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ELECTRICAL PLURAL-SWITCH MECHANISM

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Fig. 1

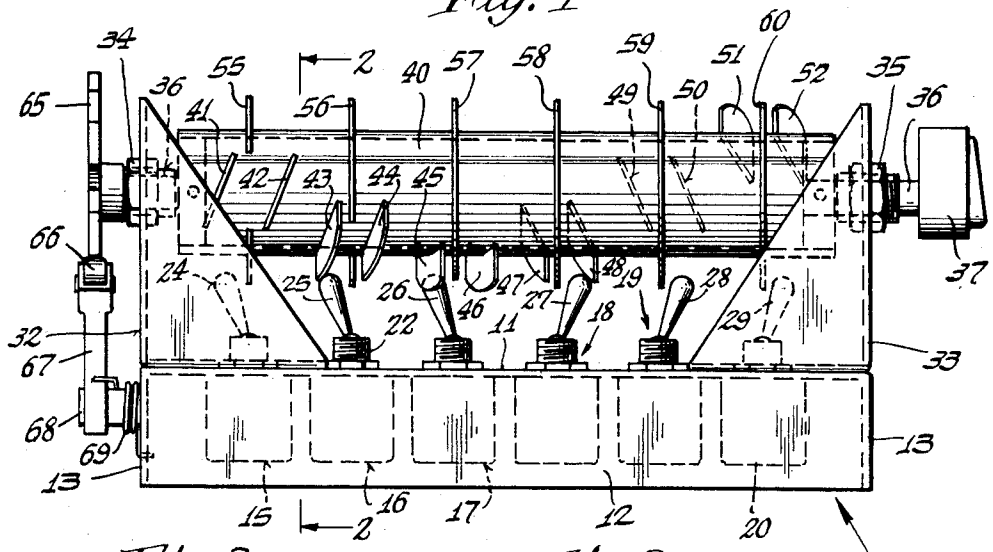


Fig. 3

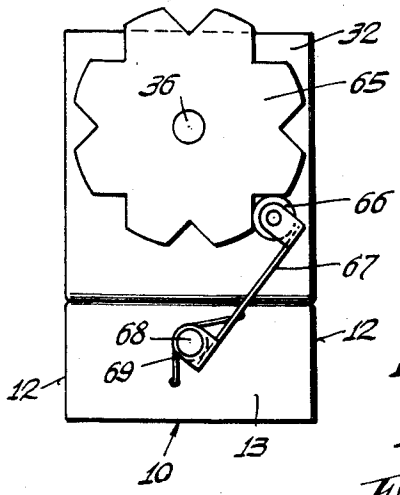


Fig. 2

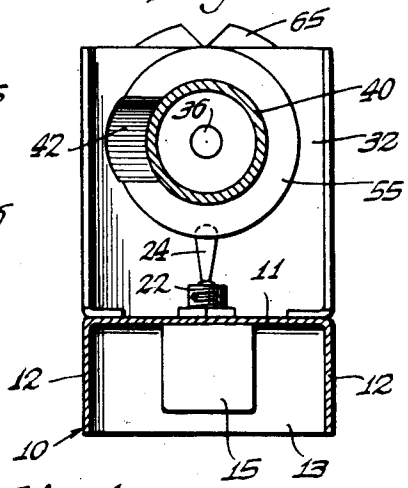
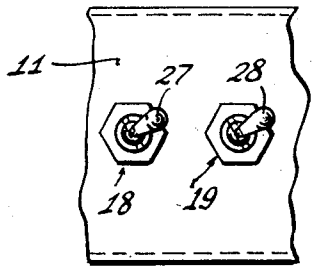


Fig. 4



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ELECTRICAL PLURAL-SWITCH MECHANISM

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5 Claims. (Cl. 200—18)

This invention relates to electric switches, and more particularly to switch mechanisms employing a plurality of switching devices intended to be variously actuated from a single operating member.

