Oct. 18, 1949. E. S. GIFFIN 2,484,991

SWITCH MECHANISM

Filed Jan. 11, 1945 3 Sheets-Sheet 1

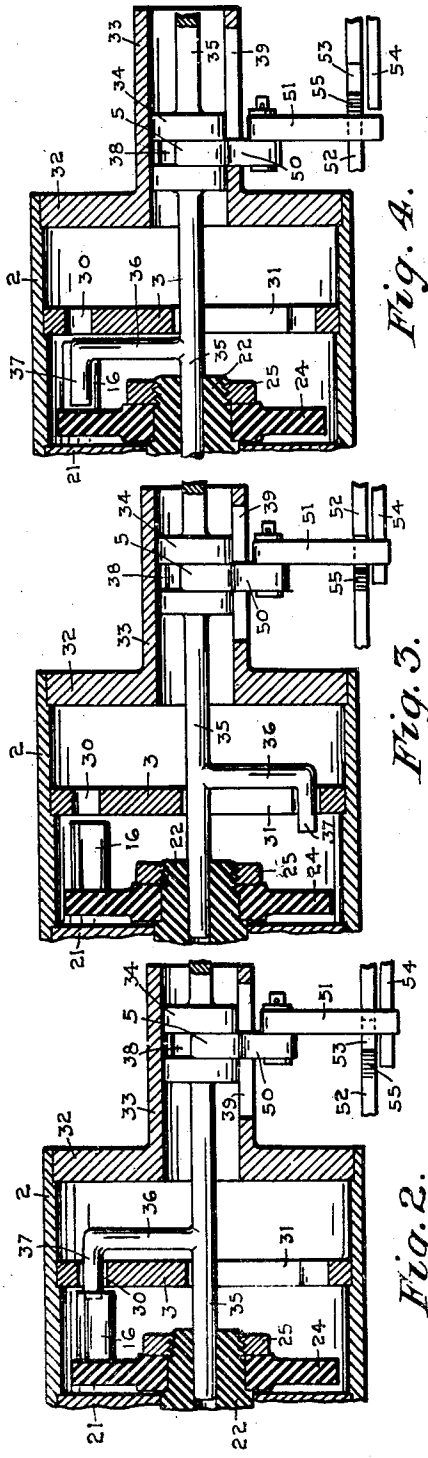


Fig. 4.

Fig. 3.

Fig. 2.

