

July 19, 1960

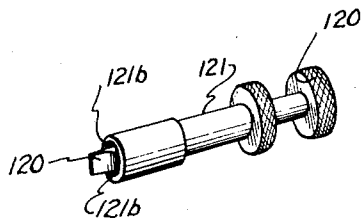
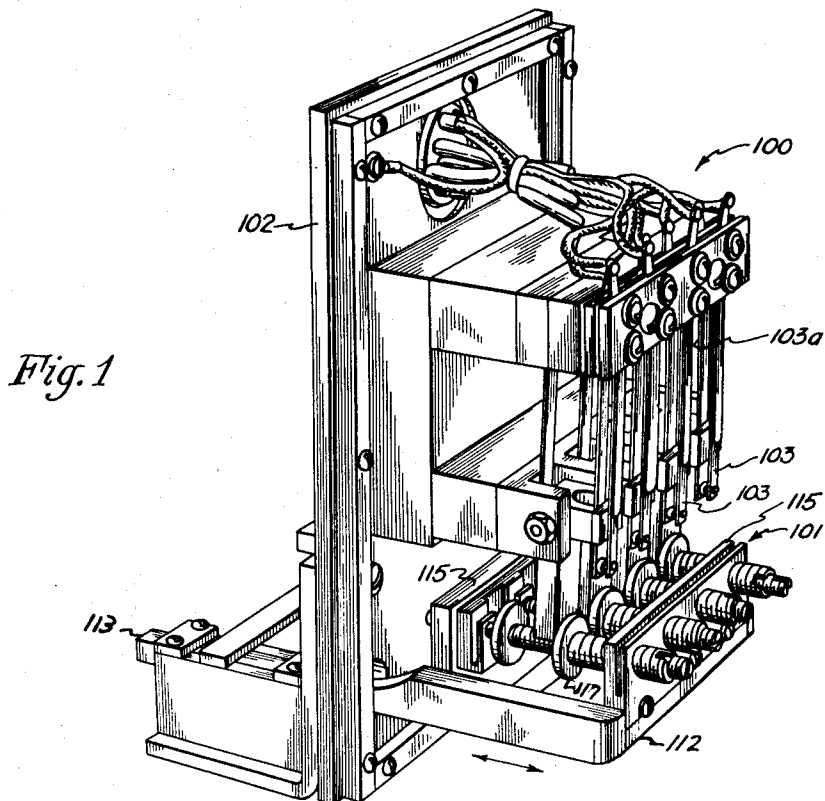
R. K. BRYAN

