

Nov. 25, 1941.

K. L. MAIER

2,264,045

MULTIPLE SWITCH

Filed Aug. 25, 1938

3 Sheets-Sheet 1

FIG. 1.

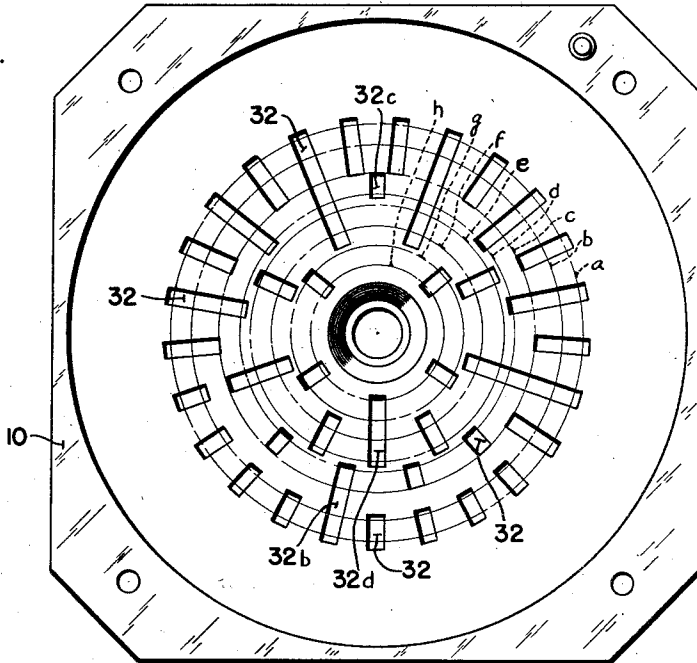


FIG. 2.

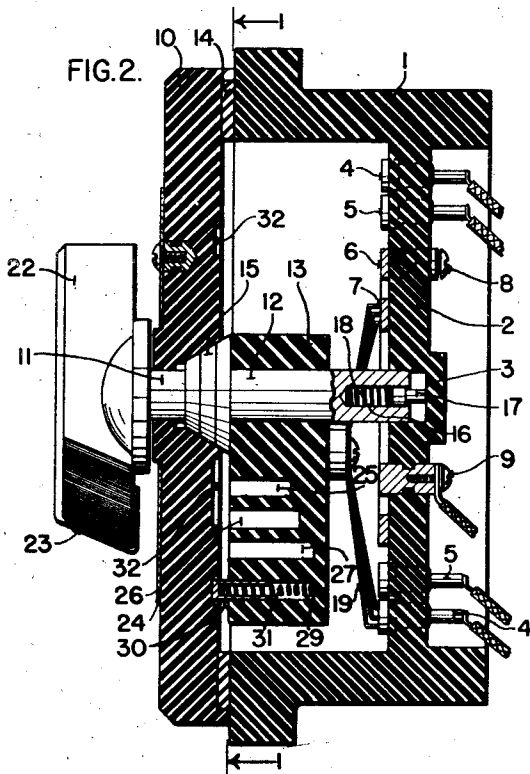
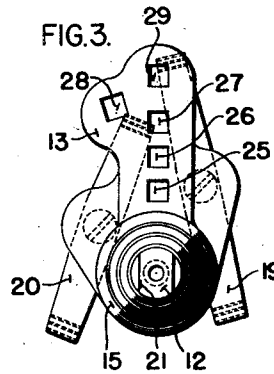


FIG. 3.



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FIG. 4.

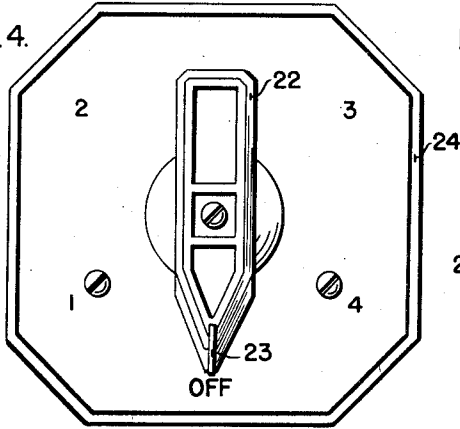


FIG. 5.

