Feb. 15, 1966 C. A. WOODCOCK 3,235,678

PLUNGER TYPE ELECTRICAL SWITCH WITH ARCUATE SHAPED CONTACT MEANS

Filed Sept. 20, 1963

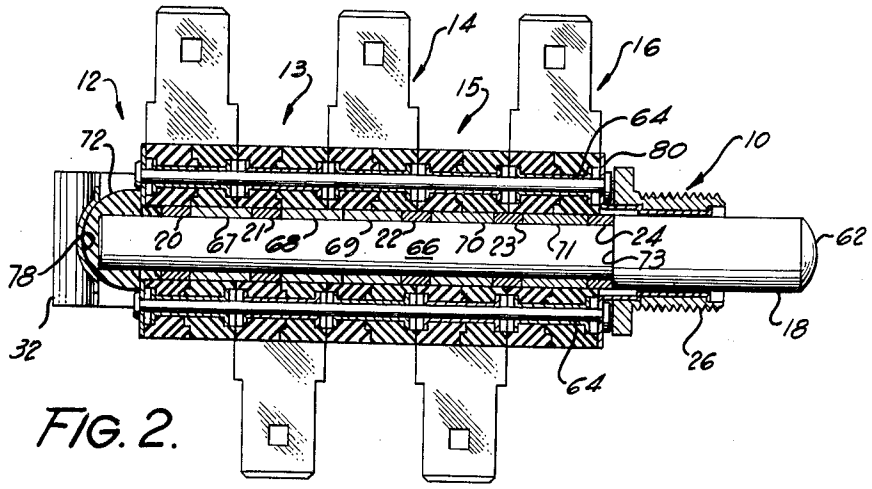


FIG. 2.

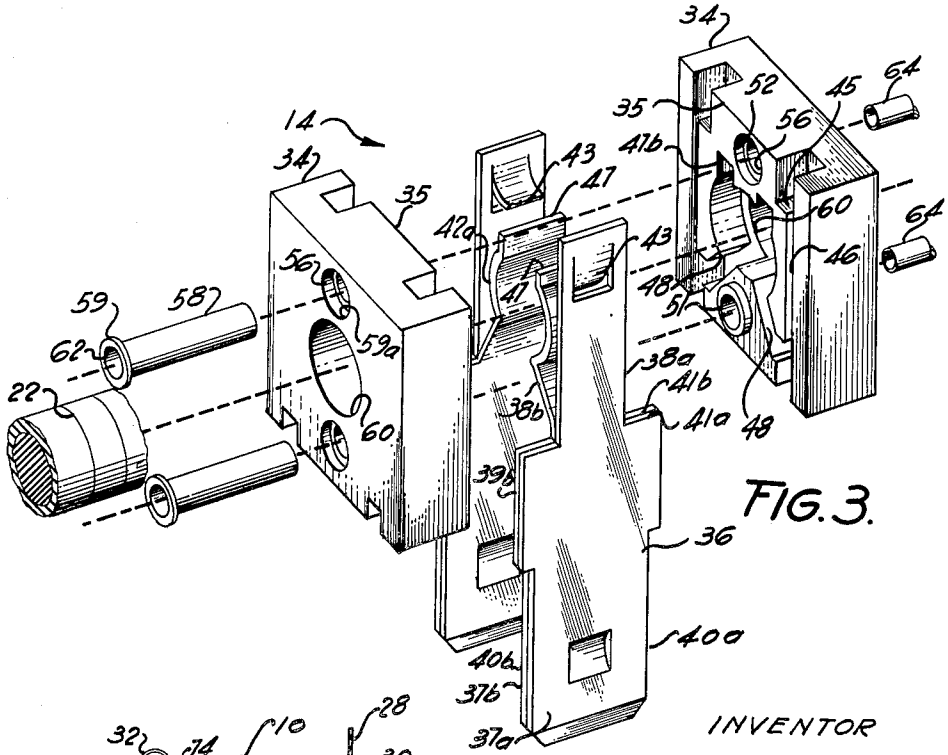


FIG. 3.

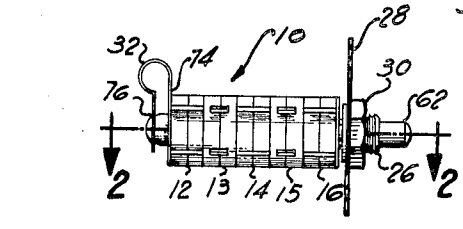


FIG. 1.