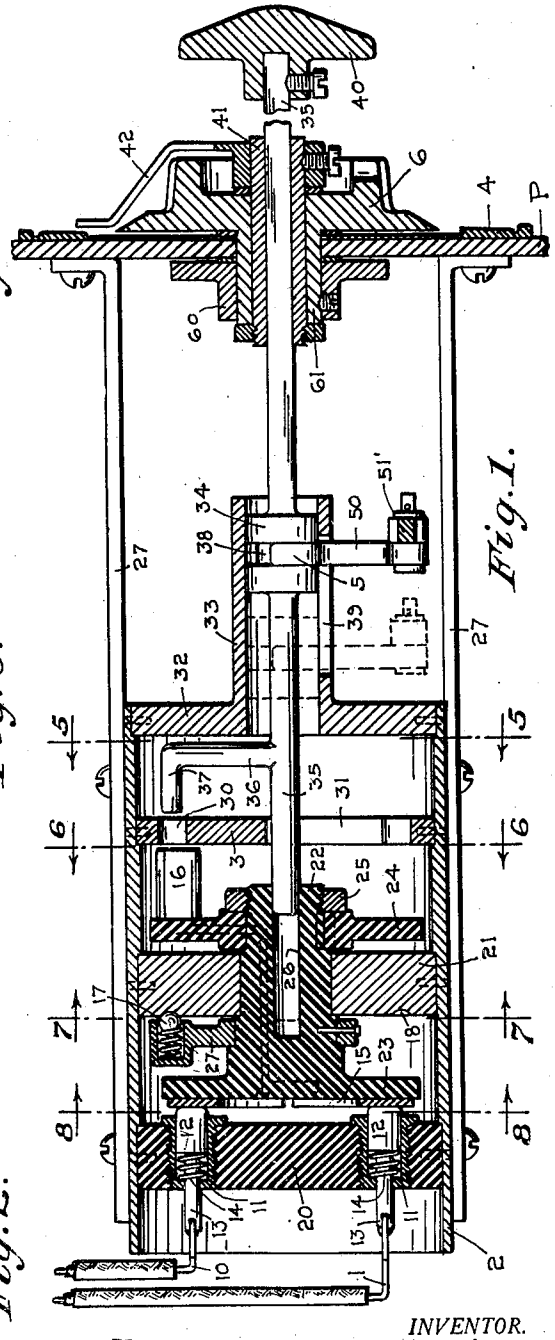


Fig. 1.

INVENTOR.
Edward S. Giffin
BY
Reynolds + Beach
ATTORNEYS.

Oct. 18, 1949. E. S. GIFFIN 2,484,991

SWITCH MECHANISM

Filed Jan. 11, 1945 3 Sheets-Sheet 2

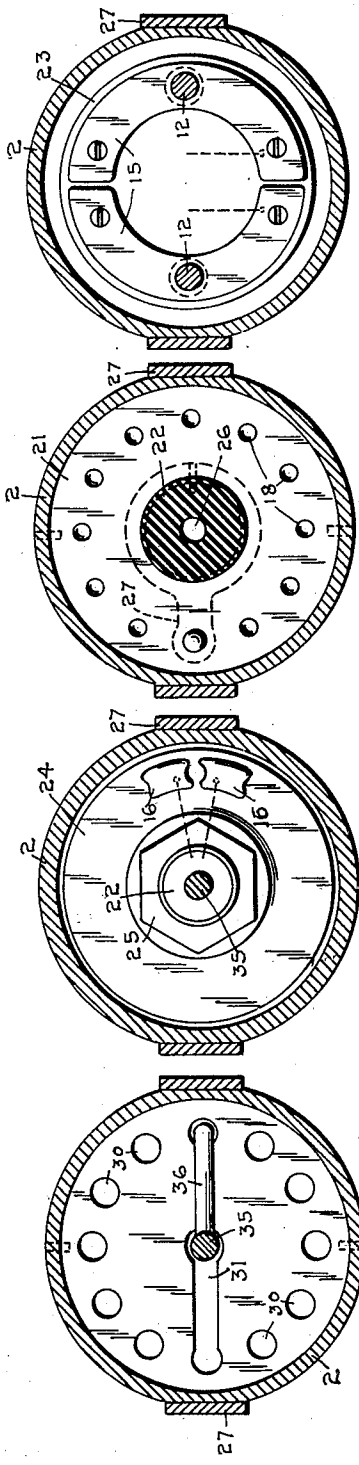


Fig. 8.

Fig. 7.

Fig. 6.

Fig. 5.

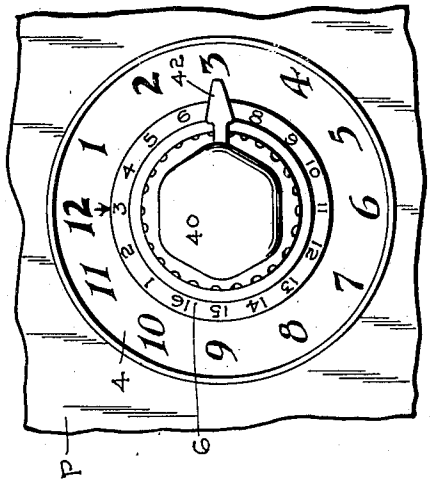


Fig. 9.