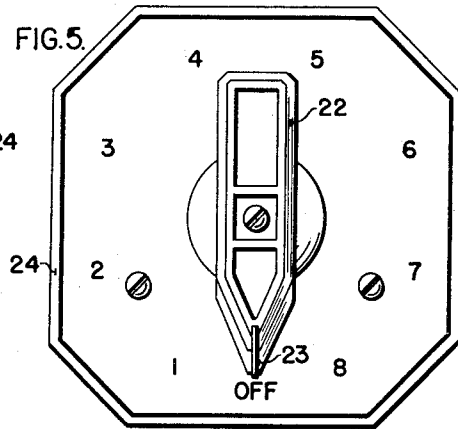


FIG. 6.

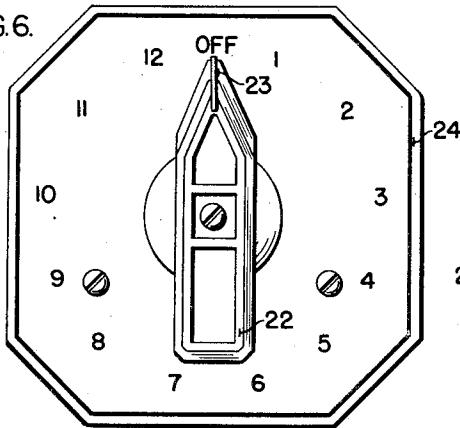


FIG. 7.

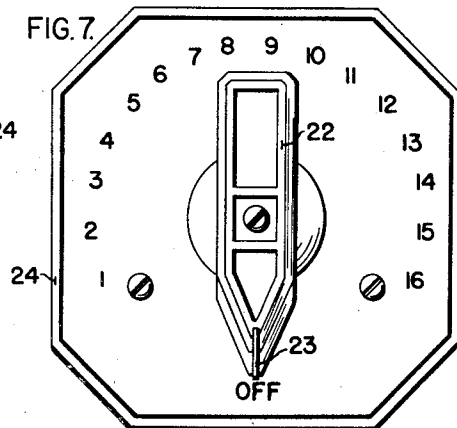
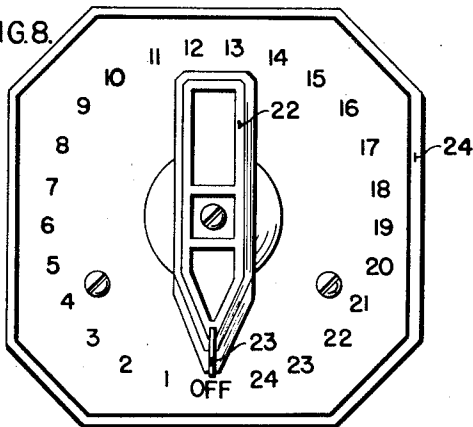


FIG. 8.



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FIG. 9.

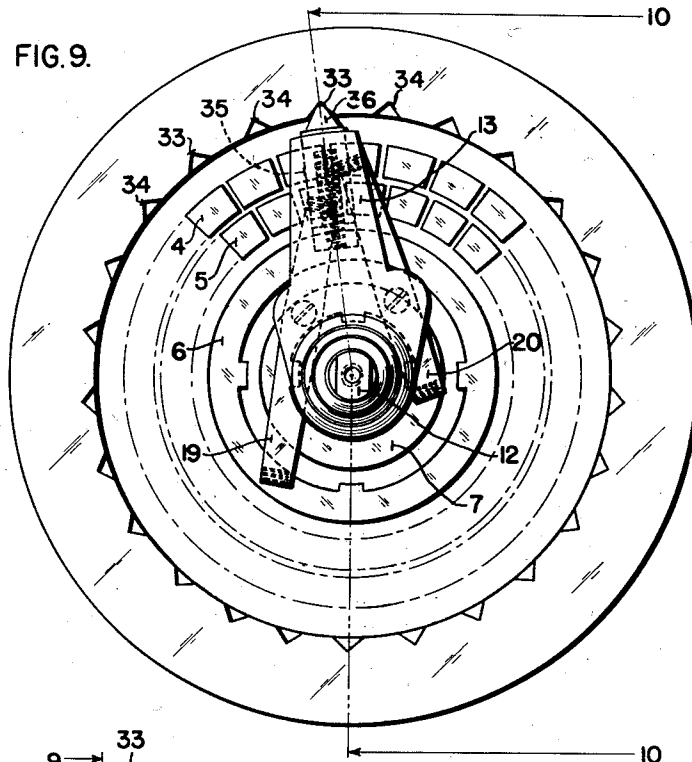


FIG. 10.