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United States Patent Office 3,235,678 Patented Feb. 15, 1966

3,235,678
PLUNGER TYPE ELECTRICAL SWITCH WITH ARCUATE SHAPED CONTACT MEANS

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Filed Sept. 20, 1963, Ser. No. 310,324
6 Claims. (Cl. 200—16)

This invention relates to an electric switch, and in particular to a plunger-type electrical switch having a plurality of separate independent switch contacts actuated in unison by a plunger member common to all.

The subject invention embodies a single switch having a selectable number of separate switching units and having a common plunger member including thereon contacts for each of the units. The separate switching units thus can be operative in separate circuits independent of one another responsive to movement of the common plunger member. The units are of substantially identical structure so that they may be stacked and held together by means of simple bolt or rivet construction. Thus, in assembly only the length of the common plunger and the number of units will vary so that the switch may be economically fabricated with a minimum of inventory. The switch is also highly versatile in that both the number of switching units can be readily varied as well as the operative arrangement of each unit.

The basic object of this invention is, therefore, to provide an economically-fabricated, highly-versatile, plunger-type switch having substantially identical switch components stacked together to form a single device actuatable by a single plunger.

In the accompanying drawing,

FIG. 1 is a side elevational view of an embodiment of the subject switch;

FIG. 2 is a greatly enlarged sectional view as seen generally from line 2—2 of FIG. 1 of the subject switch; and

FIG. 3 is an exploded perspective view of a single switch unit structure of the subject switch.

As shown in FIGS. 1 and 2, the subject switch **10** includes a plurality of separate electrical switch units indicated generally at **12**, **13**, **14**, **15** and **16** joined together as a single device. A common plunger member **18** having separate contacts **20**, **21**, **22**, **23** and **24** for the units **12** through **16**, respectively, extends through all of the switches. The switch **10** includes a threaded mounting stud **26** insertable into an appropriate receiving opening in a frame member **28** and may be secured thereto by means of a nut **30**. A spring **32** at the rearward end of the plunger **18** provides a restoring action for the plunger after the actuating force is withdrawn.

Reference is now made to FIG. 3 showing an exploded perspective view of a single switch unit used in the switch. Each unit includes an insulating body composed of identical mating body members **34** and a pair of identical spaced electrical contact members **36** supported by the mated body members.

Each body member **34** is a plastic molded element having on its adjacent mating face **35** a pair of parallel recesses or slots **46** with a central, generally circular recess **50**. Each of the parallel recesses is joined to the central recess by an angled recess **48**.

The recesses are so formed to receive the electrical contact members **36** which are each formed of strips **37***a* and *b* of conductive material such as brass or the like fastened in abutment together in any well known manner. The outer strip **37***a* is a planar member having an upper extending portion **38***a* integral and forming a shoulder **41***a* with a central portion **39***a*. A narrower lower portion **40***a* is also formed integral therewith.

The two portions **39***b* and **40***b* of strip **37***b* are identical and joined to the portions **39***a* and **40***a* of the strip **37***a* to form the contact member **36**. The extending member **38***b* of each inner strip **37***b* is angled away from the integral projection **38***a* of outer strip **37***a* and is formed at its extended end to define an arcuate cylindrical contact **42**. The projection **38***a* of the outer connector strip **37***a* has a punched tab projection **43** extending inwardly toward the arcuate cylindrical portion **42***a* of the inner strip **37***b* to form a locking means therefor within the insulating plastic body **34** as hereinafter described.

Each of the contact members **36** fits within the body members **34** so that the upper extension **38***a* of the one strip **37***a* fits within the parallel slot **46**. The arcuate circular cylindrical contact **42***a* is received within the substantially circular recess **50** of the member **34** while the angular portion of the extension **38***b* fits within the angled recess **48**. The surface extremity **47** of the projection **38***b* engages the flat surface **47***b* in the body member **34** and the tab projection **43** engages a shoulder **45** at the end of the parallel slot. These cooperating elements lock the contact members in tight assembly within the assembled switch unit. Each connector **36** is thus held from longitudinal movement with respect to the switch body **34** by the interaction of the inner projection **38***b* and the tab **43** on the outer strip.

Complementary bosses **51** and recesses **52** on the body members **34** adjacent and surrounding through-openings **56** interlock the bodies **34** to hold the contact members **36** in alignment. The through-openings **56** receive tubular rivets **58** having flanged ends **59** received within counterbores **59***a* in the outward surfaces of the body members.

The abutting portions **40***a* and **40***b* of the contact members **36** project from the body **34** of the switch unit and form terminal connections for a complementary female electrical connector not shown and not forming a part of this invention.

