DUAL REVERSING SOLENOID OPERATED SWITCH

Inventor: David Frye, Gardena, Calif.

Assignee: Norco Sales and Manufacturing Company, Gardena, Calif.

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ABSTRACT

A reversing solenoid operated switch unit has a single central plunger which carries two heavy gauge copper contact discs. Facing opposite surfaces of each disc are a pair of diametrically spaced heavy duty electrical contact shoulders at locations adapted to be contacted by and interconnected by the adjacent disc as each disc moves axially from one pair of shoulders to the other, thereby to periodically reverse the flow in each of two circuits.

7 Claims, 5 Drawing Figures
DUAL REVERSING SOLENOID OPERATED SWITCH

In operating equipment at low voltage, 12 volts for example, it is often necessary to make use of a relatively heavy current. This means that connections and contacts should be generous, as for example contacts on a 12 volt storage battery used for automotive equipment. A common article of equipment driven from a 12 volt automotive storage battery consists of outriggers for a conventional camper. Such devices are legs or stilts which are extended by application of power through either a hydraulic or an electric actuator which elevates the camper to a position where the vehicle which carries it, usually a pickup truck, can be disengaged, after which the camper, again by use of power, can be lowered to a position adjacent the ground. Obviously when such a device is to be again mounted on the pickup truck, the outriggers must be manipulated in a reverse or elevating direction to a position where the pickup truck can again be moved into a position wherein the camper can be lowered upon it for transportation.

Equipment of the type mentioned by way of example needs a reversing type switch to first elevate a heavy load and then to lower it, after which it must be again elevated and subsequently lowered by a reversal of operation. Driven from a conventional 12 volt battery, reversing contacts must be such as to be capable of handling the type of current available.

Since equipment of the kind suggested frequently is moved into areas where servicing is difficult and where demands are rugged, the mechanical equipment must be durable and dependable. Burned out motors and wiring far from a service center can generate an inordinate amount of inconvenience.

Although reference has been made expressly to outriggers for a camper, by way of example, there are other types of equipment powered by a comparable electrical source of power which in the normal course of operation need to be reversed periodically and which also may readily need more than one set of electrical contacts.

Moreover, since when such equipment is to be carried by vehicle, space is often at a premium as well as load and for that reason, conventional equipment capable of performing the necessary operation may be objectionable as being too complex or just taking up too much room.

It is therefore among the objects of the invention to provide a new and improved dual reversing solenoid operated switch which is very compact in its physical dimensions but, at the same time, adequately rugged so as to be capable of operating continuously for long periods of time without the need for servicing.

Another object of the invention is to provide a new and improved dual reversing solenoid operated switch of a compact, dependable, rugged character which is sufficiently versatile to be capable of adaptation to a great variety of uses.

Another object of the invention is to provide a new and improved dual reversing solenoid operated switch possessed of multiple leads for operation in both directions but which, at the same time, is incorporated in a single compact unit and housed within a unitary housing.

Still another object of the invention is to provide a new and improved dual reversing solenoid operated switch having contact areas broad and rugged in character and multiple in number whereby to ease the strain which otherwise would be placed upon coil windings and wiring to the end that burned out equipment is substantially minimized.

Still another object of the invention is to provide a new and improved dual reversing solenoid operated switch constructed in a somewhat modular fashion so that the mutually movable contact members can be moved into position and made functional as a result of a relatively simple operation and which, at the same time, can be just as readily dismantled should there come a time when replacement of worn parts might become necessary or on which other servicing operations might be needed.

Also included among the objects of the invention is to provide a new and improved rugged inexpensive dual reversing solenoid operated switch device wherein contact paths are made sufficiently large to substantially avoid conditions such as burned out coils and wiring.

With these and other objects in view, the invention consists in the construction, arrangement, and combination of the various parts of the device, whereby the objects contemplated are attained, as hereinafter set forth, pointed out in the appended claims and illustrated in the accompanying drawings.

In the drawings:

FIG. 1 is a longitudinal sectional view of the device showing the contact areas in one position of adjustment.

FIG. 2 is a longitudinal sectional view similar to FIG. 1 but showing other contact areas in engagement.

FIG. 3 is a fragmentary longitudinal sectional view on the line 3—3 of FIG. 1.

FIG. 4 is a cross-sectional view on the line 4—4 of FIG. 1.

FIG. 5 is a side perspective view of one of the contact shoulder members.

In an embodiment of the invention chosen for the purpose of illustration, there is shown a dual reversing solenoid operated switch unit indicated generally by the reference character 10 consisting of a three-part housing wherein there is a relative solid central section 11 on opposite sides of which are caps 12 and 13. The cap 12 provides a chamber 14 which is in communication with a recess 15 in the central section 11. Similarly, the cap 13 provides a chamber 16 which is in communication with a recess 17 in the central section 11. The central section provides a partition 18 through which extends a bore 19.