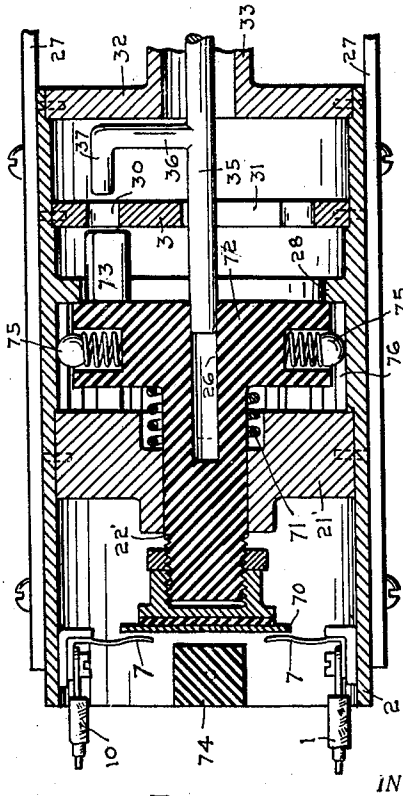


Fig 10.

INVENTOR.
Edward S. Giffin
BY
Reynolds + Beach
ATTORNEYS.

Oct. 18, 1949. E. S. GIFFIN 2,484,991

SWITCH MECHANISM

Filed Jan. 11, 1945 3 Sheets-Sheet 3

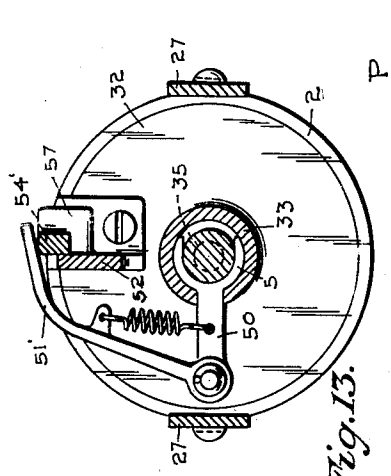


Fig. 13.

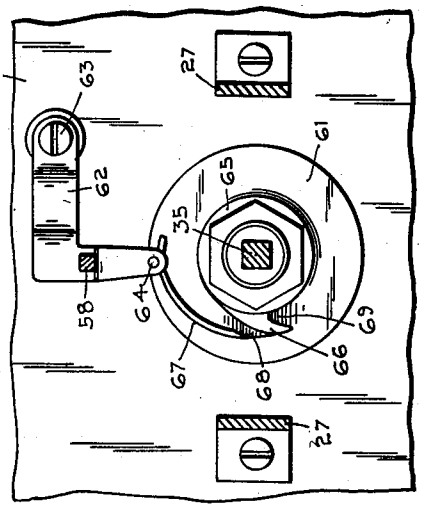


Fig. 14.

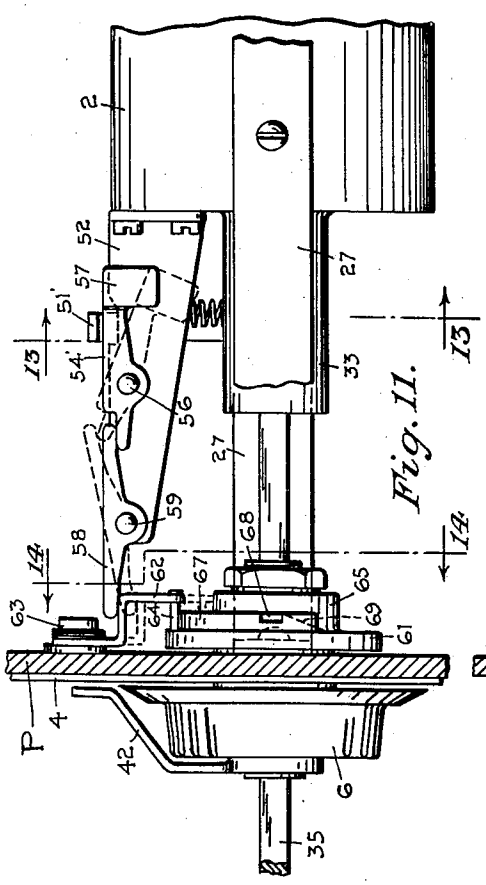


Fig. 11.