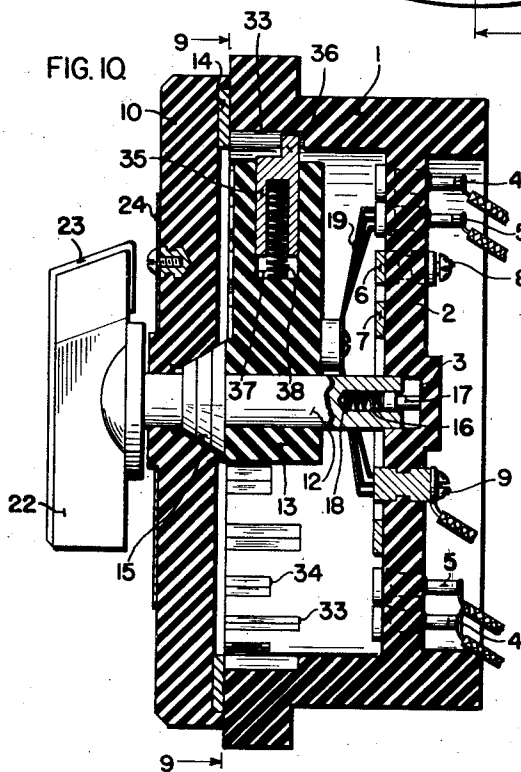
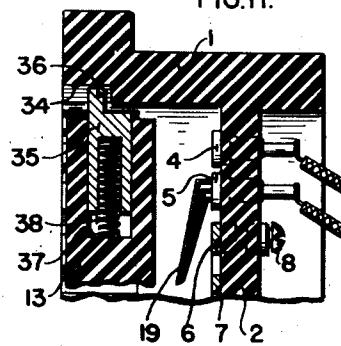


FIG. 11.



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2,264,045

MULTIPLE SWITCH

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a corporation of Pennsylvania

Application August 25, 1938, Serial No. 226,740

14 Claims. (Cl. 200—11)

The present invention relates to a multiple switch in which contacts can be made and securely held in position for any one of a number of circuits.

In certain uses, switches are designed to close a number of circuits, and one manufacturer may make switches which are designed to close, for example, four, eight, or twelve circuits. Normally this would mean that separate parts would have to be kept in stock for each of these types of switches, which would necessitate keeping a large stock on hand, as well as the expense of a large number of dies for making the different parts. It is an object of my invention to overcome this disadvantage by designing a switch whose parts may be assembled to be used for different numbers of circuits by merely changing the relation of one part with respect to the others, and thus cut down on the cost of manufacture, as well as the variety of stock that has to be kept on hand.

It is a further object of my invention to make a switch of this type which is simple to manufacture, easy to assemble, and reliable in use.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, its advantages and specific objects obtained with its use, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described a preferred embodiment of the invention.

In the drawings:

Fig. 1 is an inside view of the front plate of one form of my switch taken on line 1—1 of Fig. 2;

Fig. 2 is a sectional view of the switch;

Fig. 3 is a view of the brush carrier;

Figs. 4—8 are views of various indicia plates that may be with the switch;

Fig. 9 is a view of another form of the switch taken on line 9—9 of Fig. 10;

Fig. 10 is a sectional view of this form of the switch taken on line 10—10 of Fig. 9; and

Fig. 11 is a fragmentary sectional view similar to Fig. 10 with certain of the parts in a different position.

Referring first to Fig. 2, there is shown a body 1 of the switch which may have any suitable outline and may be made of any suitable insulating material, such as Bakelite. The casing has a partition 2 therein between its ends, which partition is formed with a cup 3 at its center.

Mounted in and extending through the partition are two circular rows of contacts 4 and 5, which are shown in plan view in Fig. 4, and two contact rings 6 and 7. Each of the contacts 4 and 5, and each of the rings 6 and 7, are provided with lead-wires that extend to the various points from and to which a circuit is to be closed. As an example, each of the pairs of contacts, consisting of one contact in each row 4 and 5, may be connected to the terminals of a thermocouple, and each of the rings 6 and 7 may be connected to the terminals of a galvanometer which deflects in response to the thermocouple current. By moving brushes from one pair of contacts to another, the galvanometer can be connected to first one thermocouple and then another, the rings being provided with terminals 8 and 9 for the purpose of connecting them to the desired instrument.

