

[54] HANGING TYPE SWITCH
CONSTRUCTION

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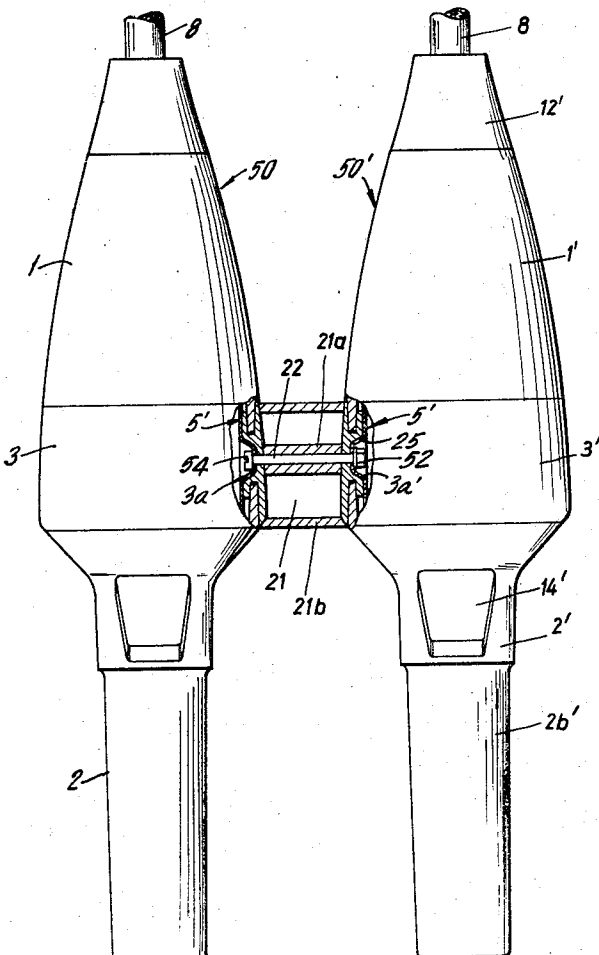
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[57] ABSTRACT

A hanging-type switch construction includes an insert carrier which is adapted to carry all of the switching elements and which is adapted to be secured to a bottom portion of a housing which is adapted to carry the push button switch actuating mechanism. The push button mechanism includes a pivotal lever which becomes engaged with the switching lever mechanism of the switching elements. The bottom part also forms a handle. The housing includes an intermediate or central part which is interengaged with the bottom part and which includes a pivotal support which engages around a journal portion of the insert carrier for the switching elements. The top part of the housing also interengages with the central part and it includes an inlet at its top for the connecting cable and it also carries means for clamping this top part to the insert carrier. By making the central part of a plastically deformable material it is possible for the upper part to twist relative to the lower part without destruction of the housing and it is also possible to interconnect several housings by connecting their elastically dependable central parts together.