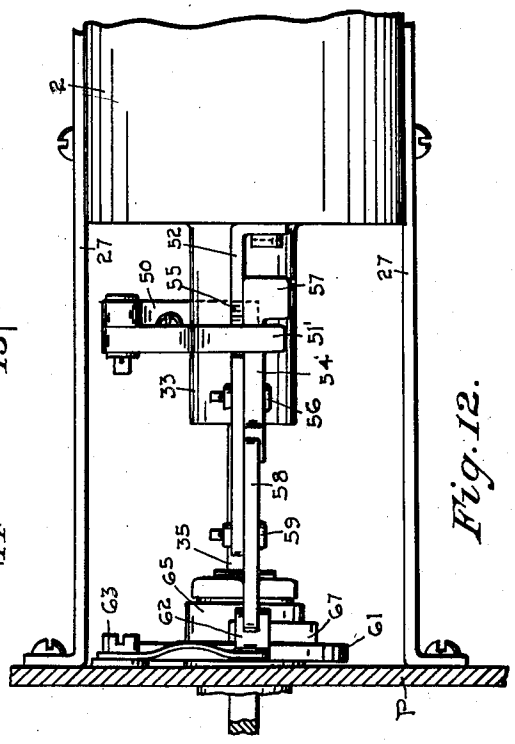


Fig. 12.

INVENTOR.
Edward S. Giffin
BY
Reynolds & Beach
ATTORNEYS.

Patented Oct. 18, 1949 2,484,991

UNITED STATES PATENT OFFICE

2,484,991

SWITCH MECHANISM

Edward Stanley Giffin, Auburn, Wash.

Application January 11, 1945, Serial No. 572,339

22 Claims. (Cl. 200—45)

1

My invention relates to controlling mechanism for electrical circuits, and more particularly to a switching device especially useful for automotive circuits, such as the engine ignition circuit of an automobile, airplane, or boat.

The purpose of my invention is to provide mechanism which will prevent unauthorized persons closing the electrical circuit controlled by my device, but which can be manipulated quickly by an authorized person to energize the controlled circuit. Moreover I prefer that my device be capable of operation without requiring the use of a key.

My device can be operated selectively so that when set in one position it can be operated by a temporarily authorized person knowing the particular condition for which it is set, but who does not know how to change the setting of the device. Thereafter one who does know the technique of altering the setting of the mechanism can reset it to a different condition so that the temporarily authorized person cannot energize the circuit thereafter unless shown the new setting.

While the resetting mechanism may be controlled in various ways, such as by a key operated lock, I prefer that it be operable by a combination type lock so that no key will be necessary. For normal operation of the device, however, it is not necessary to utilize the combination lock feature, although the device will be arranged so that it cannot be operated to close the controlled circuit by an unauthorized person.

It will be understood that the design of my mechanism may be altered in various respects, although the forms illustrated in the drawings are entirely practical.

Figure 1 is a longitudinal sectional view through my device, and Figures 2, 3 and 4 are similar views of a portion of the device showing the parts in different operative positions.

Figures 5, 6, 7 and 8 are transverse sectional views through my device, taken on lines 5—5, 6—6, 7—7 and 8—8, respectively, of Figure 1. Figure 9 is a front elevational view of the device.

Figure 10 is a longitudinal sectional view, corresponding to Figure 1, through a portion of a modified form of the device.

Figure 11 is a side elevational view of a portion of my device, with parts broken away, and Figure 12 is a plan view of the same portion of the device. Figure 13 is a transverse sectional view through the device taken along line 13—13 of Figure 11, and Figure 14 is a transverse sectional view taken along line 14—14 of the same figure.

2

My device consists of two major assemblies, the first being the switching and switch control mechanism, which includes a latch engageable in certain positions of a switch control member, and second, latch releasing mechanism to release the latch of such first mechanism, which is preferably of the combination lock type. The latch releasing mechanism may, however, be key operated or manipulated by other means to release the latch of the switch control mechanism without requiring the principal structure of the switch control mechanism to be altered.

