Aug. 18, 1964 W. L. BROWN 3,145,270

FOOT OPERATED KICK-DOWN SWITCH CONSTRUCTION

Filed Oct. 6, 1960

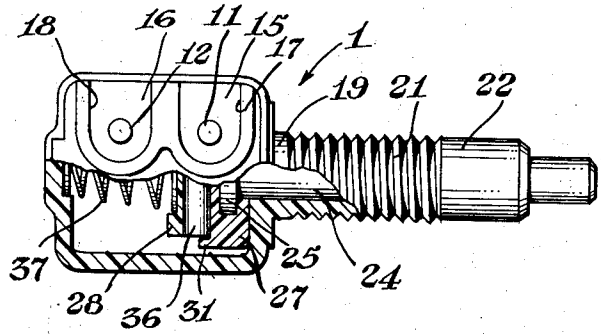


Fig. 2

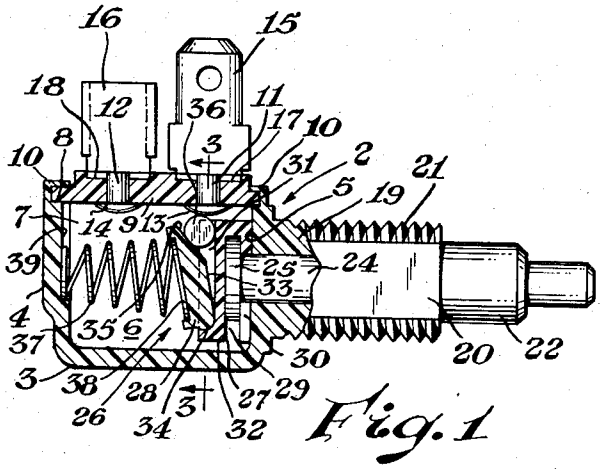


Fig. 1

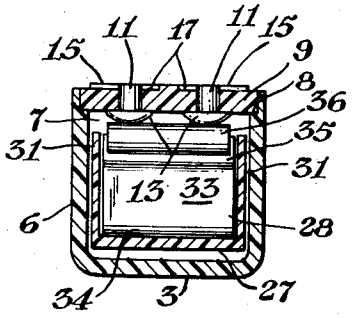


Fig. 3

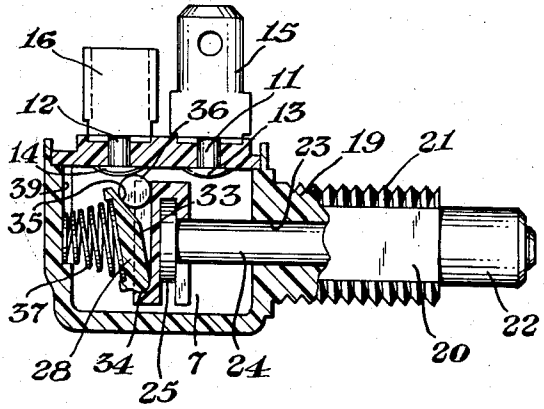


Fig. 4

INVENTOR.
William L. Brown
BY
Lerman, Lerman & McCulloch
ATTORNEYS

United States Patent Office 3,145,270 Patented Aug. 18, 1964

3,145,270

FOOT OPERATED KICK-DOWN SWITCH CONSTRUCTION

William L. Brown, Garden City, Mich., assignor to Boyne Products, Inc., Boyne City, Mich., a corporation of Michigan

Filed Oct. 6, 1960, Ser. No. 60,886
8 Claims. (Cl. 200—16)

This invention relates to electric switch constructions and more particularly to switches especially, but not exclusively, adapted for use as so-called kick-down switches in vehicles equipped with overdrive transmissions.

Overdrive transmissions currently in use are provided with a fourth or cruising gear arrangement that is well known per se. When a vehicle equipped with such a transmission is being driven in fourth gear, the acceleration characteristics of the vehicle are substantially lessened, so it has been the practice to equip such vehicles with a kick-down switch which, when actuated by manipulation of the foot throttle, changes the gearing of the transmission from fourth to third gear. Switches of this general class should be positive in action, trouble free, both electrically and mechanically, and resistant to the deleterious effects of corrosion and wear. A principal object of this invention is to provide a switch having these characteristics.