13 Claims, 3 Drawing Figures



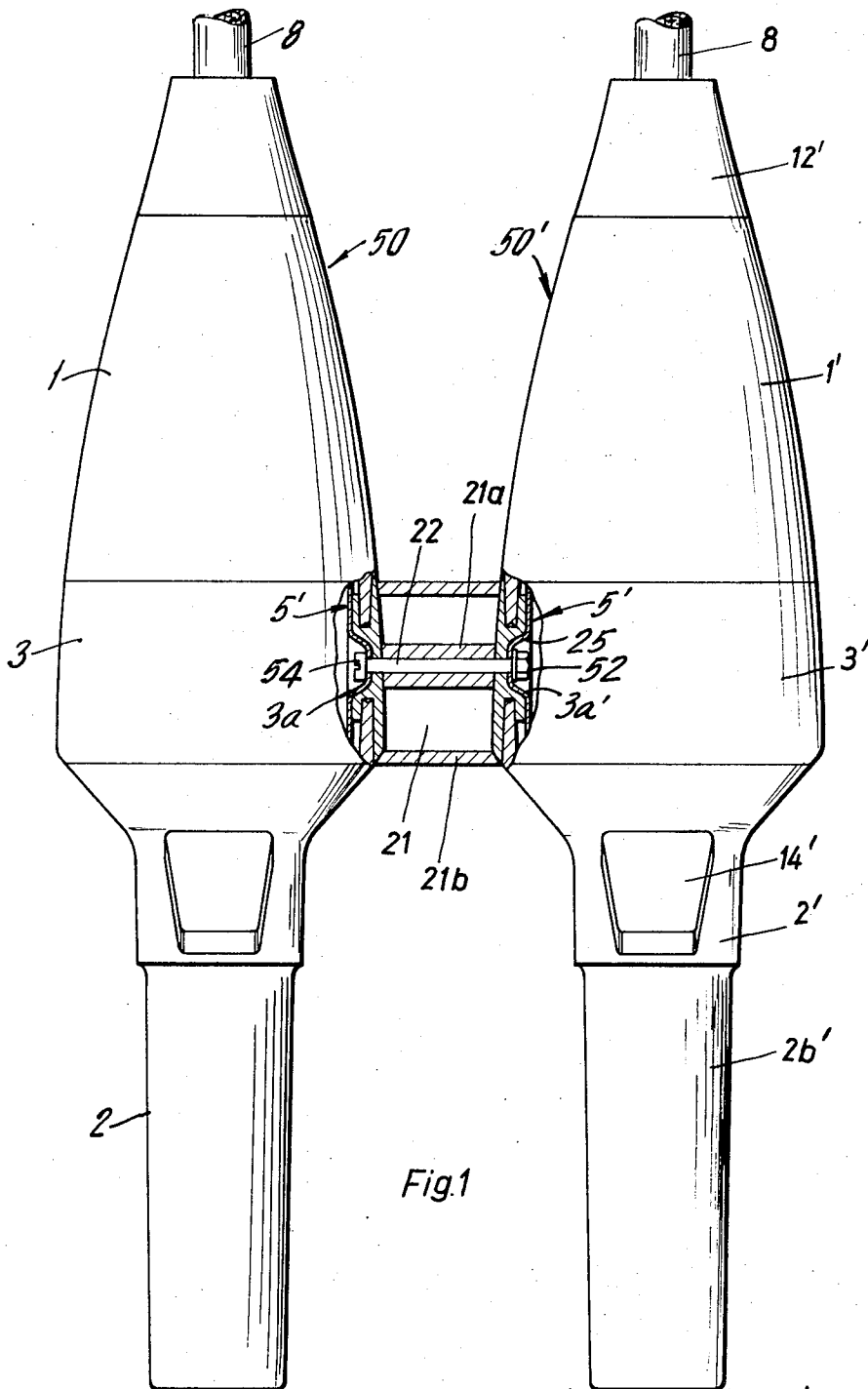


Fig.1

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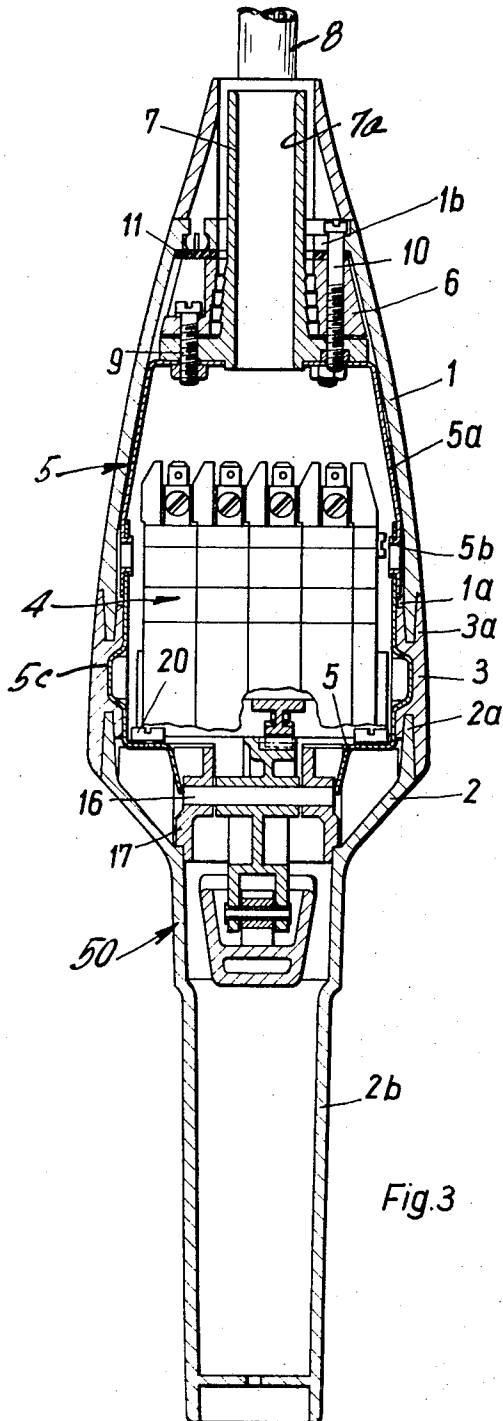


