swinging substantially in a clockwise direction by means of the small inturned ear **10***c* which is rigid with the mounting plate **10**.

The latching mechanism is also provided with a shift arm **19** swingably mounted on the flange **10***a* of the mounting plate and in alignment with the key bar and slotted to receive the key bar therethrough. The shift arm **19** may thereby be swung by rotation of the key bar **17**. A shift bar **20** is mounted on the flange **10***a* of the mounting plate **10** by means of a pin **21** extending through a slot **20***b* and thereby adapting the shift bar **20** to move in vertical reciprocation. The shift bar **20** may also be guided at the lower end thereof for vertical reciprocation. Shift bar **20** has a shift arm-receiving channel **20***a* at the upper end thereof which received the rounded outer end **19***b* of the shift arm **19**. The vertical movement of shift bar **20** is thereby controlled by the arm **19**. The shift bar **20** also has a channel **20***d* formed intermediate the upper and lower ends thereof for movement into obstructing relation with the short abutment arm **16***e* of the release lever **16**, thereby precluding swinging of the lever **16** and effecting a locking of the door.

Releasing of the rotary door-latching member **12** can also be accomplished by swinging of the door handle H to effect a swinging motion of the bell crank lever **22** which is mounted on the plate **10**. The bell crank lever **22** is connected by means of a rod or link **23** to the short bell crank arm **24** on the handle H.

It should further be noted that the vertically reciprocable shift bar **20** may be moved upwardly and downwardly by means of a shift arm **25** having the diminished and rounded inner end **25***a* projecting into the channel **20***b* of shift bar **20**. Arm **25** is swingable about a pivot **25***b* and may be manually operated by means of the upright push-pull rod **26**.

It will be noted that the push rod shift arm **28** of the locking mechanism on the rear door D_2 accomplishes substantially the same function as the arm **25** on the front door D_1, but is shaped slightly differently in the form of a bell crank lever having an upstanding arm **28***a* to which is connected a rod or link **29**, the other end portion of which is connected to a bell crank lever **30**. The second short arm portion **30***a* of bell crank lever **38** is connected to an upright push-pull rod **27**. By means of vertical movement of rod **27**, the push rod shift arm **28** will be swung to effect a similar operation as that of the arm **25**.

In each of the doors D_1 and D_2, rigid strap pedestals **31** and **32** respectively are mounted, which carry motors M for producing a power drive for the locking apparatus. Substantially upright connecting rods **36** extend from the motor M to the shift arms **25** and **28** respectively and have adjustable turn buckles **37** in the central portion thereof. The lower ends of rod **36** are drivably connected to the drive outputs of the motors M by means of a lost motion connection so as to permit the motor to start and gain an initial impetus before the driving relation to rod **36** is established. The motors M can thereby easily drive the rods **36** in vertical reciprocation for locking and unlocking the mechanisms.

Each of the door-locking and unlocking mechanisms is provided with an improved rotary electric switching device indicated in general by the numeral **39**, which is shown in detail in Figs. 4 and 5 and shown schematically in the Fig. 6. The switching device has a generally laminar construction and may be of substantially any suitable external configuration such as the generally teardrop shape shown. The mounting device has a central contact-carrying plate which is constructed of an insulating material such as one of numerous types of plastics. The contact-carrying plate **40** has a circular opening **40***a* therein which defines the rotor-mounting chamber. A plurality of switch contacts **41**, **42** and **43** are embedded into the inner peripheral surface of the plate **40**, and the contacts **41**—**43** are substantially flat and arcuate in configuration so as to conform to the peripheral contour of the opening **40***a* A flat and substantially cylindrically shaped contact member or rotor **44** is carried within the opening **40***a* of plate **40** and has an external configuration substantially identical to the internal configuration of the opening **40***a*. The rotor **44** has a substantially rectangular and diametrically disposed slot **44***a* extending therethrough and receiving the key bar **17** substantially in the manner shown in Fig. 2, whereby to facilitate turning of the rotor **44** when the key bar is turned. The rotor **44** also has an arcuate spanner contact **44***b* embedded in the outer peripheral surface thereof for engaging one or a pair of the contacts **41**—**43**. It will be noted that the spanner contact **44***b* is sufficient in length, in a direction around the circumference of the rotor **40**, so as to simultaneously engage a pair of the adjacent contacts **41**—**43**.

The switch **39** is also provided with a pair of cover plates **45** and **46** which are substantially identical in external configuration to that of the contact-carrying plate **40**. The cover plates **45** and **46** also have openings **45***a* and **46***a* therein which are slightly smaller in diameter than the opening **40***a* in the plate **40**. The cover plates **45** and **46** are thereby defined ends for the rotor mounting chamber in the plate **40** and engage the rotor **44** for positively retaining the rotor in the opening **40***a* and retaining the contact **44***b* in engaging relation with one or more of the contacts **41**—**43**.

It will be seen that the contact surfaces are substantially sealed from dust or other material which might interfere with the proper operation of the switch and furthermore the contact **44***b* of the rotor firmly engages each of the several contacts **41**—**43** when rotated into alignment therewith.

