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COMBINED ELECTRIC SWITCH AND GEARSHIFT LEVER

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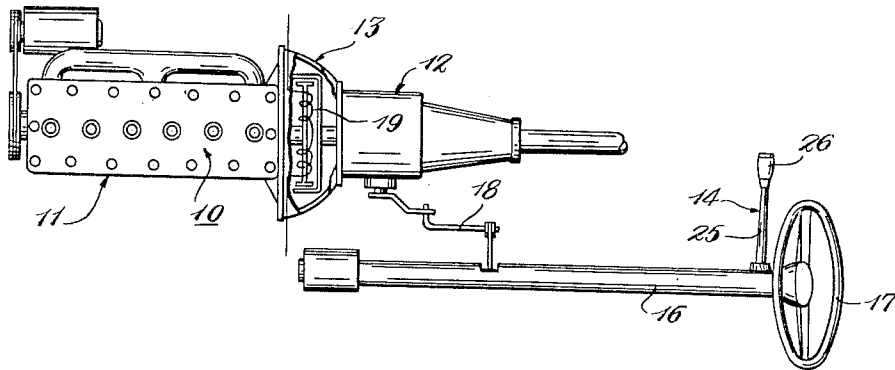


FIG. 1

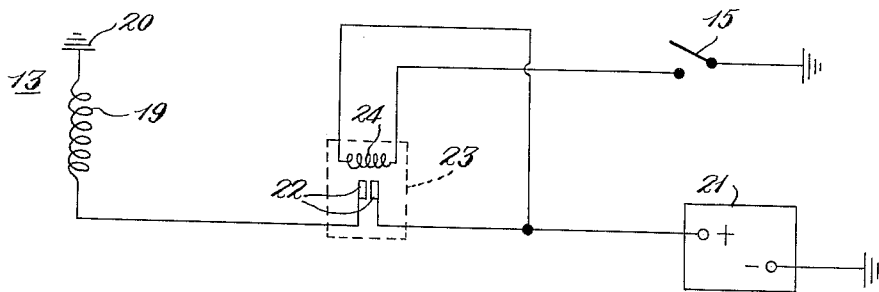


FIG. 2

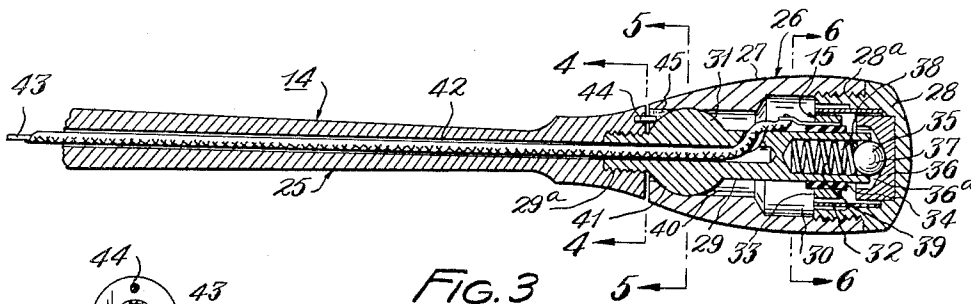


FIG. 3

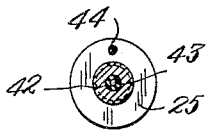


FIG. 4

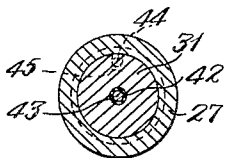


FIG. 5

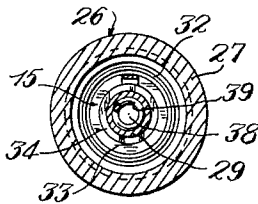


FIG. 6

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COMBINED ELECTRIC SWITCH AND GEARSHIFT
LEVER

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8 Claims. (Cl. 200—61.54)

This invention relates to electric switches and, as one of its objects, aims to provide a novel form of electric switch and a new form of combined actuating lever and control switch.

Another object is to provide a novel switch device having a sensitivity and ease of actuation such that a positive closing of its contact will result from a minor amount of relative movement occurring between a pair of relatively movably connected members with which the switch contacts are associated.