One form of the switching and switch control mechanism is illustrated in Figures 1 to 9, inclusive. The purpose of my device is to control completion of a circuit between lead wires 1 and 10 of an electric circuit, whatever may be the purpose of such circuit. Perhaps the most useful application of my device, however, is in conjunction with an automobile ignition circuit incorporating wires 1 and 10.

A cylindrical casing 2 has secured within it two partitions 20 and 21, respectively, arranged in spaced relationship. The former partition may be of insulating material and have screwed into it metallic bushings 11 guiding contact plungers 12 for reciprocation axially of the casing 2. These bushings may be arranged along a diameter of the partition and spaced equally from the casing wall. The stems 13 of brushes or plungers 12 projecting beyond the left side of partition 20 may be connected to wires 1 and 10, respectively. A spring 14 interengaged between the head of each plunger and an inwardly projecting flange of each bushing 11 urges each plunger toward the right, as indicated in Figure 1.

The partition 21 may be of metal, apertured at its center to receive the central portion of a rotor 22 made of insulating material. The partition is preferably of a width to constitute a bearing for such rotor. The left end of this rotor carries a disk 23 on which are mounted two substantially semicircular arcuate metal strips 15. The adjacent ends of these strips are spaced apart less than the width of a plunger 12. A circle having a diameter equal to the distance between contact brushes 12 would lie between the inner and outer peripheries of such strips. Consequently in substantially all rotative positions of rotor 22 one brush 12 would contact one strip 15 and the other brush would contact the other strip, being pressed against such strips, respectively, by springs 14.

A disk 24 carrying at one location near its periphery two projecting contacts 16, constituting

an abutment element of circuit-closing means, is secured by suitable means, such as a nut 25, on the right end of rotor 22. These contacts 16 are connected to the arcuate strips 15 by wires extending through the rotor.

In the right end of cylindrical casing 2 is mounted a further partition disk or plate 3 which has a plurality of holes 30 through it arranged in a circle concentric with casing 2. These holes are all located approximately the same distance from the casing as the contacts 16. While any desired number and arrangement of such holes may be employed, I prefer that they be spaced apart equal angles, for example 30 degrees, as shown in Figure 5. The location of each hole 30 then corresponds to one of the numbers 1 to 12 on the index ring 4 carried by the mounting plate P for the device, as shown in Figure 9. At one location, for example at that corresponding to the numeral 9 on ring 4, a slot 31 extends from the circle of holes 30 radially inward slightly beyond the center of disk 3.

The end wall 32 closing the right end of cylindrical casing 2 has a tube 33 projecting outward from it in which a boss 34 of a control shaft 35 slidably fits. The inner end of this shaft projects through the central end of slot 31 in partition 3, and for better support may be slidably received in a bore 26 formed centrally in rotor 22. The opposite end of the shaft may project to the right beyond mounting plate P and carry a knob 40 by which the rod may be both reciprocated lengthwise and rotated. Tie bars 27 may be secured to opposite sides of casing 2 and to mounting plate P.

Shaft 35 has an arm 36 projecting radially from it which is disposed in the space within casing 2 between partition 3 and end wall 32 when the shaft is reciprocated to its position farthest to the right, as in Figure 1. This arm carries at its outer end a control element of the circuit-closing means in the form of a head 37, preferably of cylindrical shape, disposed parallel to shaft 35 and projecting from the arm toward partition plate 3. Arm 36 carries head 37 of conducting material at a location spaced from the axis of shaft 35 a distance equal to the radius of the circle on which holes 30 lie, and such head is small enough for projection through any one of such holes by inward reciprocation of such shaft. If the shaft is shifted to the left when arm 36 is in the rotative position shown in Figure 1, head 37 will be projected into and through the hole 30 behind which the circuit-closing means abutment element contacts 16 are located. This head is of sufficient length parallel to shaft 35 so that its left end projecting through such aperture 30 and beyond the left side of partition 3 will engage and bridge between contacts 16. Head 37, constituting a control member, thus bridges the contacts 16 to energize the circuit incorporating wires 1 and 10 through the brushes 12 and contact strips 15.