Normally it is desired to maintain the rotor **44** in substantially the position shown in Fig. 4. To this end, a leaf spring **47** is affixed at **48** to the mounting plate **10** and has the upper end portion thereof bearing against one side of the key bar **17**. It will therefore be seen, that due to the resiliency of the leaf spring **47**, the key bar **17** will be urged back to its normal upright position shown in Fig. 2 after it is turned by means of the key in the lock. The spanner contact **44***b* will thereby be returned to the position shown in Fig. 4 wherein only the contact **42** is engaged thereby. It should be recognized that when the key bar **17** is turned through only a few degrees the spanner contact **44***b* will engage one of the other contacts **41** or **43** in conducting relation so as to produce a closed electric circuit between the contact **42** and the other stationary contact **43** or **41**.

It should further be recognized that in most automobiles, only the front doors D_1 are provided with the key-locking and unlocking mechanisms and that the rear doors are not ordinarily adapted to be opened by means of a key. Specifically referring to Fig. 6 it should be noted that a two-winding motor M is mounted in each of the doors D_1 and D_2. One of the windings in each of the doors is connected in parallel from the relay contact **55**; and the other of the winding in each of the motors M is

connected in parallel with a corresponding winding in each of the other motors M from the relay contact **56**, so that when one or the other of the relays **57** or **58** is energized, one of the windings in each of the motors will be energized.

It should be noted that one of the switching devices **39** is mounted in each of the front doors D_1 and a similar switching device **39'** is mounted in a third alternate position within the motor vehicle, preferably on the dashboard or in a similar location so that all of the doors may be controlled from any single switch location. All of the contacts **43** of each of the several switches **39** and **39'** are connected to the relay **57**. Each of the contacts **41** of the several switches is connected to the relay **58** for operating the same. Each of the contacts **42** of the several switches is connected to the battery B or other source of electric power in the automobile. The source of electric power or battery B is also connected through the fuses *f* to the switch contacts **55** and **56** of the relays.

It will therefore be seen that when any one of the switching devices **39** is operated by the rotating of the rotor **44** thereof through only a few degrees, corresponding windings in each of the motors M will be energized so as to turn all of the motors in one direction such as to lock all of the door-locking mechanisms simultaneously. When the motors have been energized, the key may be released and the key bar **17** will return to its normal upright position shown in Fig. 2 by operation of the leaf spring **47**, and the key may be then withdrawn from the key barrel. Similarly the other windings of the several motors may be energized to unlock the mechanisms.

The ruggedness of this switching device is an important feature of the present invention. The switching device shown in the drawings has been installed for substantially two years in an automobile for operating four motors arranged in the manner shown. Previous to the installation in the automobile, the switch was operated more than seven thousand times. There has not been a single case of failure in the preliminary testing before installation or since installation.

It will therefore be seen that the present invention provides an extremely simple and rugged electric switching apparatus adapted for use in operating the reversible motors of a power door-locking mechanism or the like.

It will, of course, be understood that various changes may be made in the form, detail, arrangement and proportion of the parts without departing from the scope of my invention which consists of the matter described herein and set forth in the appended claims.

What is claimed is:

1. The combination of a motor vehicle door latching mechanism having movable release means and a locking element movable with respect to the release means into locking and unlocking positions, key-operated means in the door and including a rotatably oscillatable key bar rotatable in opposite directions from normal position when the key is turned, and a reversible electrically operated power source connected with the locking element for moving the same into locking and unlocking positions; and an oscillatable switch in the door for operating the power source, said switch having a stator and a rotor with opposed relatively rotatable circumferential portions, the rotor being drivably connected with the key-operated bar to be turned thereby, said stator having on said portion a pair of circumferentially spaced contacts connected to the power source for supplying electrical energy to cause operation of the power source in forward and reverse directions respectively, and said stator also having a third contact between said pair of contacts and supplying electrical energy thereto, said rotor having a single spanning contact slidable on the stator contacts and dimensioned for simultaneous engagement with the third contact and one of the other contacts on the stator when the rotor is turned in one direction and then the other direction,

whereby to move the locking element into locking and unlocking positions by turning the key in said means.

2. The invention set forth in claim 1 and including resilient means on the latching mechanism and bearing against the key-operated bar for rotating the same and the rotor into centered position wherein the spanning contact is aligned with said third contact whereby when the key is turned in one direction and then released, the rotor returns to centered position to disconnect the third contact from the other stator contacts.

3. The combination of a motor vehicle door-latching mechanism having movable release means and a locking element movable with respect to the release means into locking and unlocking positions, conventional key-operated door-locking means in the door and including a rotatably oscillatable element to be turned in opposite directions from normal position in response to turning of the key in the means, and a reversible electrically operated power source connected with the locking element for moving the same into locking and unlocking positions; and an oscillatable switch in the door for operating the power source, said switch having a stator and a rotor with opposed relatively rotatable circumferential portions, the rotor being drivably connected with said element in the key-operated means to be turned thereby, one of said circumferential portions having a pair of circumferentially spaced contacts connected to the power source for supplying electrical energy to cause operation of the power source in forward and reverse directions and also having a third contact between said spaced contacts and supplying electrical energy thereto, the other of said circumferential portions having a single spanning contact slidable on the other contacts and dimensioned for simultaneous engagement with the third contact and one of the other contacts when the rotor is turned in one direction and then in the other direction, whereby to move the locking element into locking and unlocking positions by turning the key in said means.

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