A through-opening **60** extends through each body member **34** concentric with the substantially circular recess **50** to receive the movable plunger member **18**. It may thus be seen that any number of units such as just described may be assembled in a bank with a common plunger actuator **18**. The units are aligned so that the openings **62** in each of the rivets **58** may receive a fastener rod or rivet **63** of the required length. The rods **63** are inserted through said openings **62** and flared at either end to hold the assembly in secure fashion. Thus, the maximum number of switch units that may be assembled is dictated only by the design requirements and the strength required of the whole assembly.

Each of the switch units, of course, is actuated by the common plunger member which carries contacts **20**, **21**, **22**, **23** and **24** (FIG. 2). The contacts **20** through **24** are electroconductive annuli surrounding a reduced diameter portion **66** of the plunger rod and are maintained at the properly spaced interval by insulating annuli **67**, **68**, **69**, **70** and **71**.

The contacts **20** through **24** and spacers **67** through **71** are held in position on the plunger rod so the end contact **24** abuts shoulder **73** on the plunger **18** by means of a semi-spherical retainer **72** press-fit onto the end of the reduced diameter portion **66**.

The U-shaped spring **32** retains the plunger member **18** within the assembly and has one leg **74** held in engagement against the exterior surface of the end switch unit **12** by means of rods **64**. The other leg **76** of the U-shaped spring **32** is formed to define a spherical shaped portion **78** in engagement with the retainer button **72**.

The other end of the rods **64** hold a bracket **80** upon which the mounting stud **26** is formed. The stud **26** it will be remembered is utilized to secure the switch to a

frame member 28 with the cooperation of mounting bolt 30.

The switch units 12 through 16 are readily adaptable to operate as normally opened or normally closed switches by merely rearranging the positioning of the contacts 20 through 24 on the plunger member 18. The order of contacts and insulating members may be arranged so that the contacts 20 through 24 are either initially in contact or out of contact with the arcuate portions 42 of the connectors 36 therewith. For example, in the configuration shown in FIG. 2 switch units 12 and 13 operate as normally closed units and switches 14, 15 and 16 operate as normally open units. This is because contacts 20 and 21 are initially in engagement with their respective contact members 36 whereas contacts 22, 23 and 24 are initially out of engagement with their respective contact members 36.

The subject switch represents a versatile assembly which is fabricated of economically produced members. In a multiswitch arrangement only the plunger and the length of the connecting rods 64 need actually change. An almost infinite variety of switch assemblies are possible if a variety of length plungers and rivets and connecting rods ar inventoried.

While only a single embodiment has been disclosed it will be obvious to those skilled in the art that many other modifications may be made without departing from the inventive concept of the disclosure. Thus it is desired that the invention be limited only by the claims hereinafter following.

What is claimed is:

1. An electrical switch comprising a plurality of separate switch units stacked adjacent and aligned with one another, each of said switch units including a pair of abutting body members having mating recesses and aligned circular through-openings, a pair of separate electroconductive contact members disposed within said recesses and each comprising a pair of strips mated together along a portion thereof, the unmated portion of one of said strips forming a cylindrical arcuate contact disposed concentric with said through-opening, the unmated portion of the other strip forming a lock for said contact member within said recesses, the mating portions of said strips forming a terminal connection extending exteriorly of said body members, means including a pair of tubular rivets disposed through a respective pair of other aligned openings for securing each of said units in assembly, means including a pair of elongated pins received within respective aligned ones of said tubular rivets of each of said plurality of switch units for holding said units stacked against one another in a common aligned assembly, means including a common plunger extending through the aligned circular through-openings of switch units and axially translatable therein, a like plurality of contact rings replaceably mounted on said plunger, a plurality of insulating sleeve members maintaining said contacts in desired operative positions with respect to said cylindrical arcuate contacts, a button positioned on the end of the plunger operable to define a limit of the plunger in one direction and to confine the contacts and insulating sleeves on the plunger, a U-shaped spring having one leg attached to the body of the outermost switch unit by said elongated rods, the other leg of said spring engaging said button to bias said plunger to the limit defined by said button.

