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Lowe

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[54] **POSITIVE STOP ELECTRICAL SWITCH**

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[52] **U.S. Cl.** ..... **200/302,** 200/86 R, 200/159 R

[51] **Int. Cl.** **H01h 9/04,** H01h 1/20

[58] **Field of Search** ..... 200/159 B, 159 R, 86 R, 200/153 C, 302, 86.5

[56] **References Cited**

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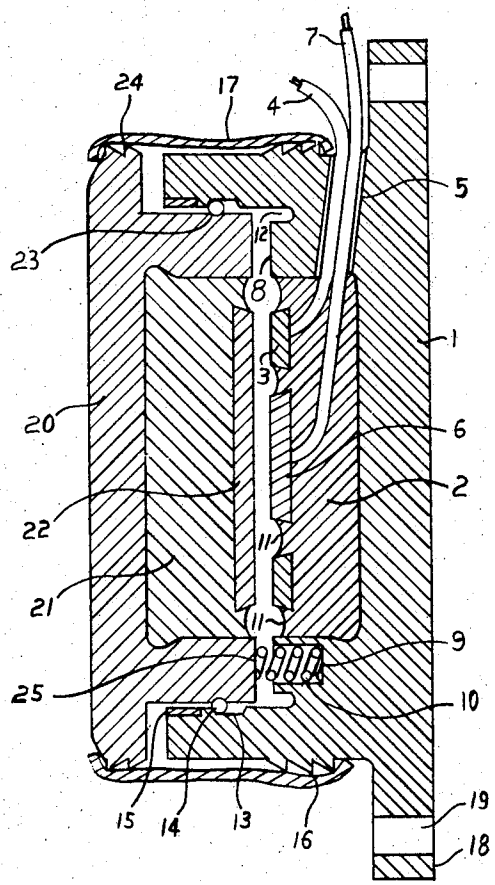
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Attorney, Agent, or Firm—Woodhams, Blanchard and Flynn

[57] **ABSTRACT**

A positive stop electrical switch having two cup like housings the open end of each mates and closedly telescopes on the other causing the enclosed contacts to make and convey the electrical signal, thereon the contacts act as a positive stop, or if necessary the contacts in conjunction with the shoulder of the housings act as a positive stop.