In the chamber 14 is a solenoid 20 of substantially conventional construction, with a coil 21 surrounding a bore 22 which is in axial alignment with the bore 19. A fastening stud 23 has an enlarged shank 24 located in the outer end of the bore 22, the outer end of the stud overlying a washer 25 over which it is anchored,
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3 whereby to provide a ground connection 26 for the coil.

A threaded binding post 27 serves as the second con-

nection for the winding of the coil 21.

At the opposite end of the unit is a similar solenoid

30 and a coil 31 surrounding a bore 32 and in which is a

shank 33 of a fastening stud 34. The stud 34 extends

through the wall of the cap 13 and overlies a washer 35

which is riveted in place, the stud providing a ground

connection 36 for the solenoid. A binding post 37 on

the side wall of the cap 13 provides the other connec-

tion for the coil 31.

A composite plunger assembly is indicated generally

by the reference character 40. The plunger assembly

consists of a missection 41 which is slidably mounted

in the bore 19.

A lower end section 42 is adapted to be slidably re-

ceived in the bore 32 of the coil 31. Interconnecting the

end section 42 with the mid-section 41 is a projection

43 of reduced diameter which has a telescoping fit

within a pocket 44 of the end section 42, there being

provided a rivet 45 to hold them in assembled condi-

tion.

A collar 46 serves as a positioner and mounting means for a relatively heavy gage contact disc 47, the collar 46 surrounding the projection 43 as shown in

FIG. 3, a stepped recess 48 being provided for that pur-

pose, there being an aperture 49 through he contact disc 47. A second stepped recess 50 accommodates a washer 51 serving as a spring keeper for a spring 52

which acts between the washer 51 and an adjacent face

53 of the partition 18.

At the opposite end of the plunger assembly 40 is a

similar end section 54 which mounts a contact disc 55

with the aid of a collar 56. A spring 57 acts between a

washer 58 serving as a spring keeper and a face 59 of

the partition 18.

Mounted in the wall of the cap 12 is a pair of diamet-

rically located contact shoulder members 60 and 61.

Each shoulder member consists of a threaded exterior

disc 62 carrying a lock nut 63 and fastening nut 64. The

other shoulder member 61 is similarly equipped. A lug

65 at the inside end of the shoulder member provides a

contact surface 66 against which one side of the

contact disc 55 engages as shown in FIG. 1. The oppo-

site contact shoulder 61 is provided with a similar lug

65 equipped in the same fashion.

In a wall 11' of the central section 11 is another pair of diametrically spaced shoulder members 67 and 68,

lugs 65 of which lie within the recess 15 and are pro-

vided with contact surfaces 66 for the opposite face of the

contact disc 55.

On the opposite side of the central section 11 is a similar pair of diametrically spaced shoulder members

69 nd 70, these being mounted in a wall 11' of the cen-

tral section 11 so that their lugs 65 present contact sur-

faces 66 for engagement with the contact disc 47. Again, a pair of diametrically spaced shoulder mem-

bers 71 and 72 are mounted in the wall of the cap 13

whereby to provide comparable lug 65, each of which

presents a contact surface 66 for engagement with the

contact disc 47 on its opposite face.

A perspective view of a typical contact shoulder member is shown in 65 possessed of a

threaded extension 62 and lug 65. The contact surface

66 is relatively long and wide and is defined on its outer

side by an arcuate wall 73 which has a radius of curva-

ture slightly larger than the radius of the corresponding
disc 47.

The caps 12 and 13 may be secured to the central

section 11 by any one of a number of acceptable and

conventional means, by way of example, and when the

central section 11 is square in geometrical form as sug-

gested in FIG. 4, a flange 74 consisting of a corner of the

cap 13 overlies the square corner of the central sec-

tion and is secured thereto by means of a screw 75 en-

gaging a threaded hole 76 in the central section.

In operation, the plunger assembly is assembled in

place on the central section 11, confining the springs as

indicated, and checked to be certain that there is a

freely reciprocatable motion of the plunger assembly

with respect to the bore 19. This assumes that the sole-

noids 20 and 30 previously have been anchored in posi-

tion in the respective caps 12 and 13. With shoulder

members already anchored in position, the caps 12 and

13 are applied to respective ends of the central section

18 and there secured by means of the screws 75 to the

central section.

By this simple assembly operation, the device is made

ready for mounting and connection into the circuit.

This is accomplished by grounding the ground connec-

tions 26 and 36 to the machine on which the unit is

mounted and connecting binding posts 27 and 37 to re-

spective electrical terminals.

Power circuits are then connected to the sundry shoulder members 60, 61, 67, 68, 69, 70 and 71, 72. In

the embodiment shown the shoulder members 60 and

62 have attached to them power leads which are in par-

allel with respect to the shoulder members 69 and 70.