2,945,922

MICRO-ADJUSTABLE SWITCH

Filed June 2, 1958

2 Sheets-Sheet 1



INVENTOR

Ray K. Bryan

BY

Arthur Vinograd

ATTORNEY

July 19, 1960

R. K. BRYAN

2,945,922

MICRO-ADJUSTABLE SWITCH

Filed June 2, 1958

2 Sheets-Sheet 2

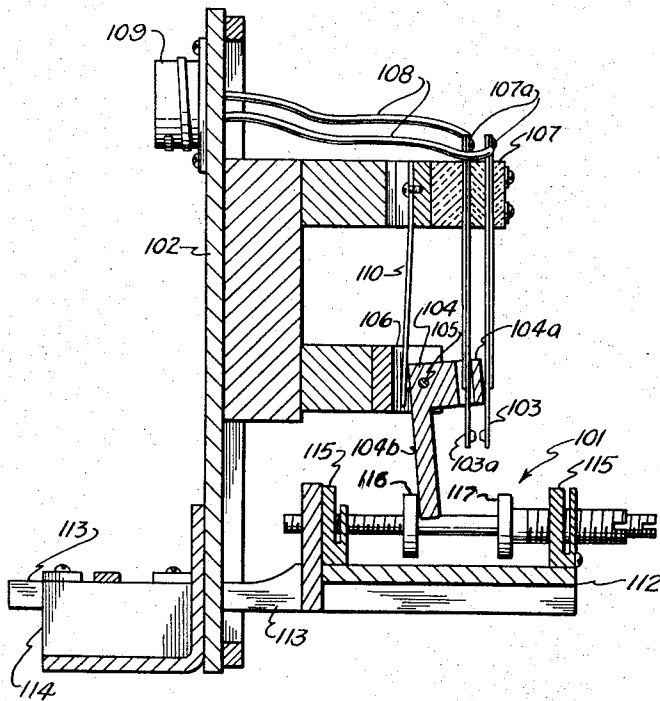


Fig. 2

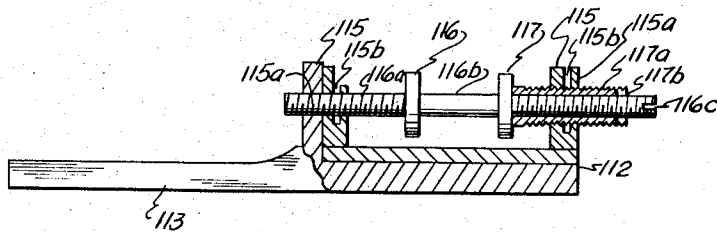


Fig. 3

INVENTOR

Ray K. Bryan

BY

Arthur Vinograd

ATTORNEY

1

2,945,922

MICRO-ADJUSTABLE SWITCH

Ray K. Bryan, 2117 SW. 61st Terrace,
Oklahoma City, Okla.

Filed June 2, 1958, Ser. No. 739,444

5 Claims. (Cl. 200—18)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States for governmental purposes without the payment to me of any royalty thereon, in accordance with the provisions of 35 United States Code (1952), section 266.

This invention relates to an electrical switch and particularly contemplates an improved micro-adjustable switch for controlling the energization of an electrical or an electronic circuit with extreme precision.

In accordance with the principles of the present invention a switch is provided in which the energization of associated electrical circuit can be precisely controlled without disrupting the alignment of the switch contacts or causing different degrees of strain on the contact blades consequent to each change in adjustment. In conventional switch constructions, so far as is known, adjustment of the operating time causes different degrees of bend of the switch contact arms. In many cases the degree of bend is increased to an extent such that metal fatigue occurs after a period of use. In accordance with the present invention the same degree of strain is presented to the switch contactor regardless of the adjustment provided. Moreover, the same degree of force is required to actuate the contactor regardless of the particular condition of operation to which the switch may be set.

It is accordingly an immediate object of the present invention to provide an improved control switch having selectively adjustable means for varying the period of operation of the switch contacts.

It is another object of the present invention to provide an improved control switch in which the same degree of force is applied to the switch contacts by the operating means regardless of the selected period of adjustment to which the switch has been set.

A still further object of the present invention is to provide an improved control switch in which the period of actuation of the switch contacts to determine the energization of an associated electrical circuit can be set and thereafter held to a high degree of precision.

Still another object of the present invention is to provide a control switch which is extremely rugged, serviceable, simple in construction, and which can be readily adjusted by means of a simple auxiliary tool.

Other uses and advantages of the invention will become apparent upon reference to the specification and drawings in which,

Fig. 1 is a pictorial view showing the over-all construction of a preferred embodiment of the switch assembly comprising the present invention;

Fig. 2 is a side elevation partly in section of the construction shown in Fig. 1;

Fig. 3 is a more detailed view, partly in section, showing the adjustable contactor operating means; and

Fig. 4 is a view of the auxiliary adjusting tool employed for setting the operating means.

As shown in the drawings the improved micro-adjustable control switch comprising the present invention com-

2

prises a switch assembly generally indicated as 100 in Fig. 1 of the drawings, a striker assembly 101, and a mounting plate or bracket 102.