2. An electrical switch comprising a plurality of separate switch units stacked adjacent to and aligned with one another, each of said switch units including a pair of abutting body members having mating recesses and aligned circular through-openings, a pair of separate electroconductive contact members disposed within said recesses and each comprising a pair of strips mated together along a portion thereof, the unmated portion of one of said strips forming a cylindrical arcuate contact disposed concentric with said through-opening, the unmated portion of the other strip forming a lock for said contact member within said recesses, the mating portions of said strips forming a terminal connection extending exteriorly of said body members, means including a pair of tubular rivets disposed through a respective pair of other aligned openings for securing each of said units in assembly, means including a pair of elongated pins received within respective aligned ones of said tubular rivets of each of said plurality of switch units for holding said units stacked against one another in a common aligned assembly, means including a common plunger extending through the aligned circular through-openings of switch units and axially translatable therein, a like plurality of contact rings replaceably mounted on said plunger, a plurality of insulating sleeve members maintaining said contacts in desired operative positions with respect to said cylindrical arcuate contacts, a button positioned on the end of the plunger operable to define a limit of the plunger in one direction and to confine the contacts and insulating sleeves on the plunger, and means including a spring in engagement with the button for biasing the plunger to the limit defined by said button.

3. In an electrical switch comprising a plurality of separate switch units stacked adjacent and aligned with one another, each of said switch units including a pair of abutting body members having mating recesses and aligned circular through-openings, a pair of separate electroconductive contact members disposed within said recesses and each including a cylindrical arcuate contact disposed centrally with said through-opening, a projecting terminal connection extending exteriorly of said body members, means including a pair of tubular rivets disposed through a respective pair of other aligned openings for securing each of said units in assembly, means including a pair of elongated pins received within respective aligned ones of said tubular rivets of each of said plurality of switch units for holding said units stacked against one another in a common aligned assembly, means including a common plunger extending through the aligned circular through-openings of adjacent switches, a like plurality of contact rings replaceably mounted on said plunger, a plurality of insulating sleeve members positioning said contacts in a desired operative condition with respect to a respective cylindrical arcuate contact switch body, a button positioned on the end of the plunger operable to define a limit of the plunger in one direction and to confirm the contacts and insulating sleeve on the plunger, a U-shaped spring having one leg attached to the body member of the outermost switch unit by said elongated rods, the other leg of said spring engaging said button to bias said plunger to the limit defined by said button.

4. An electrical switch comprising plurality of separate switch units stacked adjacent and aligned with one another, each of said switch units including a pair of abutting body members having mating recesses and aligned circular through-openings, a pair of separate electroconductive contact members disposed within said recesses and each including a cylindrical arcuate contact portion disposed concentrically with said through-opening, each of said contact members having a terminal connection extending exteriorly of said body members, means including a pair of tubular rivets disposed through a respective pair of other aligned openings in said body members for securing each of said units in assembly, means including a pair of elongated pins received within respective aligned ones of said tubular rivets of each of said plurality of switch units for holding said units stacked against one another in a common aligned assembly, a common plunger extending through the aligned circular through-openings of said switch units and axially translatable therein, a like plurality of contact rings replaceably mounted on said plunger, a plurality of insulating sleeve members positioning said contacts in desired opera-

tive positions with respect to said cylindrical arcuate contact portions, a button positioned on the end of the plunger operable to define a limit of the plunger in one direction and to confine the contacts and insulating sleeves on the plunger, and means including a spring in engagement with the button for biasing the plunger to the limit defined by said button.

5. In an electrical switch comprising a plurality of separate switch units stacked adjacent and aligned with one another, each of said switch units including a pair of abutting body members having mating recesses and aligned circular through-openings, a pair of separate electroconductive contact members disposed within said recesses and each including a cylindrical arcuate contact disposed centrally with said through-opening, a projecting terminal connection extending exteriorly of said body members, means including a pair of tubular rivets disposed through a respective pair of other aligned openings for securing each of said units in assembly, means including a pair of elongated pins received within respective aligned ones of said tubular rivets of each of said plurality of switch units for holding said units stacked against one another in a common aligned assembly, means including a common plunger extending through the aligned circular through-openings of adjacent switches, a like plurality of contact rings replaceably mounted on said plunger, a plurality of insulating sleeve members positioning said contacts in a desired operative condition with respect to a respective cylindrical arcuate contact switch body, means positioned on the end of the plunger operable to confine the contacts and insulating sleeves on the plunger, and means for biasing the plunger to the limit defined by said button.

6. An electrical switch unit comprising a pair of abutting body members having mating recesses and aligned circular through-openings, a pair of separate electroconductive contact members disposed within said recesses and each comprising a pair of strips mated together along a portion thereof, the unmated portion of one of said strips forming a cylindrical arcuate contact disposed concentric with said through-opening, the unmated portion of the other strip forming a lock for said contact member within said recesses, the mating portions of said strips forming a terminal connection extending exteriorly of said body members, and means including a pair of tubular rivets disposed through a respective pair of other aligned openings in said body members for securing each of said units in assembly.

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