

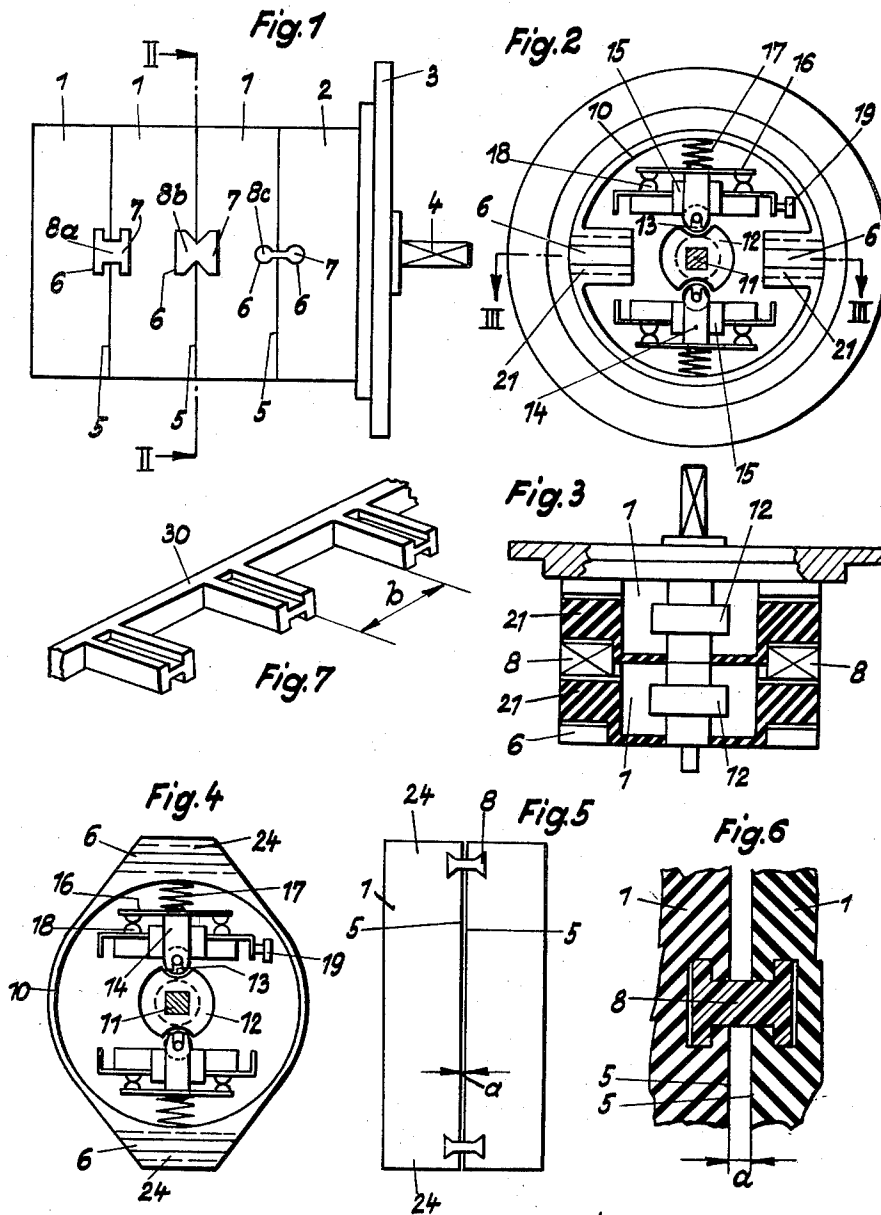
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ASSEMBLY OF AXIALLY ALIGNED COMPONENTS

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ASSEMBLY OF AXIALLY ALIGNED COMPONENTS

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In the construction of electrical switches operating with cam-actuated circuit breakers and serving for performing a relatively complicated switching program, the necessary number of individual switches, so-called switch units, are axially aligned and arranged to be operated by means of a common, continuous torque-transmitting member and a common rotary grip. These switch units are often held together by tie bolts extending through the entire series of units.

A switch of the type described hereinbefore includes not only switch units but other components which are essential for using the switch as intended, e.g., a stepping gear, key-operable locking means preventing an unauthorized operation of the switch, means for accommodating a push-on handle, signal contact for reporting completion of the switch operation to a remote control station, transmitting means for mechanically transmitting the switching operation to an adjacent device of different type, which may be another switch, and the like. Because various kinds of requirements may have to be fulfilled by a switch, as is apparent, whereas it is desired to use switch units which are as uniform as possible, to enable an efficient manufacture, the invention aims at providing a simple, appropriate coupling for connecting said components to each other and to the adjacent switch unit. This coupling should be uniform for all components mentioned and for components of other type.