Fastened to the front of the casing is a cover plate 10 that has a central opening 11 through which extends the shaft 12 of a brush carrier 13, the latter also being made of insulating material. The cover is attached to the casing in any suitable manner, as by screws, and a washer 14 of rubber, or other material, is inserted between the cover and the casing in order to prevent dust or undesirable fumes from getting into the chamber in the casing which holds the brush carrier. The left face of the brush carrier 13 has formed on it a projection in the shape of a cone 15 which fits tightly against the correspondingly-shaped side of opening 11 in the cover, while the right end of the shaft 12 fits into the cup 3 in the partition 2. This right end of the shaft 12 has formed in it a hole 16 which receives a plunger 17 and a spring 18, the spring acting to push the plunger against the wall of the cup so that the conical part 15 of the brush carrier will bear tightly against the opening in the cover.

Attached to the back of the brush carrier 13 are two laminated brushes 19 and 20, the former of which will engage with one end the contacts 4 and with its other end the ring 7, while the latter will engage with one end the contacts 5 and with its other end the ring 6. In this manner, as the brush carrier is rotated, the brushes will engage first one and then the other of pairs of contacts 4 and 5 to electrically connect these contacts with rings 6 and 7. The front end of the shaft 12 is formed with flat surfaces 21 which receive corresponding flats on a handle 22 that is attached to the shaft in front of the cover and is used to turn the brush carrier in order to connect the different contacts with the rings.

The lower end of the handle is formed as a pointer 23 which, with suitable indicia on a plate 24 attached to the front of the cover 10, indicates which pair of contacts are connected with the rings.

The brush carrier 13 is provided with a series of holes 25, 26, 27, 28 and 29 in any one of which is interchangeably mounted a plunger 30 that is forced outwardly by a spring 31. The outer end of this plunger engages with any one of a number of notches 32 formed in the back of the cover plate 10. These notches are best shown in Fig. 1, and consist of radial indentation so arranged that as the brush carrier 13 is rotated by the handle 22, the plunger will enter the notches, as the brushes 19 and 20 have their ends exactly over a pair of contacts 4 and 5. By moving the plunger 30 to different radial positions along the brush carrier, as provided for by the holes therein, there will be different numbers of notches in its path as the brush carrier is rotated.

Referring to Fig. 1, it will be seen that when the plunger 30 is in the outer hole 29 in the brush carrier, it will be at such a radial distance from the center that it will fall between the lines *a* and *b*. In this case, as the handle 22 is turned, the brush carrier will have twenty-five positions. Using the notch 32*a* as an "off" position, there are twenty-four other positions symmetrically placed with respect thereto. The plate 24 used with this arrangement is shown in Fig. 8.

If the plunger 30 is in hole 28, it will fall between the lines *b* and *c* on Fig. 1 and there will be seventeen notches in its path. Using notch 32*b* as the "off" position, there will then be sixteen "on" positions symmetrically located in its line of travel. The opening 28 and notch 32*b* are both off-set with respect to the vertical so that the point 23 of handle 22 will be straight up and down in its "off" position. The plate 24 that will now be used is shown in Fig. 7.

When plunger 30 is in hole 27, the notch 32*c* will be used as the "off" position and will form one of thirteen notches between the lines *c* and *d*, thus giving an "off" and twelve "on" positions to the brush carrier, as shown by the plate 24 in Fig. 6. If the plunger 30 is in hole 26, it will fall between lines *e* and *f*, and there will be nine notches, while if the plunger 30 is in hole 25, it will fall between lines *g* and *h*, and there will be five notches in its path. In these last two positions, notch 32*d* is used for the "off" position, and the brush carrier has respectively eight and four "on" positions. The plates 24 that will be used for these two arrangements are shown in Figs. 5 and 4 respectively.

By merely changing the position of the plunger 30, the brush carrier may be moved to and positively stopped in any one of twenty-five, seventeen, thirteen, nine or five positions as it is rotated through one turn, and each time the plunger enters a notch 32, the brushes 19 and 20 will be lined up with a pair of the contacts 4 and 5. Thus, the only change that it is necessary to make in order to use my switch for any one of a given number of circuits is the change of the position of plunger 30 and the attachment of a properly marked plate 24 on the front of cover 10. Only the number of contacts 4 and 5 necessary for the circuits that the instrument is to be used for need have leads connected to them. For example, if plunger 30 is inserted in opening 26 and leads are fastened to only six pairs of contacts 4 and 5, then the switch can be used for

that number of circuits, and a suitable plate 24 would be designed for use therewith. In such a case, the handle 22 would have two more positions than there are circuits to be closed.