Often, in connection with electrical or electronic equipment, it is desired that a number of circuits be controlled in various manners, as for example simultaneously, or one after another, either for the purpose of closing said circuits or opening the same. Where simple selector switching is needed, the multi-position tap switch has found wide acceptance, and in the case of simultaneous control of a plurality of separate circuits the provision of multi-deck tap or selector switches has proven satisfactory.

However, it is at times necessary to effect such switching by a quick make-and-break contact means, and in this circumstance the simple tap or selector switch mechanisms, either single deck or multiple deck, are not suitable.

An object of the present invention is to provide a novel and improved electric switching mechanism by which a plurality of snap action switches may be easily and quickly actuated, to control individual or separate circuits with a snap action make or break.

Another object of the invention is to provide an improved electric switching mechanism as above characterized, wherein the snap-action switches may be variously operated, either sequentially, simultaneously or in a predetermined irregular or regular order or sequence, in response to operation of a single movable member or handle.

A still further object of the invention is to provide an improved snap action switch mechanism of the above type, wherein there is at all times positively prevented inadvertent or unintended actuation of the individual snap-action switches.

A feature of the invention resides in the provision of an improved sequential or selecting type snap-acting switch mechanism, wherein existing snap or toggle switch units as currently available on the market, may be advantageously utilized.

A still further object of the invention is to provide an improved selector or seqeuntial switch mechanism characterized by a plurality of snap-acting switch units, wherein a single master operator or handle having a plurality of switching positions, is normally yieldably held in any of said positions against inadvertent dislodgment therefrom.

A further feature of the invention resides in the provision of an improved multi-circuit switching mechanism characterized by snap-action in closing and opening the circuits, wherein any desired combination or sequence of switch operations may be easily provided.

Still another object of the invention is to provide an improved switch mechanism having all of the above advantages and features, which is nevertheless simple and economical to fabricate, easy to operate and reliable

throughout an extended period of use, thereby minimizing service requirements.

Other features and advantages will hereinafter appear.

In the drawings accompanying this specification, similar characters of reference indicate corresponding parts wherever possible in the several views, in which:

Figure 1 is a side elevational view of an improved switch mechanism made in accordance with the invention.

Fig. 2 is a transverse sectional view taken on line 2—2 of Fig. 1.

Fig. 3 is a rear end elevational view of the switch of Figs. 1 and 2.

Fig. 4 is a fragmentary top view of the base member and several switch units.

Referring to Fig. 1, the switching mechanism shown therein comprises a base **10** of elongate, generally rectangular configuration. Such base, for example, may be constituted in the manner of a metal chassis, as is commonly provided for radio and other electronic equipment. The base **10** may have a top portion or plate **11**, depending elongate side portions **12**, and depending end portions **13** by which it constitutes in effect a shallow, inverted, open box.

By this invention there is provided on the base **10** and rigidly secured thereto a plurality of individual snap switches **15**, **16**, **17**, **18**, **19** and **20**, shown as being of the familiar toggle type having mounting barrels **22** and also having respectively actuating levers **24**, **25**, **26**, **27**, **28** and **29**. As clearly shown in Fig. 2, the switches **15—20** may be readily mounted on the top plate **11** of the base **10** by the usual mounting means provided, comprising the threaded barrels **22** and clamping nuts carried thereby.

The switches **15—20** are preferably secured in a row on the base **10**, being substantially in alignment. Also, for the purpose of smooth action, the axes of the fulcrums of the levers **24—29** are preferably, although not necessarily, disposed diagonally with respect to the longitudinal sides **12** of the base **10**, whereby the travel or path of movement of the levers is not exactly longitudinal of the base but in a direction making a small or acute angle, with respect to the longitudinal axis of the base.

It will be readily understood that the switches **15—20** may be individually connected to separate circuits all independent of each other, where this may be desired or necessary, or they may have common connections where a simpler type of selecting operation is involved. Also, the switches **15—20** may be of various types, as for example, single pole single throw, single pole double throw, double pole single throw, double pole double throw, three-way, etc. Additionally, the switches **15—20** may be biased to "on" positions, biased to "off" positions, etc., although in the embodiment of the invention illustrated herein the switches are shown as being two-position switches adapted to normally remain in either position.

