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MULTIPLE ROTARY SWITCH CONTROL

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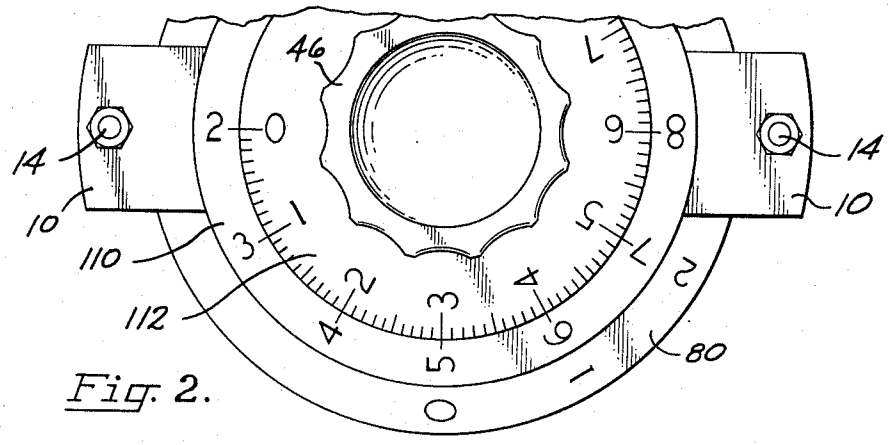


Fig. 2.

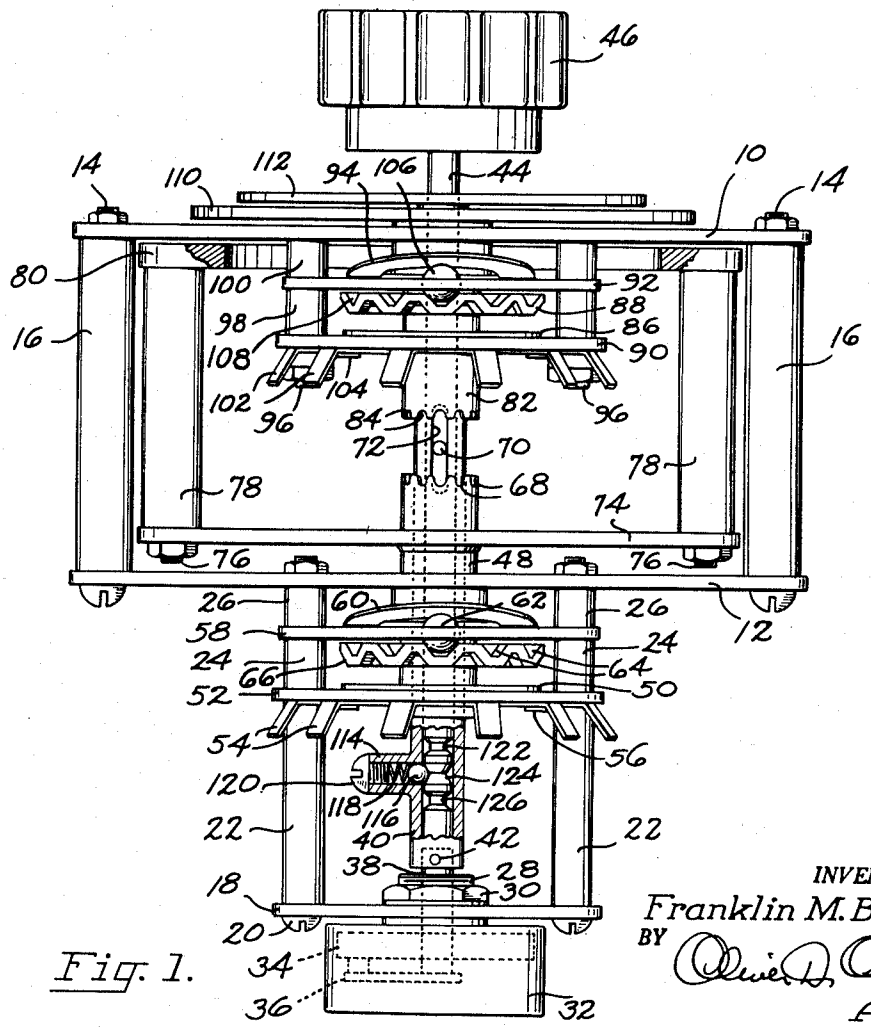


Fig. 1.