A further object is to provide a novel switch device of the character mentioned which is very simple and compact and is especially applicable to an articulated actuating member such as a gearshift lever comprising relatively movable lever and handle parts.

Still another object is to provide a novel electric switch having cooperating relatively movable contacts disposed in coaxial relation and one of which is a contact ring disposed around the other contact and having a normally open position spaced therefrom.

Yet another object is to provide a novel switch construction of the character mentioned in which the contact ring is carried by a hollow part and the other contact is carried by a stem part extending into such hollow part.

It is also an object of this invention to provide a novel switch structure of the kind above referred to in which the stem part is a portion of a manually movable lever, or the like, and the hollow part is a handle part or hand grip member which is movable relative to the stem part and is adapted to be grasped in manually imparting movement to the lever.

Additionally, this invention provides, as an article of manufacture, a new form of combined gearshift lever and control switch in which the lever comprises relatively movable coaxially disposed stem and sleeve parts and the cooperating contacts are housed in the sleeve part and comprise a contact ring disposed around a second contact member.

The invention can be further briefly summarized as consisting in certain novel combinations and arrangements of parts hereinafter described and particularly set out in the claims hereof.

In the accompanying sheet of drawings, forming a part hereof:

Fig. 1 is a top plan view somewhat diagrammatic in form and showing vehicle power plant control means embodying the present invention;

Fig. 2 is a wiring diagram illustrating an electric control system in which the novel switch means is used; and

Fig. 3 is a longitudinal section taken through the combined gearshift lever and electric switch;

Figs. 4, 5 and 6 are transverse sections taken through the combined gearshift lever and electric switch at axially spaced points thereof, as indicated by section lines 4—4, 5—5 and 6—6, respectively, of Fig. 3.

As representing one practical application of the present invention, Fig. 1 shows a vehicle power plant embodying

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control means in which the novel switch device and the novel form of combined gearshift lever and electric switch are used. The power plant 10 here shown comprises a conventional internal combustion engine 11, a change speed gearing or transmission 12 and an electric or electromagnetic clutch device 13 connecting the transmission with the engine. In Fig. 1 there is also shown a gearshift lever 14 as a part of the control means for the transmission 12 and the clutch device 13 and which includes the novel electric switch 15 to be described hereinafter. The gear shift lever 14 is mounted on a steering column 16 adjacent a steering wheel 17 and is operably connected with the transmission 12 by linkage 18 which has a portion thereof extending through the steering column.

The clutch device 13 may be any suitable form of electrically controlled clutch device embodying means adapted to be electrically energized and which means is here represented merely by the magnet coil 19 shown in Figs. 1 and 2. The coil 19 has one end thereof grounded, as indicated at 20, and has its other end connected with a storage battery 21 to be energized therefrom through the contacts 22 of an electromagnetic contactor 23 having a relay coil 24 for causing closing of such contacts. The relay coil 24 is energized from the battery 21 and such energization is controlled by the switch 15. When the switch 15 is closed, the relay 23 completes the energizing circuit for the winding 19 of the clutch device 13 causing the latter to disconnect the transmission 12 from the engine 11 to permit shifting of the gears of the transmission by the gearshift lever 14.

As shown in Fig. 3, the gearshift lever 14 is an articulated metal lever comprising a pair of connected relatively movable lever and handle members 25 and 26. The switch 15 is located in one of these relatively movable members, in this instance, in the handle member 26, and as will appear more fully hereinafter, is of a construction such that a minor amount of movement of the handle member relative to the lever member will cause closing of the switch contacts. The construction of the switch 15 and the connection of the handle member 26 with the lever member 25, are such that this minor actuating movement will always occur as the result of the initial movement which takes place when the operator grasps the handle member 26 and attempts to impart swinging movement to the gear shift lever 14. The handle member 26 thus acts as a trigger member to cause closing of the switch 15 before the gear shifting movement is imparted to the lever member 25.