Fig. 3

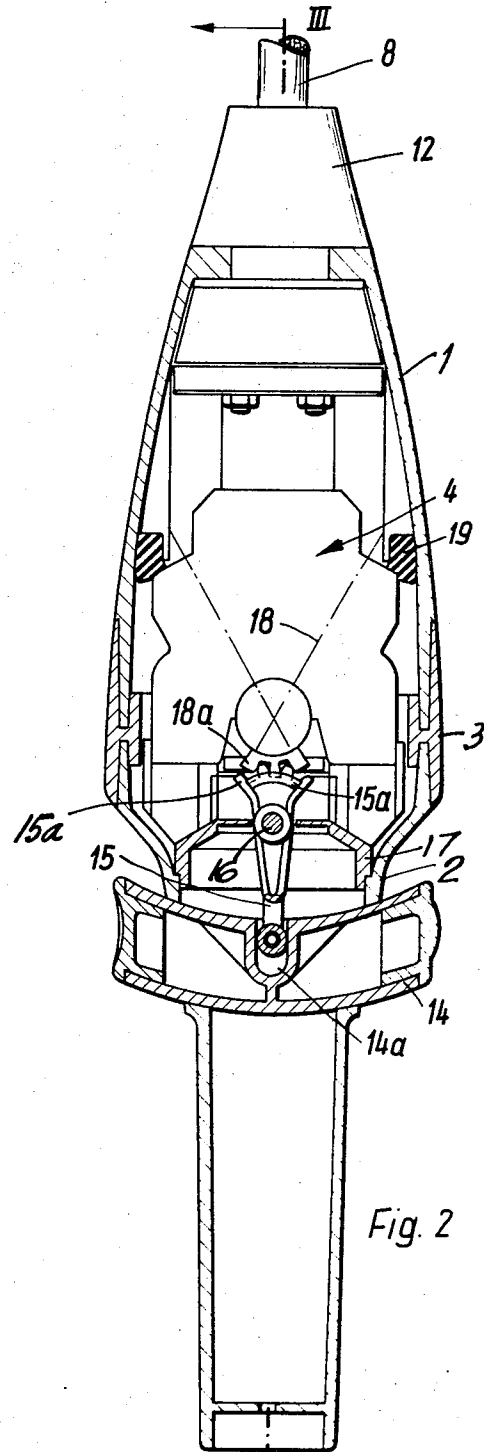


Fig. 2

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HANGING TYPE SWITCH CONSTRUCTION

SUMMARY OF THE INVENTION

This invention relates in general to the construction of switches and in particular to a new and useful hanging-type switch and to a housing therefor which is made up of a plurality of parts with a central part which is elastically deformable to permit relative movement of the other parts in respect thereto.

The invention relates particularly to a hanging-type switch for an electric motor which includes a switch insert which is disposed in a housing and which is operable by a push button accessible from the exterior of the housing. A switch of this general type is known which includes an annular central part which has a right hand thread on one end and a left hand thread on its other end, and which is connected to the upper part and lower part by threadable engagement therewith. The assembly of such a switch is complicated because the push button element which is disposed in the lower part can not be twisted beyond a predetermined amount relative to the connecting cables which are attached to the upper part. Therefore, the upper part and the central part and the lower part must be equipped with their components before the manual switch is screwed together. The parts are joined to each other by turning the central part, in which operation attention must be directed to both ends of the threads of the central part, and they must be tightened simultaneously in order to prevent undesirable twisting of the parts. Generally speaking these conditions can be met during assembly in the manufacturing of the device but they can not be effected at the location of use. A further disadvantage of the manual switch construction which is known is that some wire connections are already provided inside the upper part and these are not easily accessible. Furthermore the cable is fastened into the upper part by a gland so that the wires continuing onto the lower part must be kept relatively short. This also makes assembly more difficult.