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MULTIPLE ROTARY SWITCH CONTROL

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4 Claims. (Cl. 200—18)

This invention pertains to electric switches, and relates particularly to novel control mechanism for operating a plurality of rotary switches and for indicating the relative positions of said switches.

In many types of electrical and electronic instruments and equipment it is frequently required that relatively large numbers of switching adjustments be made for selecting proper values of resistance, capacitance, or inductance. For example, in the operation of a rheostat or voltage divider it is necessary frequently to make a large number of selections of resistance values in the search for or setting of a desired value.

It is a principal object of the present invention to provide a control by which a relatively large number of switching operations may be performed from a single dialing station.

Another important object of the present invention is the provision of a control mechanism for operating a plurality of switches selectively in any desired order by means of a single control knob.

A further important object of the present invention is to provide a control mechanism for operating a plurality of switches, which mechanism is of compact and simplified construction for economical manufacture, which is readily adaptable for use with conventional type electric switches, and which is operable with speed and precision.

The foregoing and other objects and advantages of the present invention will appear from the following detailed description, taken in connection with the accompanying drawing, in which:

Figure 1 is a view in side elevation of a multiple switch control embodying the features of the present invention, parts thereof being broken away to disclose details of construction; and

Figure 2 is a fragmentary plan view of the front end of the control mechanism illustrated in Figure 1 and showing the read-out dial assembly.

The control assembly illustrated in the drawing is mounted upon a frame assembly which includes the main frame members **10** and **12** which are secured together in spaced relation by means of the connecting bolts **14** and spacer sleeves **16**. A third frame member **18** is supported by the second frame member **12** in spaced relation to the latter by means of the mounting bolts **20** and the plurality of pairs of spacer sleeves **22**, **24** and **26**. These pairs of sleeves also serve to position elements of a switch assembly in spaced relation intermediate the ends of the mounting bolts **20**, as described more fully hereinafter.

Mounted upon the third frame member **18**, by means of the threaded hub **28** and securing nut **30**, is a housing **32** for a multiple switch assembly. Since the control mechanism illustrated in the drawing is adapted particularly for use in the assembling of voltage dividers or rheostats, the housing is shown to support a conventional continuous wire potentiometer resistance **34**. Associated with said resistance is a rotary contact member **36** mounted upon a rotary shaft **38** which extends through a central bore in the hub **28**.

An elongated tubular shaft **40** is secured at one end to the potentiometer contact shaft, as by means of a pin **42**, and extends freely through openings in the first and second frame members **10**, **12**. Mounted for longitudinal movement within the tubular shaft is a central shaft **44**, the outer end of which carries a control knob **46**.

Mounted freely on the tubular shaft **40** for independent rotation is an elongated sleeve **48**, the rearward end of which engages the rotary section **50** of a wafer switch. The fixed section **52** of the wafer switch is mounted upon the mounting bolts **20** between the pairs **22**, **24** of spacer sleeves. This fixed section carries a plurality of spaced mounting lugs **54** which are adapted to be engaged by one or more electrical contacts **56** mounted on the rotary section **50**, in accordance with conventional practice. A detent support plate **58** is mounted upon the mounting bolts **20** between the pairs **24**, **26** of spacer sleeves, and this plate supports a resilient leaf spring **60** which functions to urge a ball **62** carried freely in an opening in the mounting plate, toward the circumferentially spaced pockets **64** formed in a detent disc **66** which is secured to and rotates with the sleeve **48**. The pockets in the detent disc are arranged in such manner that when the ball is seated in a given pocket the one or more electrical contacts **56** on the central rotary section of the wafer switch makes positive electrical contact with a selected one or more of the mounting lugs **54**.

The forward end of the sleeve is serrated to provide a plurality of circumferentially spaced notches **68** adapted to receive a pin **70** which projects from the central shaft **44** through an elongated slot **72** in the tubular shaft **40**. Thus, when the central shaft is pushed rearwardly into the tubular shaft, the pin **70** engages one of the notches **68** in the sleeve **48**, whereupon rotation of the control knob **46** causes rotation of the sleeve **48** and rotary section **50** of the wafer switch.