The switch assembly 100 together with a portion of the switch operating means is shown in more detail in Fig. 2. The switch assembly 100 comprises a conventional contactor mechanism comprising a plurality of contact blades 103 and associated contactor blades 103a which are movable relative to the contact blades. Each contact blade and associated contactor blade 103a is of similar construction. Four contact units are illustrated in the drawings. It will be clear, however, that any desired number of contacts can be compounded into a single switch assembly as desired. As is apparent from Figs. 1 and 2, the operating means for displacing a contactor blade 103a relative to a contact blade 103 comprises a linkage which, as shown in the drawings, may be in the form of a bell crank 104 having a first cam portion 104a extending between the contact and the contactor blades and a second portion 104b which projects downwardly as viewed in Fig. 1. The first portion 104a of bell crank 104 is suitably slotted to provide the cam portion which fits between the switch blades 103, 103a. While a normally closed type of switch is illustrated, it will be readily apparent that the bell crank can be employed to close a normally open switch or to sequence a more complex type of switch if desired. An intermediate portion of each of the bell cranks is pivotally mounted by means of a pin 105 in an insulated supporting bracket 106, forming part of the mounting plate 102, as is clearly indicated in Figs. 1 and 2. The upper ends of the contact and contactor blades are suitably mounted as is conventional in an insulated block 107 having suitable terminals 107a from which conductors 108 are provided leading to an outlet terminal such as cable connector 109. As shown in Fig. 1, the actuating linkage or bell crank 104 is biased by a leaf spring 110, which is suitably anchored at one end in the supporting block 107 and which contacts the bell crank at its opposite end. It will be apparent from Fig. 2 that rotation of the bell crank 104 in a counter clockwise direction sets up an opposing force in spring 110.

The striker assembly 101 is mounted below the switch assembly as shown in Fig. 1 in a position such that the striker elements 116, 117, to be described are juxtaposed to the end of each of the bell cranks.

The striker assembly comprises a movably mounted carriage 112 having guides 113, which, for example, may be slidably mounted in suitable guideways 114 provided in the bracket 102. The guideways 114 may be in the form of any suitable mounting bracket provided in the mechanism to which the switch may be applied and are not necessarily restricted to the construction shown in the drawings. The striker assembly further comprises a pair of spaced walls 115 as shown in Figs. 1-3, in which the switch operating strikers now to be described are mounted. The striker assembly is further detailed in Fig. 3. Each of the strikers comprises a pair of concentrically mounted spools, 116, 117, having elongated shanks 116a, 117a, respectively, which are adjustably mounted in the end walls 115 of the striker assembly frame. The first spool 116 comprises a threaded shank or spindle 116a, which is mounted in a threaded bore 115a provided in one of the end walls 115. A second extended portion of the spindle 116a provides a mount for the spindle of the second spool 117, as will now be described. The shank 117a of the second spool 117 is internally bored so as to rotatably and slidably fit on the shank of the first spool and the outside diameter of the shank 117a of the second spool in turn is suitably threaded, as shown, for engagement with a threaded hole 115a in the end wall 115. It will be clear from such

described construction that each of the spools 116, 117, of the striker assembly can be separately and individually adjusted in a longitudinal direction by virtue of its respective threaded mounting so as to be adjustable relative to each other and with respect to the strike assembly frame. Provision is made to lock each of the spools in its selected position of adjustment. As shown in Figs. 1 and 3, the locking means may comprise a clamp formed by a slot 115b which may be milled out of each end wall 115. The resiliency of such clamping plates function in a manner similar to a spring washer as well known to frictionally engage the associated threaded members and thereby fix them in their selected position of adjustment.

It will be clear from Fig. 1 that the striker assembly is mounted relative to the switch assembly so that the depending portions 104b of the bell cranks 194 are straddled by the spools 116, 117. An end portion of the bell crank arm 104b is suitably hollowed to fit the shank 116b.

Fig. 4 shows a suitable tool for individually adjusting each of the striker spools. Specifically, the inner spindle 116b of the first-mentioned striker 116 is brought out through the bore of the spindle 117a of the second striker and terminates in a slotted end 116c as shown. Accordingly, a simple screwdriver-type of tool 120, as shown in Fig. 4, can readily be engaged with such slotted end and thereby position the first striker 116 in any selected longitudinal position of adjustment relative to the end of the bell crank. The threaded shank 117a of the second striker is provided with castellations 117b, and a second tool 121, as shown in Fig. 4, which may be mounted concentrically with the first tool 120 is provided with a cylindrical recess and suitable keys 121b adapted to engage the castellations. Accordingly the second striker may be readily adjustable in a position relative to the end of the bell crank by turning the threaded shank with such tool.