The known manual switch has two simple push buttons and therefore is simple in its construction and relatively small in its dimensions. Therefore it is not particularly endangered by shocks which would occur when it strikes a fixed object. In most recent times, however, since small-step switching of electric motors has become possible and is often required, the housing of such switches must be considerably larger. Due to the greater kinetic energy they are more endangered when striking a fixed object.

It is known to equip such housings of hanging switches with rubber rings which project outwardly and attenuate the impact energy but these rubber rings only protect a small part of the housing while a relatively larger central part including the internal components can still be destroyed when the switch strikes a fixed object.

In accordance with the present invention, there is provided a hanging type switch for an electric motor which is capable of withstanding shock caused by impact with objects and which is of improved simplified construction. The inventive construction includes a housing formed of a central part which is made of a plastically deformable material and which is easily interengaged upon assembly with the lower part and top

part. The use of a plastically deformable center part makes it possible for the upper part to twist relative to the lower part without destroying the housing. Such a switch is able to withstand deformation wherever it takes place due to impact regardless of where the impact occurs on the housing.

In the preferred form of the invention, the central part has clamping noses or recesses which are oriented for interengagement with respective noses or recesses on the complementarily formed upper and lower parts. The interfitting construction is in the form of a tongue and groove interconnection which insures a fitting which does not permit the penetration of water or humidity into the interior of the housing.

The inventive construction includes an insert carrier for the switching elements which includes a housing portion which is secured to the lower part of the outer housing and which includes a movable switching lever which is engaged by an operating lever mechanism of a push button carried in the lower part and which also forms a handle. The switching insert is fastened to the lower part of the housing and it is equipped with a flexible holding clip, or clamp for a cable clamp. The holding clip may be jointed to the switching insert and the insert is preferably formed with a hinged joint for one direction of movement and it will deform automatically in the other direction because it is formed of a sheet metal strip. In order to permit inspection of the switching insert the upper and central parts of the housing with the top closure cap are pushed upwardly over the cable which is connected into the top of the housing.

The switching insert with the lower part of the housing remains hanging from the cable due to the fact that the connecting cable clip is carried by the insert member and therefore the individual wires are not stressed and tensioned between the cable clamp and the switching insert. This is an improved arrangement in respect to the previously known switches wherein the cable was fastened in the upper part of the housing, by means of a cable clamp or bushing. In addition by arranging the clamping elements on the insert member the inspection of the switching insert is made much easier because the wires are relieved from tension.

The inventive construction includes a cable clamp in the form of a collet which is pushed against the cable by a clamping ring which is screwed to a holding clip carried on the upper part of the insert. This arrangement assures a connection which is secure against pull between the cable and the holding clip of the switching element insert.

In accordance with another feature of the invention the upper part of the housing is fastened to the holding clip of the insert by means of securing screws or bolts. In this manner both the upper part and the lower part which carries the switching insert are pushed against the plastically deformable center part. When angular deflections of the upper part relative to the lower part of the housing occur, the plastically deformable center part is further compressed on one side and the screws on that side which secure the upper part to the holding clip of the insert are relieved of tension.

In accordance with another feature of the invention, a plurality of such switches may be joined together by the interposition of a spacing element between ad-

jacent center parts of adjacent switches. The central parts of adjacent switches are joined together by a screw which extends through a tubular guide of the spacer and is fastened at each central part of the adjacent switches. By arranging the spacer at the electric center part there is no excessive contact pressure when the hanging switches are cocked relative to each other. In addition the connection by means of a spacer which is preferably made to the interior of the central part is much less expensive than the known connections and the fastening screw may be retained within the parts out of an exposed position through which it would form a projection which is likely to cause damage.