According to another object of the invention it is recommended to provide both sides of the switch units or similar components with projections and recesses which cooperate as in a rotary bayonet joint. In this case, components of any desired type can be coupled to each other in the correct position if they enable this type of connection.

The present invention is also concerned with the problem of coupling components of the type described in the correct position and resides essentially in an arrangement wherein two adjacent components comprise casings or casing parts defining an interface and formed with profiled grooves which in the assembled switch are in registry and complement each other to form a common, outwardly open key slot, into which an appropriate coupling member can be inserted.

For an explanation of the invention, reference is made to the accompanying diagrammatic drawings, in which illustrative embodiments of the inventive concept are shown. FIG. 1 is a side elevation showing a switch consisting of three switch units and a stepping gear. FIG. 2 is a sectional view taken on line II—II of FIG. 1 and FIG. 3 is a sectional view taken on line III—III of FIG. 2. FIG. 4 is a top plan view showing another embodiment and FIG. 5 shows an appertaining side view. FIGS. 6 and 7 show details of the couplings mentioned above. It may be noted that the present invention is mainly intended for providing a connection between an

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additional component and a switch unit in a correct position rather than a connection between switch units although the application of the invention for the last-mentioned purpose is not precluded.

FIG. 1 shows three switch units 1 and a stepping gear 2 which does not differ in outward appearance from the switch units and may be connected to the front plate 3 in any desired manner, e.g., by the bayonet joint mentioned hereinbefore. A rotary shaft 4 serves for operating the switch and may carry a rotary grip, not shown. The front plate 3 may be secured to a control panel or the like in known manner. As has already been stated, it is insignificant for the practice of the invention whether the components 1 are switch units or components of other type. The interfaces 5 formed by adjacent components 1, 2 are provided with grooves or recesses 6 having undercut portions 7. In the assembled switch, pairs of said grooves complement each other to form outwardly open key slots with lateral lobes, in which corresponding coupling members 8, 8a, 8b are interlockingly inserted. Three different embodiments of these coupling members, selected from a much larger number of shapes possible, are shown. For the example shown it is essential that the coupling members can be fitted by reason of their special profile in the undercut grooves, which together form passages of, for example, H, bowtie or dumbbell shape as illustrated, in such a manner that an axial separation of two components thus connected is precluded and a relative rotation of these two components is also prevented.

FIG. 2 shows the interior of a switch unit and indicates how the above-mentioned key slots may be accommodated. In FIGS. 2 and 3 the most important parts of a switch of a frequently used type are shown without all details. It is only desired to indicate that it is actually possible in practice to make such structural changes in conventional components as are required for carrying out the invention. For instance, a stepping gear has a mechanical structure which is very similar to that of the switch shown in FIG. 2.

The unit shown in FIG. 2 has a plastic casing 10 which is pot-shaped and open on one side. The cover of this casing is at the same time the bottom of the next-adjacent component. The rotary shaft 11 of the switch carries a cam 12 which acts through rollers 13 and push rods 14, slidable in guides 15, on contact bridges 16 each acted upon by a compression spring 17. The cams 12 can be rotated to lift the bridges 16 against the action of the springs 17, whereby the current path between the countercontacts 18 and the terminals 19 is broken. This switch construction is conventional so that it does not appear necessary to discuss further details, which are not shown either. In the spaces between the contact bridges 16 the casing 1 is formed with extensions 21. The coupling members are designated with numerals 8 provided with the key-slot-forming grooves 6.

It will be seen that the embodiment shown in FIGS. 1-3 operates with radially insertable coupling members 8. FIGS. 4 and 5 show a construction comprising coupling members which can be inserted in a tangential direction with respect to the casing of the component. In FIGS. 4, 5 the same parts as shown in FIGS. 1-3 are provided with the same reference characters. In this case the

grooves 6 jointly forming the key slots are machined in bosses 24 provided on the outside of the casings.

It is apparent that the coupling members according to the invention may be provided in numerous forms as regards their profile and their relative position in the components interconnected thereby.

As shown in FIG. 6, the coupling member 8 may be formed to enable such a positioning of the two adjacent components 1 relative to each other that they face each other with a spacing a . This idea may also be embodied with the aid of grooves of various shapes and correspondingly shaped coupling members.

In the embodiments shown by way of example it is assumed that the coupling members fit the receiving key slots more or less without any play. To cause the coupling members to be held in the slot by friction it is desirable, as a rule, to provide the slots and/or the couplings in a wedge-shaped form tapering in the direction in which the couplings are inserted. This object may also be achieved by enabling a deformation of the coupling members or of the thinner wall portions defining the slots. The coupling members may also be provided with projections which snap into recesses in the slots when the coupling members are inserted. In this case the coupling members must be made from a sufficiently elastic material. Finally, the coupling members may also be adhesively held in the slots with the aid of suitable adhesives.