7 Claims, 3 Drawing Figures



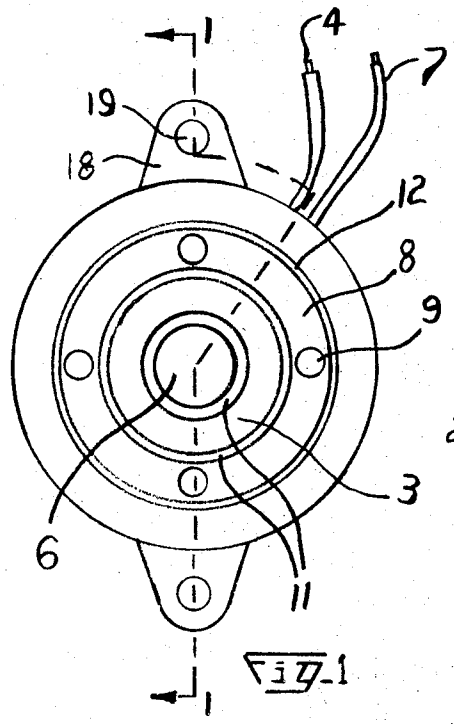


Fig. 1

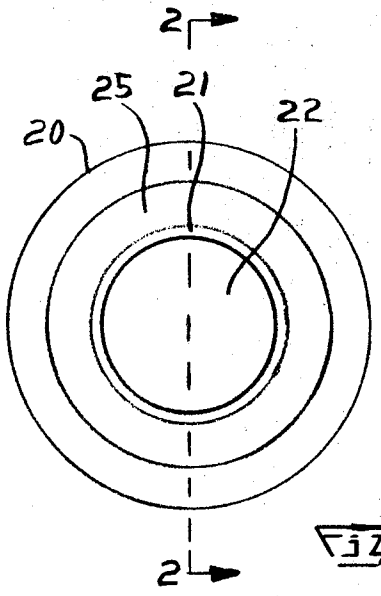


Fig. 2

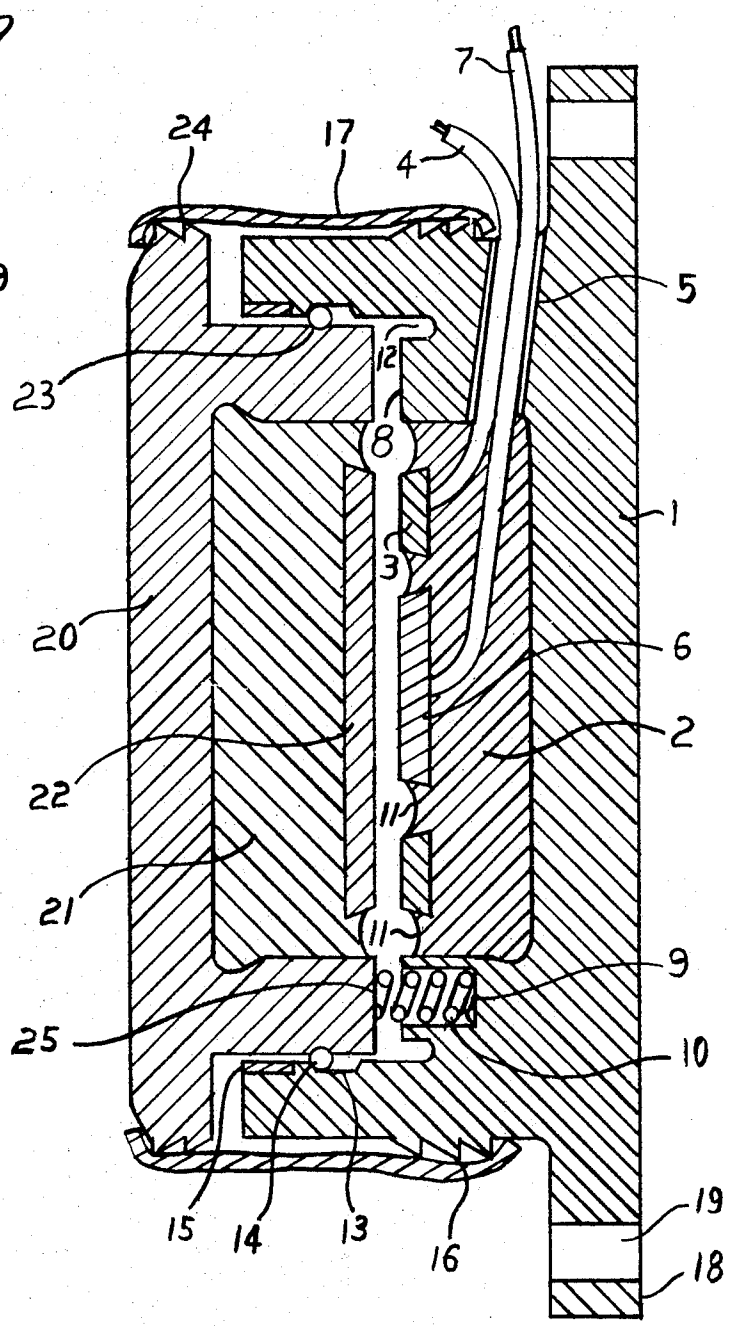


Fig. 3

POSITIVE STOP ELECTRICAL SWITCH

This invention relates to a device having the duel functions of conveying an electrical signal and being a positive stop.

The object of the invention is to provide an electrical switch which is an integral part of a positive stop such that the signal action and the stopping action occur simultaneously.

This object is accomplished by providing a positive stop electrical switch having two cup like housings in which the open end of each mates and closedly telescopes on the other. The base housing contains a ring like contact having an external lead wire. Inside the ring contact is a disc like contact with an external lead wire. The ring contact, disc contact and base housing are insulated from each other. The operator housing encloses and is insulated from a disc contact. The machine cycle closedly telescopes the housings causing the disc in the operator housing to contact the ring and disc in the base housing. The contacts are so constructed and supported that upon closing they either independently, or in conjunction with the shoulder of the housings, become a positive stop.

The advantages and economies of the positive stop electrical switch will become clear from the following detailed description, with reference to the accompanying drawings, in which:

FIG. 1 is a plan view of the cup like base half of the invention showing the inside arrangement.

FIG. 2 is a plan view of the cup like operator half of the invention showing the inside arrangement.

FIG. 3 is a cross sectional side view of the invention in its entirety taken at line 1—1 FIG. 1 and line 2—2 FIG. 2.