Another object of the invention is to provide a switch of the class referred to having fewer parts than comparable switches in use heretofore, thereby making the switch easier to assemble and less expensive while promoting greater reliability and longer life.

A further object of the invention is to provide a switch construction having fixed and movable contact elements and wherein operation of the switch maintains the contact elements clean and bright without subjecting them to any great degree of wear.

Another object of the invention is to provide a switch construction having fixed contacts adapted to be bridged by a movable contact that normally is biased in one direction and wherein the biasing means not only urges the movable contact in such direction but also urges the movable contact into positive engagement with the fixed contacts.

Other objects and advantages of the invention will be pointed out specifically or will become apparent from the following description when it is considered in conjunction with the appended claims and the accompanying drawing, in which:

FIGURE 1 is a view, partly in side elevation and partly in section, of a switch constructed in accordance with the invention;

FIGURE 2 is a partly top plan and partly sectional view;

FIGURE 3 is a sectional view taken on the line 3—3 of FIGURE 1; and

FIGURE 4 is a view like FIGURE 1, but showing the movable parts of the switch in adjusted position.

A switch constructed in accordance with the invention is represented generally by the reference character 1 and comprises a casing 2 formed of nonconductive, moldable material such as nylon, for example, having a bottom wall 3, end walls 4 and 5, and side walls 6 defining a hollow chamber or housing 7. Each of the side and end walls of the casing is provided with a shoulder 8 on which a terminal block or plate 9 seats, the block 9 being formed of nonconductive material such as nylon or the like and being retained in place in any suitable manner such as by turned over tabs 10 formed at the upper ends of the end walls 4 and 5.

Extending through the terminal block 9 is a plurality of sets of spaced apart electrical contacts 11 and 12, the

contacts being conveniently formed from brass rivets having crowned heads 13 and 14, respectively, received within the chamber 7 and having their external ends secured to corresponding sets of terminals 15 and 16 that may be seated in recesses 17 and 18, respectively, formed in the outer surface of the terminal block 9.

Preferably integrally joined to the casing end wall 5 is a rearwardly extending boss 19 which may be flattened on two sides, as is indicated at 20, and threaded on its remaining sides, as is indicated at 21, the flattened and threaded portions cooperating in mounting the switch at the proper location on the vehicle or other apparatus with which it is adapted for use. The boss 19 terminates in a reduced end portion 22 and is provided with a longitudinal bore 23 which slideably accommodates a reciprocable plunger 24 which is of such length as to have a portion thereof extend beyond the reduced end section 22 of the boss when the switch is in one of its extreme positions of adjustment, as is indicated in FIGURES 1 and 2. The opposite or inner end of the plunger 24 is equipped with an enlargement or flange 25 by means of which a contact carrier device 26 is mounted for reciprocating movements with the plunger.

The carrier member 26 is composed of two parts, 27 and 28, the part 27 having a compartment 29 which receives the enlargement 25. The rear wall of the compartment 29 is slotted as at 30 so as to pass the plunger 24. The front face of the carrier part 27 is recessed to provide forwardly projecting side flanges 31 and a bottom flange or ledge 32, the upper surface of the lower flange 32 being formed on the arc of a circle. The second part 28 of the carrier member comprises a generally rectangular block having a planar rear surface 33 adapted to bear against the forward surface of the part 27 and having its lower edge 34 shaped complementally to the curvature of the flange 32 of the carrier part 27. The rear, upper portion of the block 28 is inclined upwardly and forwardly as at 35 so that, when the parts 27 and 28 are in face-to-face engagement, the inclined portion of the block 28 defines a substantially V-shaped slot between the carrier parts, the slot extending transversely of the path of reciprocating movements of the plunger 24 and its associated parts.