Accordingly, it is an object of the invention to provide an improved hanging type switch construction which includes a housing formed of a lower part which is adapted to be secured to an insert carrier for the switching elements and which is interengaged with a central and top housing part by the interfitting of the peripheries thereof and wherein the central part is made of an elastically deformable material which permits the relative movement between the parts.

A further object of the invention is to provide a hanging switch type construction which includes a bottom part preferably forming a handle which includes a push button or actuating switching elements and which provides a mounting for the switching elements within an insert carrier which is secured to the bottom part, and which includes an elastically deformable central part which is interlocked over the bottom part and is also interlocked with a top part, the top part being secured to the insert carrier and the insert carrier including a clamping ring for receiving a cable through the top part.

A further object of the invention is to provide a hanging type switch which includes a plurality of switch housing elements which are made up of a plurality of parts including at least one intermediate plastically deformable part and wherein the switch housings are connected together by spacer elements extending between the plastically deformable parts and held to the parts by means of a clamping screw extending through the space or elements and secured on the interior of each intermediate part.

A further object of the invention is to provide a hanging type switch which is simple in design, rugged in construction and economical to manufacture.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and specific objects attained by its uses, reference should be had to the accompanying drawing and descriptive matter in which there is illustrated a preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1. is a front elevational view partly broken away showing the interconnection of two hanging type switches constructed in accordance with the invention;

FIG. 2. is an axial sectional view of a single hanging type switch constructed in accordance with the invention;

FIG. 3. is a section taken on the line III — III of FIG. 2;

GENERAL DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings in particular, the invention embodied therein as shown in FIG. 1, includes two hanging type switches for electric motors generally designated 50 and 50' which are joined together by a spacer member 21.

In accordance with the invention, each housing 50 and 50' includes a top portion 1, 1', a bottom portion 2, 2', and an intermediate portion 3, 3' respectively. The feature of the invention indicated in FIG. 1 is the interconnection of the housing 50 and 50' by the spacer 21, which includes an outer tubular part 21 b, which is shaped to extend between the central or intermediate housing portions 3 and 3' and which carries and encloses a central guide sleeve 21a, through which a securing bolt 22 is adapted to extend. Each central part 3 and 3' is made of an elastically deformable material which permits the relative shifting of the other parts of the housings and a shifting of one switch housing relative to the other. Each intermediate part 3 and 3' is also provided with a recess area 3a to permit form engagement with a switch housing or insert carrier generally designated 5. The insert carrier is formed with a complimentary projection or journal portion 25 which fits into the recess portion 3a and which provides an accommodating recess for a nut 52 or a bolt head 54 as the case may be. In this manner it is possible to secure housings 50 and 50' together by clamping bolt 22 which is recessed on the interior of the intermediate housing parts 3 and 3' and the connection is at an elastic point of the housings 50 and 50' so that they may move slightly relative to each other without causing damage to the housing.

In accordance with a further aspect of the invention the insert carrier 5 is mounted on the bottom part or lower part 2 by means of securing screws 20. The top of the insert carrier provides a mounting for the base of a collet 7 which has a central bore 7a for the passage of a cable 8 therethrough. The cable 8 is connected on the interior of the insert to the switching elements or switching assembly generally designated 4 in a manner which is not clearly shown in the drawings. A clamping ring 6 is arranged around the collet 7 and it is held in a tight position wedged against the outwardly flaring lower part of the collet by means of securing screws 9 which extend through the ring 6 and the flange of the collet 7 and into the insert 5. The screws 9 connect the clamping ring 6 and the collet 7 to a holding clip part 5a of the insert carrier 5. The holding clip part 5a is connected to the base part 5c through an intermediate joint part 5b. The connection is such that the upper part 1 of the housing may move relative to the lower part 2 under shock stresses. The construction also makes it possible to provide a considerable motion of the switching insert 4 out of its holding clip 5a in order to make the terminals with the controlled cables at the upper end of the switching insert well accessible.

The lower part 2 of the housing advantageously includes a handle portion 2b in which there is disposed a push button 14 which may be moved from one side to the other in a curved support therein. The push button 14 engages with a switch lever or rocker arm 15 which is pivoted on a shaft 16 and which includes a gear segment portion 15a which engages with a gear segment 18a of a switch lever 18 of the switching elements 4.

The switching lever is indicated only in dot and dash lines in the drawings.