If, on the other hand, shaft 35 were in rotative position in which head 37 is aligned with a hole 30 other than the one with which rotor projection contacts 16 register, or with slot 31, reciprocation of shaft 35 to the left could be continued to shift arm 36 beyond its position shown in Figure 2. If the head 37 were in registry with a hole other than that corresponding to the location of contacts 16, the shaft could be shifted inward until arm 36 engaged the right side of partition 3, which disposition is shown in Figure 3. If, however, arm 36 were in registry with slot 31, as shown in Figure 3, continued reciprocation of the shaft to the left would move this arm bodily through such slot to dispose it at the left side of partition 3 as in Figure 4. Additional inward movement of the shaft would be interrupted either by its inner end seating on the end of bearing cavity 26 in rotor 22, or by the guide boss 34 striking a stop member, or by engagement of knob 40 with the outer end of sleeve 41 which cannot move lengthwise.

After arm 36 has thus been shifted through slot 31 to the left side of partition 3 shaft 35 may again be rotated. Depending upon the direction of such rotation, head 37 will eventually engage one side or the other of the circuit-closing means abutment element composed of contacts 16, as illustrated in Figure 4. In that particular instance rotation of shaft 36 has been effected in a clockwise direction. Such engagement of head 37 with a contact 16 will not close a circuit between wires 1 and 10 because the head is in engagement with only one of the contacts and cannot bridge between them.

If a torque is applied to shaft 35 after head 37 thus engages the circuit-closing means abutment element and in the same direction, arm 36 will apply a rotational force to such element, and consequently to rotor 22. The location of contacts 16 may thus be shifted by rotation of the rotor from registry with one hole 30 to a different hole. Rotation of shaft 35 in the opposite direction after arm 36 has passed through slot 31 could, of course, cause head 37 to engage the opposite side of the circuit-closing means abutment element, and the contacts 16 and rotor 22 would be revolved in a counterclockwise direction, instead of in a clockwise direction as described previously.

In whichever direction contacts 16 may be shifted they will be held in proper registry with one or another of holes 30 by engagement of a ball detent 17 carried by an arm 28 with one of the depressions 18 in the left side of partition 21, which depressions are located correspondingly to the several apertures 30 and numerals 1 to 12, inclusive, on index ring 4. Preferably, as shown in Figure 6, the width of the circuit-closing means abutment element is such that when arm 36 is shifted in a clockwise direction the location of contacts 16 will be one number farther in a clockwise direction than the location of arm 36, whereas, on the contrary, when shaft 35 is rotated in a counterclockwise direction the location of contacts 16 will be one number farther in a counterclockwise direction than that corresponding to the location of arm 36.

Boss 34 on shaft 35, slidable in guide tube 33, has an annular groove 38 in its periphery, in which fits a yoke 5 of latch mechanism. This yoke is carried by an arm 50 extending radially of shaft 35 through a slot 39 in tube 33. The yoke fits in groove 38 sufficiently loosely that the shaft may be rotated easily without swinging arm 50, but reciprocation of the shaft will shift the arm laterally to actuate the latch.

Latch mechanism coordinated with lengthwise shifting of shaft 35 into various positions is shown diagrammatically in Figures 2, 3 and 4. Thus arm 50 carries the latch bar 51 pivoted to swing relative to it. The latch bar slides on a track 52 which is stationary and disposed generally parallel to shaft 35. A spring may urge the bar downward against the track. This track has a notch 53 in its upper side of a width sufficient to enable latch bar 51 to drop downward into it,

A lifting lever 54 beneath the tip of latch bar 51 may be raised by mechanism described hereafter to lift the latch bar out of notch 53.

Notch 53 is located relative to the lengthwise travel of shaft 35 and the lateral shift of arm 50 and notch bar 51 so that when arm 36 is between partition 3 and end wall 32 the latch bar will be located well to the right of the notch. When shaft 35 has been shifted to the left into the position of Figure 2, so that head 37 bridges between contacts 16 to complete a circuit between wires 1 and 10, the engagement of the head with the contacts will limit lengthwise movement of shaft 35 before latch bar 51 has reached notch 53.