The cup like base **1**, preferrably made of metal, has a circular cavity the bottom portion of which is slightly enlarged so as to mechanically hold in place the insulating material **2** such as, for example, plastic (see FIG. **3**). Embedded in the insulation **2** is a ring like contact **3** (see FIG. **1** and FIG. **3**) connected to an external lead wire **4** which exits the base **1** through hole **5.** Also embedded in the insulation **2** is a disc like contact **6** connected to an external lead wire **7** which likewise exits the base **1** through the hole **5.** The ring contact **3** and the disc contact **6** are tapered such that they are mechanically held in the insulation **2** (see FIG. **3**).

The base **1** is provided with an annular shoulder **8** having a series of holes **9** for accepting the springs **10.** Annular grooves **11** are provided in the insulation **2** and an annular groove **12** is provided at the outer edge of shoulder **8** (see FIG. **3**). The grooves **11** and the groove **12** accept sludge caused by wear.

The annular notch **13** accepts the outer portion of the O-ring **14** and allows it to act as both a seal and a retainer. The anti-friction insert **15** in the base **1** aids the telescoping movement of the operator **20.**

The outer raised portion of the base **1** has annular sawteeth **16** for engaging and holding a protective and pliable band **17** such as, for example, a rubber band. Winged bosses **18** with holes **19** project from the base **1** for mounting.

The cup like operator **20,** preferrably made of metal, is made simular to the base **1.** The operator **20** has a circular cavity the bottom portion of which is slightly enlarged so as to mechanically hold the insulation **21.** Embedded in the insulation **21** is a disc like contact **22** tapered such that it is mechanically held in place. The annular groove **23** holds the O-ring **14** in place. The outer raised portion of the operator **20** has annular sawteeth **24** for holding the band **17** in place.

The springs **10** press against the shoulder **25** of the operator **20** to maintain proper clearance between the operator contact **22** and the base contacts **3** and **6** (see FIG. **3**). To suppress arcing of said contacts when the electrical circuit is broken, the clearance gap between the contacts may be partially filled with insulating oil.

In operation the positive stop limit switch is mounted to the stationary part of a machine. The workhead of the machine, when near the end of its work stroke, contacts the outer face of the operator **20.** The force of the springs **10** is overcome and the operator **20** is forced toward the base **1.** As the operator contact **22** comes into contact with the base contacts **3** and **6** the electrical signal is initiated (to return the workhead) and simultaneously the device mechanically acts as a positive stop. The positive stop electrical switch has now performed its dual functions of conveying an electrical signal and thereon acting as a positive stop.

When the device is used on small to medium size machines, the shoulder **25** of operator **20** will be machined a few thousandths below the surface of contact **22.** This allows the contacts **3, 6,** and **22** to act as a positive stop without any support from the shoulder **25** of operator **20.** When medium to large machinery is encountered the shoulder **25** of operator **20** will be machined even with the surface of contact **22** and the shoulder **8** of base **1** will be machined even with the surface of contact **3** and contact **6.** This allows said contacts and said shoulders to act together as a positive stop.

Having thus described my invention I claim as new and desire to secure by Letters Patent:

1. A combined mechanical stop and electrical switch, comprising a cuplike base housing and a cuplike operator housing disposed in opposed relationship to one another and positioned in slidable telescopic relationship to define a substantially closed chamber therebetween, each of said housings defining therein an inside cavity, a body of insulating material substantially filling each of said cavities and being fixed relative to the respective housing, an electrical contact embedded within each body of insulated material with said electrical contacts as mounted on the opposed housings being deposed opposite one another and positioned for contacting one another when said housings are slidably moved toward one another, the cavity in one of said housings having a bottom portion which is enlarged so as to mechanically hold the body of insulating material therein, and the contact as associated with said one housing comprising a disk having a tapered edge which is embedded and mechanically held within the respective body of insulating material, the exposed surface of said disk being substantially flush with the open end of said one housing, said one housing having an annular groove formed on the outer circumference thereof, an annular seal ring disposed within said groove and sealingly engaged between said pair of housings, and an annular flexible seal disposed in surrounding relationship to and extending between said pair of housings.