The various holes 25 to 29 are made different in depth as shown, the deepest hole being the furthest from the shaft 12. This is for the purpose of compressing spring 31 various amounts so that the same amount of force will be necessary to index the brush carrier 13 regardless of the number of circuits that the switch is being used for. The nearer the plunger 30 is to the shaft 12, the shorter its moment arm and therefore the more compressed or stronger the spring 31 has to be to give the same resistance.

It will be apparent that by forming the notches 32 in various other lengths and groupings that the switch can be designed for other combinations of circuits than those shown such, for example, as will now be described.

The embodiment of the invention disclosed in Figs. 9-11 is essentially the same as that in Figs. 1-3 except that it is designed to accommodate only two different numbers of circuits instead of four. In this form of the invention, a series of long notches 33 and short notches 34 are formed in the inner surface of casing 1 and extending from its edge. These notches alternate and are so spaced that there are thirteen of the long notches 33 and twelve of the short notches 34 equally spaced around the circumference, as is best shown in Fig. 9.

A plunger 35, having a tooth 36 projecting from its end is adapted to engage with the notches 33 and 34 as the brush carrier is rotated. To this end, the brush carrier is provided with a hole 37 that receives the plunger 35 and a spring 38 which is compressed between the bottom of the hole and a recess in the plunger, the latter serving to force the plunger toward the notches.

With the parts in the position shown in Fig. 10, the tooth 36 of plunger 35 is positioned so that it is away from the edge of the casing 1 far enough for the tooth 36 to miss the short notches 34 as the brush carrier 13 is rotated. Therefore, as there are thirteen long notches 33 which the finger 36 will enter, the brush carrier will have an "off" and twelve "on" positions. By turning the plunger 35 from the position of Fig. 10 to that of Fig. 11, the finger 36 will be moved nearer the edge of casing 1 and will be in a position in which it will engage all of notches 33 and 34. This will then give the brush carrier 13 twenty-five positions during a rotation, which means an "off" position and twenty-four "on" positions.

With the use of a switch designed in the above-described manner, the same parts are used to assemble the switch to render it adaptable to the selection of a variable number of circuits. This affords a definite saving where a manufacturer has to keep a large variety of parts in stock in order to supply multiple switches that are adapted to be used for different numbers of circuits. Other combinations of notches and positions of the plunger than those disclosed herein could obviously be used to adapt the switch for use with various groups of circuits as desired.

While in accordance with the provisions of the statutes, I have illustrated and described the best form of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit of my invention as set forth in the appended claims, and that certain features of my

invention may sometimes be used to advantage without a corresponding use of other features.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. The combination with a multiple switch of a casing comprising a body portion and a cover therefor, a series of notches in said casing, a series of pairs of contacts in said casing, a brush carrier mounted for rotation in said casing, brushes on said carrier adapted to engage with various pairs of contacts when the brush carrier is adjusted in a particular position relative to various of said notches, a movable plunger mounted in said brush carrier and adapted in one position to engage some of said notches and in another position to engage other of said notches, and means to rotate said brush carrier.

2. In a multiple switch, the combination with a casing having a partition therein, a cover for said casing adapted to form therewith a chamber, a brush carrier mounted for rotation in said chamber, a plurality of series of notches in said chamber, a resiliently and removably mounted plunger cooperating with said brush carrier and adapted to engage various of the notches upon rotation of the brush carrier, and means to rotate the brush carrier.

3. In a multiple switch, a casing having a chamber therein, a plurality of pairs of contacts in said chamber, a brush carrier having brushes adapted to engage said contacts mounted for rotation in said chamber, said brush carrier having a plurality of holes therein, a plunger adapted to be resiliently mounted in one of said holes, a plurality of series of notches in said chamber, one of said series being in the path of said plunger when it is in each hole as the brush carrier is rotated, and means to rotate said brush carrier.

4. In a multiple switch, a casing, a cover for said casing, a plurality of series of notches radially arranged on the inner face of said cover, a brush carrier mounted for rotation in said casing, said brush carrier having a series of holes therein, each hole being radially aligned with one of said series of notches, a plunger adapted to be resiliently mounted in any one of said holes whereby it can cooperate with any one of said series of notches depending upon the hole that it is in, and means to rotate said brush carrier.