Indicator means is provided for indicating the relative positions of the electrical contact **56** on the rotary section of the wafer switch with respect to the mounting lugs **54**. In the embodiment illustrated in the drawing, such indicating means includes a transverse support **74** which is secured to the sleeve **48** and which carries at its outer ends the supporting bolts **76** and sleeves **78**. Mounted on the forward ends of the bolts and sleeves is an annular dial **80** which may be graduated and marked appropriately to indicate the relative positions of the rotary and fixed sections of the wafer switch. Said dial assembly is mounted within the confines of the main frame members **10**, **12** and the interconnecting sleeves **16**, as illustrated in Figure 1.

Also mounted upon the tubular shaft **40** for independent axial rotation is a second sleeve **82**, the rearward end of which is serrated to provide a plurality of circumferentially spaced notches **84** adapted to receive the projecting pin **70**. An intermediate section of the sleeve engages the rotary section **86** of a second wafer switch and the detent disc **88** associated therewith. The fixed section **90** of the wafer switch and the support **92** for detent spring **94** are supported from the first main frame member **10** by means of the mounting bolts **96** and the pairs of spacer sleeves **98**, **100**. The fixed section of the wafer switch supports a plurality of circumferentially spaced mounting lugs **102** arranged for engagement by one or more electrical contacts **104** carried by the rotary section **86**, as in the wafer switch assembly previously described. Positive interengagement of said contacts and mounting lugs is assured by means of the detent assembly which includes the ball **106** mounted freely in the spring support plate **92**, which ball is urged resiliently by the spring **94** towards the pockets **108** formed in the detent disc **88**.

The forward end of the sleeve **82** projects through the

first main frame member **10** and is secured at its outer end to a flat circular dial member **110** which may be graduated and marked in appropriate manner to indicate the relative positions of the rotary section **86** and fixed section **90** of the wafer switch.

The tubular sleeve **40** projects forwardly through an opening in the dial member **110** and supports a third dial member **112** for rotation therewith. The third dial member overlies the second dial, and is smaller in diameter than said second dial. The third dial member is associated with the potentiometer unit, and since the latter generally functions, in a voltage divider or rheostat, as an interpolating resistance, the third dial is graduated and marked accordingly, as illustrated in Figure 2.

With the pin **70** engaged in one of the notches **68** formed in the sleeve **48**, rotation of the control knob **46** causes simultaneous rotation of the rotary section **50** of the first wafer switch. With the pin engaged in one of the notches **84** of the second sleeve **82**, rotation of the control knob causes simultaneous rotation of the rotary section **86** of the second wafer switch. When the pin is positioned out of engagement with the notches in the sleeves, rotation of a control knob causes simultaneous rotation only of the contact arm **36** of the potentiometer unit. Means preferably is provided for securing the pin **70** releasably in said three positions of adjustment. In the embodiment illustrated in the drawing, such means is provided by a hollow stud **114** projecting laterally from the tubular shaft **40**. An opening in the tubular shaft registers with the hollow stud, and a ball **116** is mounted in said opening and urged resiliently toward the central shaft **44** by means of a coil spring **118** interposed between the ball and a cap screw **120** secured to the stud. Three longitudinally spaced annular grooves **122**, **124** and **126** are formed in the central shaft **44** for selective reception of the ball **116**. Thus, when the ball is seated in the forwardmost annular groove **122**, the pin **70** will be retained within one of the notches **68** of the first sleeve **48**. When the ball is retained in the intermediate annular groove **124**, as illustrated, the pin will be positioned out of engagement with the notches of either of the sleeves. When the ball is retained in the rearwardmost annular groove **126**, the pin will be secured in engagement with a notch **84** in the second sleeve **82**.

As stated hereinbefore, the multiple switch control mechanism of the present invention is particularly adapted for use in the assembling of resistance elements into voltage dividers or rheostats. Such assemblies are made by mounting a plurality of fixed resistance elements between adjacent mounting lugs on each of the fixed sections of the wafer switches, to form a pair of series connected resistance chains. One or both ends of the potentiometer resistance then may be connected to selected ones of the fixed resistance elements mounted on the fixed section **52** of the wafer switch, by connection to the one or more electrical contacts **56** carried by the rotary section **50**. Similarly, one or both ends of the series chains of resistances mounted upon the fixed section **52** of the first wafer switch may be connected selectively to one or more of the fixed resistances mounted upon the fixed section **90** of the second wafer switch, by connection to the one or more electrical contacts **104** carried by the rotary section **86**. One or both ends of the resistance chain supported upon the fixed section **90** of the second wafer switch may be led outwardly through the space between the ring shaped dial member **80** and the second dial member **110**, for connection to an external circuit.