As shown in Fig. 3, the handle member 26 is hollow and comprises a sleeve member 27 which is open at its inner end and is closed at its outer end by a metal cover 28 having a screw connection 28^a therewith. The lever member 25 is an elongated rigid member having an axial stem portion 29 at its outer end which extends into the passage or chamber 30 of the sleeve 27. The stem portion 29 is preferably made as a separate part which is connected with the lever member 25 by the threaded connection 29^a. At a point adjacent the connection of the stem portion 29 with the lever member 25, the stem portion is provided with a substantially ball-shaped fulcrum member 31 on which the sleeve 27 is rockably mounted for tilting movement relative to the stem portion.

The switch 15 comprises a pair of cooperating switch contacts 32 and 33 of which the outer contact 32 is a contact ring mounted on the sleeve 27, preferably by being connected with the cover 28. The other or inner contact, that is the contact 33, is mounted on the stem 29 from which it is insulated by the insulating sleeve 34. The contact 33 is also shown in this instance as being a contact ring which is disposed around the stem 29.

The coaxial relation of the contacts 32 and 33 is such

that the outer contact 32 has a normally open position spaced from the inner contact 33, but upon the occurrence of a minor amount of tilting of the sleeve 27 relative to the stem 29, the outer contact will engage the inner contact to thereby establish the closed condition of the switch 15 and cause energizing current to be supplied to the magnet coil 24 of the contactor 23 from the battery 21. Since the cooperating switch contacts 32 and 33 are contact rings and the fulcrum ball 31 permits a substantially universal relative movement of the handle member 26, a small amount of tilting of the handle member in any direction relative to the axis of the lever member 25, will result in engagement of some portion of the contact 32 with a portion of the contact 33 for closing the switch 15.

For normally maintaining the outer contact 32 in an open position in spaced relation to the inner contact 33, the switch 15 is provided with a detent means or automatic centering means 35 for the handle member 26. This detent means 35 comprises a socket member 36 mounted in the cover 28 and a detent ball or plunger 37 engageable in a substantially conically shaped counterbore or socket 36^a of this socket member.

The detent ball 37 is carried by the stem 29 and is axially movable in a bore 38 of the latter. A compression spring 39 located in the bore 38 urges the detent ball 37 outwardly into the socket member 36 such that the ball will tend to assume a central position in the conical socket 36^a, as shown in Fig. 3, and which tendency will cause the handle member 26 to assume a position coaxial with the stem 29 whenever the operator releases his grasp on the handle member. The return of the handle member 26 to this axially aligned position with the lever member 25 causes the contact member 32 to be moved to and retained in its normally open position.

In addition to forming a fulcrum for the handle member 26, the ball 31 also forms a connecting means for retaining the handle member in connected relation with the lever member 25. For this purpose, the inner end of the cylindrical fulcrum recess 40 of the sleeve 27 is reduced in size, as indicated at 41, to a diameter somewhat smaller than that of the ball 31. The outward force of the compression spring 39 also holds the reduced portion 41 of the sleeve 27 against the ball 31, such that the handle member 26 will be retained in connected relation with the lever member 25 with little or no lost motion therebetween and will be freely tiltable relative to the lever member in a manner such that it will be automatically returned to its axially aligned position with the lever member whenever the operator's grasp on the handle member is released.

As shown in Fig. 3, the lever member 25 and the stem 29 are provided with an axial passage 42 through which an insulated electric conductor 43 extends and is connected with the inner contact member 33. In assembling the switch device 15 and the handle member 26 on the gear shift lever 14, the stem 29 is inserted through the open outer end of the sleeve 27 and the conductor 43 is threaded through the passage 42 of the lever member 25. The threaded inner end of the stem 29 is then screwed into the threaded opening of the lever member 25 by applying a suitable tool to the outer end of the stem.

The threaded connection 29^a thus formed connects the stem 29 with the lever member 25, and the engagement of the ball 31 with the reduced portion 41 of the sleeve 27 draws the latter toward the lever member and maintains the handle member 26 in connected relation with the lever member. The movement of the sleeve 27 to its assembled position of Fig. 3 by the forming of this threaded connection 29^a, causes an axial retaining pin 44 of the lever member 25 to engage in a keyway 45 of the sleeve to prevent rotation of the handle member 26 relative to the lever member after the handle member is in its assembled position on the lever member. The

cover 28 carrying the contact member 32 is now screwed into the outer end of the sleeve 27 to complete the assembly operation.