A special advantage of the present method of positioning resides in that the several components may be separated from each other to make the electrical connection. This improves the accessibility of the terminals in the case of switch units and affords greater flexibility of design as compared with switches in which electrical connections must be made without a possibility of a disassembly of the switch into its units.

In modern mass production the casing parts 1 consist of plastics, as a rule. Where these materials are used the slots required in the present case may be formed in the casing parts without difficulty. The coupling members are suitably made from a thermoplastic. In this case a plurality of coupling members 8 spaced by the distance b may depend from a common connecting member 30, FIG. 7. This special connecting member 30 with the coupling members protruding therefrom forms a comblike structure, which prevents a separation of the casing parts in the axial direction. In this case it is not necessary for the slots of the intermediate units receiving the couplings to have an undercut profile because the couplings need only prevent a rotation whereas the units (except the two outermost ones) are axially held together by the comb webs 30.

The invention is also applicable to electrical devices other than switches which consist of several axially aligned components.

We claim:

1. An electric switch assembly comprising a plurality of cylindrical units of like diameter detachably and relatively rotatably juxtaposed in co-axial relationship, having respective confronting surfaces extending substantially transversely to the unit axes each of said units being provided with at least two angularly spaced peripheral recesses in a respective one of said surfaces open toward an adjacent unit and forming with the corresponding recesses in a respective surface of said adjacent unit at least two key slots extending transversely to the axis of the assembly and opening at the periphery thereof, upon correct angular alignment of said units, and a coupling member of complementary shape matingly inserted in each of said key slots in a direction transverse to said axes for preventing relative rotation of adjacent units said key slots and said coupling members being formed with relatively tapering surfaces for frictionally retaining said members in their inserted positions, said coupling members being interconnected by an axially extending link.

2. An electric switch assembly comprising at least three axially aligned cylindrical units of like diameter provided with a common stem which detachably and relatively rotatably interconnects them in co-axial relationship, each of said units being provided, near each edge facing an adjacent unit, with a radially extending peripheral recess open toward said adjacent unit, all of said recesses being angularly aligned with one another whereby at least two radially extending key slots are formed at the junctions of said units by adjoining pairs of said recesses, and at least two coupling members of complementary shape matingly inserted in a direction transverse to the unit axes in said key slots, respectively, for preventing relative rotation of said units said coupling members being interconnected by an axially extending link.

3. An electric switch assembly comprising a plurality of cylindrical units of like diameter detachably and relatively rotatably juxtaposed in co-axial relationship, each of said units being provided with at least two angularly spaced peripheral undercut recesses extending transversely to the axes of said units and open toward an adjacent unit and forming with the corresponding recesses of said adjacent unit at least two key slots upon correct angular alignment of said units, and a coupling member of complementary shape interlockingly inserted in a direction transverse to the unit axes in each of said key slots for preventing relative rotation and separation of adjacent units said coupling members being interconnected by an axially extending link.

4. An electric switch assembly comprising a plurality of axially aligned units and a cam shaft detachably and relatively rotatably interconnecting said units with one another, said units having cylindrical housings of like diameter coaxially adjoining one another, each of said housings being provided with a pair of diametrically opposite projections, each pair of adjacent units being provided with two diametrically opposite key slots each consisting of two recesses extending transversely to the axes of said units and open toward the periphery and toward each other, said recesses being formed in said projections and extending therein over less than half the axial width of the respective units, and a coupling member of complementary shape matingly inserted in a direction transverse to said axes in each of said key slots for preventing relative rotation of adjacent units said coupling members being interconnected by an axially extending link.

5. An electric switch assembly comprising a plurality of axially aligned units and a cam shaft detachably and relatively rotatably interconnecting said units with one another, said units having cylindrical housings of like diameter coaxially adjoining one another, each of said housings being provided with a pair of diametrically opposite projections, each pair of adjacent units being provided with two diametrically opposite key slots each consisting of two undercut recesses extending transversely to the axes of said units and open toward the periphery and toward each other, said recesses being formed in said projections and extending therein over less than half the axial width of the respective units, and a coupling member of complementary shape interlockingly inserted in a direction transverse to said axes in each of said key slots for preventing relative rotation and separation of adjacent units, said coupling members being interconnected by an axially extending link.

6. An electric switch assembly comprising a plurality of cylindrical units of like diameter detachably and relatively rotatably juxtaposed in co-axial relationship, each of said units being provided with at least two angularly spaced radially extending peripheral recesses open toward an adjacent unit and forming with the corresponding recesses of said adjacent unit at least two key slots upon correct angular alignment of said units, and a radially extending coupling member of complementary shape matingly inserted in each of said key slots for preventing relative rotation of adjacent units, said key slots

and said coupling members being provided with respective wall portions at least one of which has a yieldable formation interlockingly engageable with the other wall portion for maintaining said members in their inserted positions said coupling members being interconnected by an axially extending link.

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