From the foregoing it is believed to be apparent that the present invention provides a mechanical control by which the assembling and operation of multiple switches is accomplished with speed, facility and precision. The mechanical assembly is compact in design and thus accommodates installation in electric and electronic instruments with maximum facility. Selective operation of a plurality of multiple switches is achieved by operation of a single control knob, without longitudinal displacement of the indicating dials. This latter arrangement affords maximum precision of dial reading.

It will be apparent to those skilled in the art that various details of construction described hereinbefore may be changed without departing from the scope and spirit of this invention. For example, it will be apparent that the potentiometer unit may be replaced by one of the wafer switch assemblies described and illustrated, and that other forms of switches may be utilized in the assembly with equal facility. These and other modifications may be made as desired, and therefore it is to be understood that the foregoing description is primarily illustrative of the invention and is not to be considered as limiting the scope thereof.

Having now described my invention and the manner in which the same may be used, what I claim as new and desire to secure by Letters Patent is:

1. A control for a plurality of rotary switch members, comprising a frame, a shaft mounted on the frame for axial rotation and for longitudinal displacement, a pair of rotary switch members mounted on the frame coaxial with and independently of the shaft and spaced apart with respect to the axis of the shaft, engagement means secured to the shaft and movable with the latter for selective engagement with each of the pair of rotary switch members one at a time for rotating the engaged rotary member simultaneously with the shaft, indicator dial means concentric with the shaft and associated with each rotary switch member, and connector means concentric with the shaft and interconnecting each indicator dial means and associated rotary switch member.

2. A control for a plurality of rotary switch members, comprising a frame, a shaft mounted on the frame for axial rotation and for longitudinal displacement, a pair of rotary switch members mounted on the frame coaxial with and independently of the shaft and spaced apart with respect to the axis of the shaft, engagement means secured to the shaft and movable with the latter for selective engagement with each of the pair of rotary switch members one at a time for rotating the engaged rotary member simultaneously with the shaft, indicator dial means associated with each rotary switch member, and connector means concentric with the shaft and interconnecting each indicator dial means and associated rotary switch member, a third rotary switch member mounted on the frame coaxial with the shaft, indicator dial means associated with the third rotary switch member and secured to the shaft for rotation therewith, and coupling means interconnecting the shaft and the third rotary switch member for rotating the latter simultaneously with the shaft while permitting longitudinal displacement of the shaft.

3. A control for a plurality of rotary switch members, comprising a frame, a hollow shaft mounted on the frame for axial rotation, a central shaft mounted slidably within the hollow shaft for axial rotation with and longitudinal displacement with respect to the latter, a pair of rotary switch members mounted on the frame coaxial with and independently of the hollow shaft and spaced apart with respect to the axis of the hollow shaft, engagement means secured to the central shaft and movable with the latter for selective engagement with each of the pair of rotary switch members one at a time for rotating the engaged rotary member simultaneously with the central shaft, indicator dial means concentric with the hollow shaft and associated with each rotary switch member, and connector means concentric with the hollow shaft and interconnecting each indicator dial means and associated rotary switch member.

4. A control for a plurality of rotary switch members, comprising a frame, a hollow shaft mounted on the frame for axial rotation, a central shaft mounted slid-

ably within the hollow shaft for axial rotation with and longitudinal displacement with respect to the latter, a pair of rotary switch members mounted on the frame coaxial with and independently of the hollow shaft and spaced apart with respect to the axis of the hollow shaft, engagement means secured to the central shaft and movable with the latter for selective engagement with each of the pair of rotary switch members one at a time for rotating the engaged rotary member simultaneously with the central shaft, indicator dial means associated with each rotary switch member, connector means concentric with the hollow shaft and interconnecting each indicator dial means and associated rotary switch member, a third rotary switch member mounted on the frame coaxial with the hollow shaft, indicator means associated with the third rotary switch member and secured to the shaft for rotation therewith, and coupling means interconnecting the hollow shaft and the third rotary

switch member for rotating the latter with the central shaft while permitting longitudinal displacement of the shaft.

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