The switch includes an electrically conductive bridging member 36 located in the slot between the carrier parts 27 and 28. The bridging member should be of such length as to be capable of bridging the pairs of contacts 11 and the pairs of contacts 12 and it is restrained against endwise movement by the flanges 31 of the carrier part 27. The bridging member 36 preferably is cylindrical so as to be capable of free rotation about its own longitudinal axis and its diameter is greater than the greatest width dimension of the slot when the parts 27 and 28 are in face-to-face engagement. The purpose of the latter characteristic of the bridging member 36 will be explained subsequently.

The carrier part 28 is free to rock about its lower edge 34 relatively to the carrier part 27. In order to maintain the parts 27 and 28 in adjustable assembled relation, a spring 37 is interposed between the block 28 and the forward wall 4 of the casing, the ends of the spring being received in recesses 38 and 39 formed respectively in the parts 28 and 4. The spring 37 also performs two additional functions which will be referred to hereinafter.

When the switch parts are assembled and located as shown in FIGURE 1, the plunger 24 will lie in its projected position and the bridging member 36 will bridge and engage the pair of contacts 11. Since the heads 13 of the contacts 11 project into the chamber 7, they exert a force on the bridging member 36 tending to drive it deeper into the slot between the carrier parts 27 and 28. Because of the sloping surface 35 formed on the carrier part 28, the bridging member 36 is capable of camming or rocking

the block part 28 counterclockwise about its lower edge 34, thereby permitting the bridging member 36 to move more deeply into the slot. Rocking of the block 28 in a counterclockwise direction, however, is yieldably opposed by the spring 37. The spring 37 therefore tends to rock the block 28 in the opposite direction to reduce the size of the slot. Thus, a constant force is exerted on the bridging member 36 in a direction substantially normal to the path of reciprocation of the plunger, urging the bridging member into positive engagement with the heads 13 of the contacts 11. The constant urging of the bridging member 36 into positive engagement with the fixed contacts is a second function of the spring 37.

Upon the application of a force to the free end of the plunger 24 in such direction as to cause the latter to be moved to the left, as viewed in FIGURE 1, the carrier part 27 will bear against the carrier part 28 and against the bridging member 36 and force those elements also towards the left against the force of the spring 37. As the elements move towards the left, the bridging member 36 will traverse the heads 13 of the contacts 11 and, due to the force of the spring 37 urging the bridging member laterally of the path of reciprocation of the latter, the bridging member will be forced to move bodily in a direction outwardly of its slot and into engagement with the lower surface of the terminal block 9, thereby assuring rotation of the bridging member 36 as it is moved from one end of the casing toward the other. The rotation of the bridging member not only prevents excessive wear between the latter and the contact elements 11 and 12, but it also keeps the bridging member clean and bright, thereby minimizing electrical failure.

FIGURE 4 discloses the plunger and its associated parts in the positions they occupy when the plunger has been moved to the left a distance sufficient to cause the bridging member 36 to bridge the contact elements 12. In arriving at these positions, the bridging member 36 once again will be forced deeper into the slot between the carrier parts 27 and 28, due to the projection of the heads 14 into the casing, thereby assuring a forceful and positive engagement of the contact elements 36 and 14. Upon removal of the force that was applied to the stem of the plunger 24 to move it and its associated parts to the position shown in FIGURE 4, the spring will expand and restore the parts to the positions shown in FIGURE 1. This is the third characteristic of the spring which was referred to earlier.

The disclosed embodiment is representative of a presently preferred form of the invention, but is intended to be illustrative rather than definitive thereof. The invention is defined in the claims.

I claim:

1. A switch construction comprising a support; spaced contact elements mounted on said support; carrier means mounted on said support for back-and-forth movements in opposite directions along a path and comprising a pair of relatively movable parts defining therebetween a generally V-shaped slot opening transversely of said path; a bridging member received in said slot and supported by said carrier means at a level to engage and bridge said contact elements; yieldable means acting on said carrier means and constantly biasing the latter in one direction to one end of said path, said yieldable means also exerting a force on the parts of said carrier means tending to reduce the size of said slot and thereby eject said bridging member therefrom transversely of said path in a direction to engage said contact elements; and means connected to said carrier means for moving the latter along said path in a direction opposite to said one direction.