Secured to the opposite end portions of the base **10** are uprights **32** and **33**, provided respectively with bearings **34**, **35** in which shafts **36** bear. One shaft **36** may carry a handle or actuating knob **37**, by which the shaft **36** may be turned.

Between the uprights **32** and **33**, or more properly the bearings **34** and **35** thereof, the shafts **36** carry a rotary operator member **40** in the form of a drum or cylinder, said operator being provided with a plurality of pairs of cams **41—42**, **43—44**, **45—46**, **47—48**, **49—50**, and **51—52**. The pairs of cams thus provided are adapted to engage and actuate respectively the switch levers **24—29** in response to turning movements imparted to the drum or operator **40**, and reverse movement of the drum **40** will effect reverse actuation of the switch levers. As shown, the pairs of cams **41—42**, **43—44**, etc., are

located in different sequential positions circumferentially about the drum **40**, thereby to cause a sequential actuation of the switch lever **24—29**. It should be understood, however, that this particular arrangement is not limiting, since some of the pairs of cams may be located in alignment with each other axially of the drum **40**, or in various other combinations or positions, to effect a desired sequential or simultaneous actuation of the switch levers.

Considering the cams **41**, **42** and the switch lever **24** it will be seen that counterclockwise movement of the drum **40** as viewed from the left end thereof in Fig. 1, will enable the cam **41** to shift the lever **24** from left to right. After this has occurred, opposite turning movement of the drum **40** will enable the cam **42** to shift the lever **24** from right to left. A similar action occurs with respect to the cams **43**, **44** and lever **25**, the cams **45**, **46** and the lever **26**, etc.

Also, in accordance with this invention, means are provided on the drum **40**, extending into the path of movement of the switch levers **24—29** when the cams are out of engagement with said levers, to block the levers and prevent unintentional actuation thereof. This means comprises a plurality of circular members **55**, **56**, **57**, **58**, **59** and **60**, one for each of the switch levers, said members preferably extending through an arc of more than 270 degrees around the circumference of the drum **40**, as shown in Fig. 2. The members **55—60** are secured to the drum **40** in positions as determined by the associated pair of cams, and when a switch lever is on one side of the member, it may not be actuated to operate the switch, since the member would block the lever and prevent such actuation. Thus, only actuation of the switch levers may take place where the pairs of cams are located, and of course at these places the members **55—60** are cut away to provide the necessary clearance.

Also, in accordance with this invention, I provide a detent means in conjunction with the rotary operator **40**, to position the latter so that it corresponds with various definite open or closed positions of the switches **15—20**. In accomplishing this I provide on the other shaft **36** a star wheel **65** engaged by a roller **66** of a detent arm **67**, the latter being pivotally carried by a stud **68** secured to an end plate **13** of the base **10**. The detent arm **67** is biased by means of a coil spring **69**, so as to maintain the roler **66** in engagement with the star wheel **65** at all times. The engagement of the roller **66** with the notches of the star wheel **65** provide an effective and smooth detent action, by which the user of the switch will be apprised of the various possible positions of the knob **37** for which the switches **15—20** are in their "rest" positions, either closed or open.

It will be readily understood from the foregoing that I have provided a novel and improved, greatly simplified, multiple switch device by which a plurality of circuits may be effectively controlled with a snap action. The circuits may be either closed or opened sequentially, or simultaneously, or in various combinations as required by the apparatus to which the mechanism is attached. Moreover, the present improved switch utilizes snap switch units of the toggle type which are readily procurable on the market and which may be easily and quickly replaced if they become defective at a later time. The structure of the present switching mechanism is seen to be extremely simple and economical to manufacture, and reliable in operation throughout an extended period of use.

By virtue of the axes of the switch lever fulcrums being disposed diagonally with respect to the base **10**, a very smooth camming action is obtained, further enhancing the reliability of the switch mechanism.

Variations and modifications may be made within the scope of the claims, and portions of the improvements may be used without others.