2. A combined mechanical stop and electrical switch, comprising first and second cuplike housings disposed opposite one another and positioned in sliding telescopic relationship to one another to define a substantially closed chamber therebetween, said first housing

defining therein a first cavity which has a first body of insulating material fixed therein and a first electrical contact embedded within said first body of insulating material, the second housing having a wall portion which projects inwardly from the open end of the housing to a point about midway of the housing, said wall portion being of reduced thickness to define an inner annular shoulder at the inner end thereof, said shoulder having a plurality of openings formed therein each containing a spring, said second housing having a second cavity formed in the bottom thereof and surrounded by said shoulder with said second cavity being filled with a second body of insulating material, the bottom portion of said second cavity being at least slightly enlarged to mechanically hold said second body of insulating material therein, a tapered ringlike contact embedded and mechanically held in said second body of insulating material, a tapered disk-shaped contact disposed within said ringlike contact and embedded and mechanically held in said second body of insulating material, a pair of external lead wires with one of said wires being connected to said ringlike contact and the other of said wires being conntected to said disk-shaped contact, said wires extending through a hole provided in said second housing, the exposed surfaces of said ringlike contact and said disk-shaped contact being substantially flush with the plane of said annular shoulder, said second body of insulating material being provided with an annular groove therein between said ringlike contact and said disk-shaped contact, said second body of insulating material having a further annular groove formed therein between said ring-shaped contact and said shoulder, and said second housing having an annular groove formed therein between said shoulder and said wall portion, said wall portion having an annular notch on the inside circumference thereof adapted to accommodate therein an annular sealing ring, an annular antifriction insert mounted on the inside circumference of said wall portion adjacent the open end of said second housing, and the outer circumference of said second housing having projection means positioned for engagement with a flexible annular shield adapted to surround and extend between said first and second housings.

3. In an electrical switch device, the improvement comprising:

a first cup-shaped housing including a first base wall and a first annular sidewall fixed to said base wall and projecting outwardly therefrom, said first annular sidewall defining a first cavity therein;

a first body of insulating material positioned within said first cavity and fixed relative to said first housing;

a first electrical contact member fixedly mounted on said first body of insulating material, said first contact member having an exposed contact surface which faces the open end of said first housing;

a second cup-shaped housing disposed opposite and slidably telescopically mounted on said first cup-shaped housing for defining a substantially closed compartment therebetween, said second housing including a second base wall and a second annular sidewall fixed to said second base wall and projecting outwardly therefrom, said first and second annular sidewalls being slidably telescopically received one within the other, and said second annular sidewall defining a second cavity which opens toward and is disposed opposite said first cavity;

a second block of insulating material disposed within said second cavity and fixed relative to said second housing;

a second electrical contact member fixedly mounted on said second block of insulating material, said second contact member having an exposed contact surface which faces toward the open end of said second housing member whereby the exposed contact surfaces on said first and second contact member are disposed directly opposite one another;

said first and second housing being relatively slidably movable toward and away from one another between a first position wherein said exposed contact surfaces are spaced from one another and a second position wherein said exposed contact surfaces engage one another; and

mechanical stop means coacting between said first and second housings for limiting relative movement of said first housing toward said second housing, said stop means including a first stop surface associated with said first housing and a second stop surface fixedly associated with said second housing, said first and second stop surfaces being disposed directly opposite one another and spaced apart when said first and said second housings are in said first position, said stop surfaces being disposed in engagement with one another when said first and second housings are in said second position.

4. A device according to claim **3,** wherein said first contact member comprises a ringlike member, wherein said second contact member comprises a disklike member of a size sufficient to engage said ringlike member, and wherein said first body of insulating material has a third contact member fixedly mounted thereon and positioned within but spaced from said ringlike member, said third contact member having an exposed contact surface thereon which is substantially flush with the contact surface formed on said ringlike member, whereby said disklike member engages both said ringlike member and said third contact member when said housings are in said second position, and a pair of electrical leads associated with said device and extending externally of said first housing, one of said leads being connected to said ringlike member and the other of said leads being connected to said third contact member.

5. A device according to claim **3,** wherein said first housing has an annular shoulder fixedly associated therewith and disposed within said first annular sidewall, said annular shoulder being spaced axially inwardly from the free end of said first annular sidewall, and said second annular sidewall being slidably telescopically received within said first annular sidewall, and said second annular sidewall having the free end thereof defining one of said stop surfaces thereon, and said annular shoulder defining the other stop surface thereon.

6. A device acording to claim **5,** further including an elongated flexible annular sleeve disposed in surrounding relationship to and extending axially between said first and second housings.

7. A device according to claim **6,** further including spring means coacting between said first and second housings for normally resiliently urging same away from one another to normally maintain said housings in said first position.

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