2. The construction set forth in claim 1 wherein one of said parts of said carrier means is rockably mounted on the other of said parts.

3. A switch construction comprising a casing; a first set of spaced apart contact elements supported by said casing; a second set of spaced apart contact elements supported by said casing, each of said sets of contact elements being spaced from one another along said casing; a bridging member adapted to bridge the contact elements of either of said sets; a carrier member composed of a pair of relatively movable parts defining therebetween a variable size, substantially V-shaped slot in which said bridging member is received, said carrier member mounting said bridging member in said casing for back-and-forth movements in opposite directions along a path adjacent and between said sets of contact elements and for movements in and out of said slot away from and toward the contacts of said sets of contacts; yieldable means reacting between said casing and said carrier member and constantly biasing the latter in one direction towards one end of said path and constantly urging said parts of said carrier member to move relatively to one another to reduce the size of said slot and urge said bridging member to move out of said slot; and means connected to said carrier member for shifting the latter along said path in a direction opposite to said one direction.

4. The construction set forth in claim 3 wherein said carrier member supports said bridging member for rotation.

5. The construction set forth in claim 3 wherein said bridging member comprises a substantially cylindrical roller.

6. A switch construction comprising a casing; a first set of spaced apart contacts supported by said casing; a second set of spaced apart contacts supported by said casing, said sets of contacts being spaced from one another; carrier means mounted in said casing for movements in opposite directions along a path between said sets of contacts, said carrier means comprising a pair of relatively movable parts defining therebetween a variable size, generally V-shaped slot; a bridging member received in said slot, said bridging member being of such length as to bridge the contacts of either of said sets; yieldable means reacting between said casing and one of said parts of said carrier means and constantly but yieldably urging said parts toward one another to reduce the size of said slot and tend to eject said bridging member therefrom in a direction to engage the contacts of said sets of contacts and simultaneous biasing said carrier means in one direction towards one end of said path; and means in engagement with the other part of said carrier means for moving the latter towards the opposite end of said path.

7. A switch construction comprising a casing; a number of sets of contacts mounted on said casing; a bridging member adapted to bridge selected sets of said contacts; carrier means mounted in said casing for movements along a path between said contacts, said carrier means comprising a pair of relatively movable parts arranged face to face and defining a variable size slot therebetween in which said bridging member is supported for bodily displacement laterally of said path in a direction to engage the contacts of said sets of contacts; and yieldable means reacting between said casing and said carrier means and constantly acting on the latter to urge said carrier means in one direction along said path and to vary the size of said slot to displace said bridging member laterally of said path in said direction.

8. A switch construction comprising a support; spaced contact elements mounted on said support; carrier means mounted on said support for movements back and forth in opposite directions along a path adjacent said contact elements, said carrier means comprising a pair of parts movable relatively to one another and defining a receptacle therebetween; a bridging member adapted to bridge said contact elements movably mounted in said receptacle for movement transversely of said path in a direction to engage said contact elements; yieldable means acting on said carrier means and constantly biasing the latter in only one direction along said path and urging the parts of said carrier means to move relatively to one another to eject said bridging member from said receptacle transversely of said path; and means in engagement with said carrier

means for moving the latter along said path in the direction opposite to said one direction against the bias of said yieldable means.

References Cited in the file of this patent

UNITED STATES PATENTS

1,667,165	Martino	Apr. 24, 1928
1,696,902	Clerico	Jan. 1, 1929
1,767,380	Kudrna et al.	June 24, 1930
1,812,410	Meuer	June 30, 1931
1,876,874	Douglas	Sept. 13, 1932
2,222,765	Geyer	Nov. 26, 1940
2,520,681	Hanson	Aug. 29, 1950

FOREIGN PATENTS

56,220	Holland	May 15, 1944
206,841	Great Britain	May 1, 1924
238,376	Great Britain	Aug. 20, 1925
582,208	Germany	Aug. 10, 1933