5. In a multiple switch, a casing having a cover therefor to form a chamber therewith, the cover having a plurality of radially arranged notches of various lengths on its inner surface, a brush carrier mounted for rotation in said chamber, a plunger, means to mount said plunger on said brush carrier at various distances from its center whereby it may cooperate with different of said notches when placed at different points on the brush carrier.

6. In a multiple switch, the combination with a casing having a chamber therein, a series of pairs of contacts in said casing, a brush carrier mounted for rotation in said chamber and having brushes to cooperate with said pairs of contacts, means to hold said carrier in position with the brushes and various pairs of contacts in engagement, said means comprising a resiliently mounted plunger on said carrier and a plurality of series of notches in a wall of said chamber to be engaged thereby, and means to hold said plunger in cooperating relation with one of said series of notches at a time, each notch having a definite relation with a pair of contacts.

7. In a multiple switch, the combination with a

chamber, a plurality of pairs of contacts in one wall of said chamber, a brush carrier having brushes adapted to cooperate with selected pairs of contacts during the rotation thereof mounted for rotation in said chamber, means to determine which pairs of contacts said brushes will cooperate with comprising a plunger adapted to be mounted in said brush carrier at various radial distances from its center of rotation, and a series of radial notches of various lengths in said chamber in the path of said plunger, each notch being in a definite relation to a pair of contacts.

8. In a multiple switch, a casing having a cylindrical chamber therein, a series of long and a series of short notches around the inner wall of said chamber, a brush carrier mounted for rotation in said chamber, a plunger resiliently mounted in said brush carrier, and a projection on said plunger adapted in one position to cooperate with the long notches and in another position to cooperate with both said long and short notches.

9. In a multiple switch, a cylindrical chamber, a plurality of notches around the inner wall of said chamber, a brush carrier mounted for rotation in said chamber, a plunger having an offset projection resiliently and changeably mounted in said brush carrier and extending radially thereof, the projection cooperating with all of said notches upon rotation of said brush carrier when it is in one position and with some of said notches when it is in another position.

10. In a multiple switch, a pivoted contact arm, a series of contacts adapted to be engaged by said arm, structure adapted to form a support for said pivot arm and provided with a plurality of series of notches, a member carried by said contact arm and adapted to selectively engage one or another of said series of notches, and adjustable relatively to said arm to determine the particular series of notches engaged thereby.

11. In a switch adapted to complete a plurality of circuits, the combination with a member carrying a plurality of contacts, a part carrying brushes to cooperate with selected ones of said contacts, means tending to hold said part in a series of positions in which the brushes individually cooperate with the selected contacts and provisions permitting said part to be held in a different series of positions.

12. In a switch adapted to complete a plurality of circuits, a member provided with a plurality of pairs of contacts, a part rotatable relative thereto carrying circuit completing elements to cooperate with selected ones of said contacts, means to rotate said part, means tending to hold said part in various positions relative to said member with the circuit completing members cooperating with selected individual contacts in each position during a rotation of said part, and means adapting said part to be held in different series of various positions upon rotation thereof.

13. In a multiple switch, a supporting structure, a plurality of terminals on said structure, circuit closing members adapted to cooperate with selected ones of said terminals, a rotatable part journaled on said structure carrying said circuit closing members, a circular row of detents on said supporting structure, an element on said rotatable part adapted to successively engage with said detents and thereby stop said part in positions in which said circuit closing members cooperate with certain of said terminals, a second circular row of detents also on said supporting structure having a different number from said

first row, means to allow said element to selectively cooperate with said second row of detents whereby said part will be successively stopped in position for said circuit closing members to cooperate with various other of said terminals.

14. In a multiple switch, a supporting structure, a plurality of terminals on said structure, circuit closing members adapted to cooperate with selected ones of said terminals, a part movable relative to said supporting structure carrying said circuit closing members, a row of detent members fixed relative to said support, an element on said movable part adapted to successive-

ly engage with said detent members and thereby stop said part in positions in which said circuit closing members cooperate with certain of said terminals, a second row of detent members located in proximity to said first row but having a different number from said first row, means to allow said element to selectively cooperate with said second row of detent members whereby said part will be successively stopped in position for said circuit closing members to bridge various other of said terminals.

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