Similarly, shoulder members 67 and 68 are connected to

power leads in parallel with shoulder members 71 and

72.

By applying energy to the solenoid 20 by means of a
current directed to the binding post 27, the solenoid 20

is energized which moves the plunger assembly 40 in an

upward direction as viewed in FIG. 1. This has the ef-

fect of bringing the contact disc 55 into engagement with

the contact surfaces 66 of the contact shoulder members

60 and 61 closing that circuit and, at the same time,
bringing the contact disc 47 into engagement with

the contact services 66 of the respective contact shoul-
der member 69 and 70. Broad areas of contact are ex-
perienced. At the same time, the spring 52 is com-
pressed and the spring 57 permitted to expand.

When the switching action is to be reversed, the sole-

noid 20 is deenergized and the solenoid 30 energized.

This has the effect of pulling the plunger assembly 40

in a downward direction to the position shown in FIG.

2. When this occurs, the contact disc 55 moves to a po-

sition engaging the contact surface 66 of the contact

shoulder members 67 and 68. At the same time, the

contact disc 47 moves into engagement with the

contact surface 66 of the respective contact shoulder

members 71 and 72, thereby to cause current to flow in

the respective two circuits. Meanwhile the spring 57 is

compressed while the spring 52 expands.

By constructing the contact shoulder members in the

manner described providing, as described, a lug 65 at

the interior end of each, the lug can be made just as

ample as need be in order to provide an abundant area

for the contact surface 66. This area can be made just

as large as needed insasmuch as irrespective of what size

is selected, within reason, it will all provide engagement
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with a corresponding portion of the respective contact disc 47 or 55 as the case may be. Should there be any need for inspection of the contact areas, or servicing or replacement, as occasion might require, the caps can be readily disengaged from the central section 11 whereupon all lugs are exposed and can be readily removed by disengagement of the lock nuts from the threaded exterior ends, subject to replacement in a comparable fashion, after which the caps can be reassembled with the central section.

While the invention has herein been shown and described in what is conceived to be a practical and effective embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.

Having described the invention, what is claimed as new in support of Letters Patent is:

1. A reversing switch unit comprising a housing having chambers at opposite ends, a partition between the chambers and a bore through the partition interconnecting the chamber, a solenoid in each chamber having a central axial bore and a single plunger assembly extending between the solenoids and through said bore, said plunger assembly comprising a guide portion intermediate the ends having a slidable engagement with said bore and end portions having slidable engagements with the bores of the respective solenoids, a contact disc in each chamber and mounted on that portion of the plunger assembly which is located in the respective chamber, a pair of diametrically spaced contact shoulder members mounted in each chamber on the side of the respective contact disc adjacent the solenoid and a second pair of diametrically spaced contact shoulder members mounted in each chamber on the side of the respective contact disc remote from the solenoid, the pairs of contact shoulder members in each chamber being spaced axially from each other so that movement of the respective contact disc in an axial direction alternately interconnects the contact shoulder members of each pair of said shoulder member.

2. A reversing switch unit as in claim 1 wherein the housing comprises a central section including said partition and having axially opposite facing recesses in communication with respective chambers, one pair of said contact shoulder members being mounted in each recess, said housing comprising cap sections each including a portion of the respective chamber therein and another pair of said contact shoulder members mounted in each cap section, said cap sections being releasably attached to the respective side of said central section.

3. A reversing switch unit as in claim 2 wherein there is a compression spring located between each contact disc and the partition.

4. A reversing switch unit as in claim 1 wherein each contact shoulder member comprises a stud threaded on the exterior end extending through the wall of the housing and a lug at the interior end projecting into the recess and having a portion of each lug facing the disc depressed and comprising a contact surface throughout its length and width in position adapted for contact by said contact disc.

5. A reversing switch unit as in claim 1 wherein the plunger assembly comprises a mid-section slidably mounted in said bore and opposite end sections, each end section being in slidable engagement with the respective solenoid, the end sections having each a releasable solenoid, the end sections having each a releasable telescopic engagement with and attached to the mid-section.

6. A reversing switch unit as in claim 1 wherein the central bore of each solenoid is adapted to receive a respective end of said plunger assembly and a fastening stud having a shank in the bore of the outwardly located end of each solenoid and extending through the housing in axial alignment with said plunger and the solenoids whereby to fasten the solenoids in the housing in axial alignment and provide a ground connection for the respective solenoid.

7. A reversing switch unit as in claim 1 wherein said contact shoulder members are each provided with a lug at the inner end and said chambers each comprise cylindrical side walls, said walls having radially outwardly extending pockets for said lugs, said contact shoulder members being releasably secured to the housing with the lugs in the respective pockets. * * * * *