In accordance with a further feature of the invention, the three parts of the housing interengage by a tongue and groove interengagement and for this purpose a sealing projection 2a of the lower part 2 engages into a receiving recess or groove of the central part 3, and similar interengagement is provided in respect to a projecting part 1a of the top part 1, with the central part 3.

A sealing ring 11 is disposed between the top part 1 and the clamping ring 6 and the collet 7. All of the housing parts are held in engagement by the various clamping screws which interconnect them. The top of the top part 1 is closed by a closure cap or cover 12 which provides a smooth transition from the cable to the hanging switch. This closure cap may be pushed upwardly to effect separation and removal of the various parts and access to the switching elements 4. The upper area of the switching insert 4 is supported within the upper part 1 of the housing on pressure pads 19 as shown in FIG. 2.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A hanging type switch construction comprising an insert carrier for the switching elements, and a housing enclosing said elements including interengagable central part, top part and bottom part, said central part being of a plastically deformable material and engaging with said insert carrier, said bottom and said top part being secured to said insert carrier and clamping means for the passage of a cable into said top part and said insert carrier for holding said housing to the cable.

2. A hanging type switch according to claim 1, including a tubular spacer member connected to said central part, a screw extending through said central part and into said spacer and adapted to be connected to the central part of an adjacent switch.

3. A hanging type switch according to claim 1, wherein said top part, said central part and said bottom part include interengageable projections and recesses sealing said parts together.

4. A hanging type switch according to claim 1, wherein said central part includes a top and bottom periphery having a receiving groove, said bottom part having a bottom part projection engaged with the bottom receiving groove and said top part having a top part projection engaged in the top receiving groove.

5. A hanging type switch according to claim 1, wherein said clamping means is carried on said insert carrier, said insert carrier including a lower part carrying the switching elements and an upper part carrying said clamping means which is pivotal relative to the lower part.

6. A hanging type switch according to claim 5, wherein said upper part of said insert carrier is pivotally connected to the lower part of said insert carrier.

7. A hanging type switch according to claim 1, wherein said clamping means includes a collet secured to said insert carrier having a bore for the passage of a cable therethrough and a clamping ring engaged over said collet for clamping said collet to said cable.

8. A hanging type switch according to claim 7, including fastening screws threaded through said clamping ring and said collet and secured on the interior of said insert carrier.

9. A hanging type switch according to claim 1, wherein said insert carrier is secured to the top of said housing by a securing bolt.

10. A hanging type switch according to claim 1, wherein said clamping means includes a tubular collet having a bore therethrough for the passage of a connecting cable from the top of said top part, said collet being secured to said insert carrier, and a closure cap engaged over said collet and forming a transition between said top part and said cable.

11. A hanging type switch construction comprising a first switch having an insert carrier for holding the switching elements, and a housing enclosing said elements including an interengagable intermediate part, top part and bottom part, said intermediate part being of a plastically deformable material, said insert carrier being secured to said bottom part and said top and bottom parts being interfitted into said central part, means on said insert carrier for holding a connecting cable which extends through said top part, said top part being bolted to said insert carrier, and a second switch of the same construction as said first switch arranged alongside said first switch, a spacer extending between said central part of said first and second switches, and a securing bolt extending from the interior of said central part through said spacer of said first switch to the interior of the central part of the second switch, said intermediate part of said first and second switch being of a plastically deformable material and permitting relatively movement of said first and second switches.

12. A hanging type switch construction comprising a switch housing formed of a bottom part, an intermediate part, and a top parts all interfitted together by interengagable projection-and-recessed interengagement, said bottom part forming a handle and having a movable push button switch thereon, an insert carrier for a switch element mounted on said bottom part and secured thereto, a switch element carried in said insert carrier lever means connected between said movable push button switch on said bottom part and the switch element in said insert carrier, a cable clamping collet having a flange portion secured to said insert carrier adjacent the top thereof and including a bore therethrough for the passage of a connecting cable extending outwardly through the top of said top part, and clamping ring means engaged over said collet for clamping said collet to said cable and to said insert carrier.

13. A hanging type switch according to claim 12, wherein said insert carrier includes an upper part which is movable relative to a lower part.

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