We claim:

1. A multi-circuit electric switch mechanism comprising a plurality of snap switches each having an actuating lever, said levers being disposed in a row in substantially aligned relation to each other; a rotary operator disposed adjacent and extending along said row of levers, said operator having an axis of rotation extending transversely of the fulcrum axes of said levers; and means including opposed pairs of cams on said operator adapted to engage said levers, for reversely actuating the latter in response to reverse turning movements of the operator, said levers extending between the cams of said pairs and said cams being spaced apart a distance substantially greater than the thickness of said levers, thereby to provide clearance for enabling the levers to have a snap action, the fulcrum axes of the levers making an angle of less than 90 degrees with the axis of rotation of the operator.

2. A multi-circuit electric switch mechanism comprising a plurality of snap switches each having an actuating lever, said levers being disposed in a row in substantially aligned relation to each other; a rotary operator disposed adjacent and extending along said row of levers, said operator having an axis of rotation extending transversely of the fulcrum axes of said levers; means including opposed pairs of cams on said operator adapted to engage said levers, for reversely actuating the latter in response to reverse turning movements of the operator, said levers extending between the cams of said pairs and said cams being spaced apart a distance substantially greater than the thickness of said levers, thereby to provide clearance for enabling the levers to have a snap action; an elongate base mounting the switches in a longitudinal row thereon; and means including uprights on the ends of said base and bearings carried by said uprights, mounting the rotary operator for turning movement above the switches with its axis extending longitudinally of the base, the fulcrum axes of the switch levers extending diagonally with respect to the base.

3. A multi-circuit electric switch mechanism comprising a plurality of snap switches each having a snap-acting contact member and an actuating snap lever constituted as a member separate from the said contact member, said levers being disposed in substantially aligned relation to each other; a rotary operator disposed adjacent and extending along said levers, said operator having an axis of rotation extending transversely of the fulcrum axes of the said levers; means including opposed pairs of cams on said operator, adapted to engage said levers for reversely actuating the latter in response to reverse truning movements of the operator; and means on said rotary operator, extending into the path of movement of said levers when the cams are out of engagement therewith, thereby to effect a blocking of the levers and prevent unintentional actuation thereof, said levers extending between the cams of said pairs and said cams being spaced apart a distance substantially greater than the thickness of said levers, thereby to provide clearance for enabling the levers to have a snap action, said rotary operator comprising a drum, said blocking means comprising a circular, discontinuous member carried by the drum and extending around the latter, and the ends of said circular member being disposed adjacent the said cams.

4. A multi-circuit electric switch mechanism comprising a plurality of switches, each having an actuating lever, said levers being disposed in substantially aligned relation to each other; a rotary operator disposed adjacent and extending along said levers, said operator having an axis of rotation extending transversely of the fulcrum axes of said levers; means including cams on said operator, adapted to engage said levers for reversely actuating the latter in response to reverse turning movements of the operator; means on said rotary operator, extending into

the path of movement of said levers when the cams are out of engagement therewith, thereby to effect a blocking of the levers and prevent unintentional actuation thereof, said rotary operator comprising a drum, and said blocking means comprising a circular discontinuous member carried by the drum and extending around the latter, the ends of said circular member being disposed adjacent the said cams, and the said circular member being in the form of a flat washer having a radial cut through it.

5. A multi-circuit electric switch mechanism comprising a plurality of snap switches each having an actuating lever, said levers being disposed in substantially aligned relation to each other; a rotary operator disposed adjacent and extending along said levers, said operator having an axis or rotation extending transversely of the fulcrum axes of said levers; means including cams on said operator, adapted to engage said levers for reversely actuating the latter in response to reverse turning movements of the operator; means on said rotary operator, extending into the path of movement of said levers when the cams are out of engagement therewith, thereby to effect a blocking of the levers and prevent unintentional actuation thereof,

said rotary operator comprising a drum, said blocking means comprising a circular discontinuous member carried by the drum and extending around the latter, and said member being in the form of a flat washer having a radial cut through it, said cams comprising a pair of flat strips disposed in spaced parallel relation and extending diagonally with respect to the axis of the drum.

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