If arm 36 should be in a rotative position other than that corresponding to the location of contacts 16, however, head 37 will move through such an aperture 30 until arm 36 engages the right side of partition 3, in which case latch bar 51 will have moved into registry with notch 53 and will drop into it. The left side of this notch is inclined as indicated at 55, however, so that if arm 36 is in registry with slot 31 reciprocation of shaft 35 to the left may be continued until such arm has moved entirely to the left of partition 3 into the position shown in Figure 4.

There is no difficulty in moving shaft 35 to the right from the contacting position shown in Figure 2. If latch bar 51 has passed to the left sufficiently far to engage in notch 53, however, reciprocation of shaft 35 to the right will be interrupted by engagement of the right side of the latch bar with the abrupt right side of notch 53. It will thereupon be necessary to raise lifting lever 54 to lift latch bar 51 out of the notch so that rod 35 may be moved to the right again. The preferred mechanism for raising the lifting lever will be described hereafter.

Instead of the circuit-closing means abutment element being contacts 16 as in Figures 1 to 4 and 6, arm 36 and control head 37 may operate the alternative type of abutment element shown in Figure 10 to close the circuit between wires 1 and 10. In this instance the rotor 22' is journaled in a fixed partition 21', similar to rotor 22, and also has a guide bore 26 receiving the left end of shaft 35. The arrangement of holes 30 and slot 31 in partition 3 may be the same as described previously.

In this form of my device wires 1 and 10 are connected to contact strips or fingers 7 mounted on the wall of cylindrical casing 2 at diametrically opposite locations. Rotor 22' in this instance is not only rotatable but is reciprocable in partition 21'. At its left end it carries a contact bridging disk 70 adapted to engage both contact fingers 7 by reciprocation to the left, in whatever rotative position rotor 22' may be.

Normally rotor 22' is urged toward the right by a helical spring 71 interposed between partition 21' and a disk 72 mounted on the right end of the rotor. Movement of the rotor to the right is limited by engagement of the periphery of this disk with an annular rib 28 projecting inwardly from casing 2 at a location intermediate partitions 21' and 3.

In place of contacts 16 constituting the circuit-closing means abutment element in the form of my device described previously, a block 73 of approximately the same length and aggregate width as contacts 16 projects from disk 72. This block is disposed at a distance radially from the center of the disk corresponding to the radius of the circle around which holes 30 are located.

When shaft 35 is reciprocated to the left with the control head 37 and abutment block 73 in registry with the same hole 30 the force exerted on shaft 35, transmitted through the head to such block, will slide rotor 22' sufficiently to the left to engage plate 70 with both contact fingers 7, thus closing the circuit between wires 1 and 10. Movement of rotor 22' in such direction is limited by engagement of disk 70 with a bar 74 of insulating material extending diametrically across casing 2 and located between contact fingers 7.

Since the abutment block 73 in the instant device is of the same size, shape and location as the abutment contacts 16 of the form shown in Figures 1 and 6, arm 36 may be shifted to a location to the left of partition 3 through slot 31 and rotated for the purpose of altering the circumferential position of block 73 in the manner previously described in connection with such other form. Such block will be held in registry with any selected hole 30 by diametrically opposite detents 75 carried by disk 72 and engaged with grooves 76 which are formed on the inner side of casing 22 and extend longitudinally of it. These grooves are located to correspond, respectively, with the positions of the several holes 30.

In order to indicate to the operator the rotative position of arm 36 and head 37, a pointer 42 is secured upon sleeve 41, such as by a set screw, to be rotated with shaft 35 and to indicate the various numerals 1 to 12 on ring 4, shown in Figure 9. The right end of shaft 35 as it is seen in Figure 1 is preferably square or of other non-cylindrical shape to fit sleeve 41, or it may be slidably keyed or splined to such sleeve, for affecting a rotative driving connection between these parts while leaving shaft 35 free to reciprocate within this sleeve. In the arrangement shown the numeral 9 corresponds to the location of slot 31. Plate 3 may, of course, be installed so that registry of arm 36 with it will be indicated by pointer 42 pointing to a different number. Alternatively the position of pointer 42 may be shifted on sleeve 41 for a change in the relationship between it and arm 36 as desired by the individual operator, but for purposes of discussion the pointer 42 has been shown in Figure 1 to be in registry with arm 36.