In operation the striker assembly carriage 112 is connected to any suitable motivating means adapted to reciprocate the carriage relative to frame 102. The striker spools 116, 117 are then individually adjusted by the mechanism of Fig. 4 to obtain the desired sequence of operation of the switch contacts. It will be apparent that the time of operation of each of the individual bell cranks 104 will be determined by the relative settings of the corresponding spools 116, 117 associated with the respective bell crank. It will be noted from Fig. 2 that each of the switch blades remains in a neutral unbiased condition until actuated by the cam portion 104a of the bell crank and that the selective setting of the spools therefore does not operate to apply different degrees of force to the switch blades. The same degree of force is applied to the switch blades by the bell crank and associated spools, regardless of the spool setting with consequent gain in operating efficiency and longevity of parts. Moreover, the particular means of spool adjustment described results in a preciseness of setting which insures exact operation of the switch contacts according to any desired sequence.

It will be clear from such described construction that the operating force applied to the contact and contactor portions of the switch is always the same regardless of the positions to which the striker spools have been selectively adjusted. Stated in another way, actuation of the bell crank is predicated by the time at which each of the striker spools 116 or 117 actuate the bell crank upon displacement of the striker carriage. The adjust-

ability provided by the mechanism of this invention arises from the relative positions between the striker spools and the bell crank and does not involve any change in position between the operating end of the bell crank and the switch blades. Since each of the strikers are individually adjustable, a high degree of flexibility is obtainable in regard to control of the switch and associated electrical circuit.

It will be noted that the design of the striker assembly permits precise adjustment of the switch operating point and that such adjustment may easily be changed. Moreover, by virtue of the threaded spindles or shanks and the self-locking feature provided by the slotted walls 115 on the striker carriage, the strikers hold their position with unfailing accuracy, thus contributing to the dependability of the switch.

It will be apparent that the embodiments shown are only exemplary and that various modifications can be made in construction and arrangement within the scope of the invention as defined in the appended claims.

What is claimed is:

1. A control switch for precisely determining the energization of an associated electrical circuit comprising a contactor of the type having a contact blade and a contactor blade movable relative thereto, linkage means for actuating said contactor blade relative to said contact blade, said linkage means comprising a pivotally mounted lever having first and second portions, said first portion positioned for engagement with and normally disengaged from said blades, striker means comprising a plurality of spools adapted to actuate said linkage, a carrier comprising a carriage, spindles independently mounting each of said spools on said carriage, means for selectively adjusting each of said spindles on said carriage for positioning the respective spool relative to the second portion of said linkage, means mounting said carrier for movement in a path intersecting the second portion of said linkage, and means for displacing said carrier for actuating said linkage into operative engagement with said blades.

2. The invention of claim 1 in which said linkage comprises a bell crank and said carriage comprises a slide reciprocable transversely to said second portion of said bell crank.

3. The invention of claim 1 in which said spindles are concentrically mounted on said carriage and said adjusting means comprise threaded means on each of said spindles cooperable with threaded portions on said carriage, and means for independently rotating each of said spindles.

4. The invention of claim 3 in which said carriage comprises spaced walls for supporting said spindles, each of said walls having threaded recesses for receiving said spindles, and resilient means on each of said walls adapted to normally clamp said spindles against rotation.

5. The invention of claim 1 including a plurality of said contact and contactor blades arranged in pairs, a respective linkage for operating each of said blade pairs and a separate striker means for each linkage and in which all of said striker means are mounted on said carriage.

References Cited in the file of this patent

UNITED STATES PATENTS

2,354,282 Shaw ----- July 25, 1944

FOREIGN PATENTS

555,449 France ----- Mar. 22, 1933