From the foregoing description and the accompanying drawing, it will now be readily understood that this invention provides a novel electric switch of a very simple and reliable form and having such sensitivity and ease of actuation that a minor amount of relative tilting movement imparted to the handle member will result in a positive closing of the switch contacts regardless of the direction in which the relative tilting movement occurs. Additionally, it will be seen that this invention provides a new form of combined gearshift lever and control switch in which any relative tilting of the handle member of the lever caused by the operator grasping the handle member and attempting to move the gear shift lever, will result in a positive closing of the electric switch.

Although the novel electric switch and the combined gearshift lever and switch device of this invention have been illustrated and described herein to a somewhat detailed extent, it will be understood, of course, that the invention is not to be regarded as being limited correspondingly in scope, but includes all changes and modifications coming within the terms of the claims hereof.

Having thus described my invention, I claim:

1. In an electric switch, a first member comprising a lever having fulcrum means thereon and an extension stem portion projecting axially beyond said fulcrum means, a second member having a bearing portion journaled on said fulcrum means and another portion substantially axially coextensive with said extension stem portion, said second member being rockable on said fulcrum means and tiltable relative to said extension stem portion, cooperating switch contacts one of which is movable and another of which is carried by said extension stem portion and is engaged by the movable contact in response to the tilting of said second member relative to said extension stem portion, and means effective between said members and normally urging said second member toward a position corresponding with an open condition of said contacts.

2. An electric switch comprising, a pair of lever and handle members one of which has an axial recess therein and the other has an axial stem portion extending into said recess substantially coaxially thereof, cooperating ball and socket fulcrum means rockably mounting said handle member on said lever member for tilting movement relative thereto, and a pair of substantially coaxially disposed contact rings one of which is movable and the other of which is carried by said lever member and is engaged by the movable contact ring in response to the relative tilting movement of said handle member.

3. In an electric switch, a first member having a fulcrum means thereon and a stem portion projecting beyond said fulcrum means, a second member having a sleeve portion disposed around said stem portion and a closed end located adjacent the free end of said stem portion, said second member being movably mounted on said fulcrum means for tilting of said sleeve portion relative to said stem portion, contact means on said stem portion having an exposed perimetral contact surface, a contact ring in said sleeve and engageable with said contact means in response to the tilting of said sleeve portion, and cooperating detent elements effective between said free end and said closed end and normally urging said sleeve portion to a position corresponding with an open-switch position of said contact ring.

4. A gearshift lever having the electric switch of claim 3 thereon and in which said stem portion is a portion of the lever and said second member is a handle member adapted to be manually grasped for actuating the gearshift lever.

5. An electric switch as defined in claim 3 in which said fulcrum means is a ball member located at a point spaced from the free end of said stem portion, and in

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which said second member is movably connected with said first member by engagement with said ball member.

6. An electric switch as defined in claim 3 in which one of said detent elements is a substantially conical recess in said closed end and another of said detent elements is a spring pressed ball member mounted in said free end.

7. In an electric switch, a pair of axially adjacent lever and handle members, a substantially ball-shaped fulcrum on the lever member adjacent one end thereof, a stem substantially rigid with said one end and projecting therefrom axially of the lever member and beyond said fulcrum, said handle member being hollow and being carried by said one end in a substantially coaxially telescoping relation to said stem, said handle member having a substantially closed outer end and an open inner end substantially universally rockable on said fulcrum for tilting of the handle member relative to said stem, and a pair of substantially coaxially disposed annular contact

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elements housed in the closed end of said handle member and mounted respectively on said handle member and stem.

8. An electric switch as defined in claim 7 which includes a positioning means also housed in said closed end effective between said handle member and stem for normally urging said handle member toward a position corresponding with an open condition of said contact elements.

References Cited in the file of this patent

UNITED STATES PATENTS

1,847,407	McManaman	Mar. 1, 1932
2,223,678	Elliott	Dec. 3, 1940
2,235,069	Gover	Mar. 18, 1941
2,269,512	Bobroff	Jan. 13, 1942

FOREIGN PATENTS

832,822	France	July 11, 1938
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