In operating my device, therefore, the operator will first rotate knob 40 until pointer 42 indicates numeral 9, placing arm 36 in alignment with slot 31. The knob may then be pushed inward to shift arm 36 and head 37 through slot 31 to the left of partition 3.

When shaft 35 has been pushed fully to the left in this manner knob 40 may be rotated in either direction through one complete turn to make sure that head 37 has been brought into engagement with one side or the other of the circuit-closing means abutment element, whether it be contacts 16 or block 73, depending upon the form of the device. In both instances the circuit-closing means abutment element setting operation is accomplished in precisely the same manner.

Rotation of knob 40 is continued in the same direction through that fraction of the next revolution necessary to bring pointer 42 into position to indicate the numeral on ring 4 next preceding the desired circuit-closing number. Thus if the selected number is 3 and the knob 40 is being rotated in the clockwise direction, rotation will be stopped when the pointer indicates the numeral 2 . The knob is then rotated in the reverse direction until the pointer again points to number 9, indicating that arm 36 is in registry

with slot 31. Knob 40 may then be drawn outward to move arm 36 through slot 31. Such outward movement will be interrupted, however, by engagement of the latch bar 51 in notch 53 of track 52 as shown in Figure 3. Consequently it will be necessary to manipulate the latch controlling mechanism for raising lifting lever 54 to lift the latch bar out of the notch, so that the knob may be pulled farther outward to dispose arm 36 and head 37 in the space between partition 3 and end wall 32, which positions they occupy in Figures 1 and 10.

The device has now been set so that the circuit between wires 1 and 10 may be closed by rotating knob 40 to align pointer 42 with numeral 3, and then pushing the knob inward to reciprocate shaft 35 for moving the head 37 of arm 36 through the hole 30 which is in registry with the circuit-closing means abutment element, as shown in Figure 2, to engage such element. To deenergize the circuit it is merely necessary to pull knob 40 outward to return head 37 to the position of Figures 1 and 10.

An unauthorized person will not know with which number on ring 40 pointer 42 must register in order to engage contacts 16 or block 73, although he would have one chance in twelve of selecting the proper number. If the wrong position were selected, however, shaft 35 would be reciprocated inward until arm 36 engaged the right side of partition 3, which would enable latch bar 51 to drop into notch 53 of track 52. Since the shaft could not be pulled outward again until after the latch had been released it would not be possible for an unauthorized person to try first one number and then another until the location of the circuit-closing means abutment element had been discovered.

In order to eliminate all chance of an unauthorized person selecting the proper circuit-closing number on ring 4, after drawing shaft 35 outward to the position shown in Figures 1 and 10 the operator could turn pointer 42 to a number different from that corresponding to the location of contacts 16 or block 73. Thus if the number corresponding to the selected position of the circuit-closing means abutment element is 3 the pointer 42 may be turned to the numeral 7, for example, and then knob 40 can be pushed inward until latch bar 51 has engaged in notch 53, to lock shaft 35 against lengthwise movement. Knob 40 will thus be locked against both reciprocation and rotation, just as when head 37 is inadvertently pushed into the wrong hole 30, until the latch is released.

Except under unusual circumstances the operator will not manipulate knob 40 to engage the latch mechanism, because considerably more time is required to release the latch and then to close the circuit by rotation and reciprocation of knob 40 than is necessary for circuit-closing operation of the knob alone. If the latch is not engaged it is merely necessary to rotate the knob until the pointer is aligned with the selected circuit-closing number, and then to push in the knob.

The latch arrangement shown in Figures 2, 3 and 4 is somewhat diagrammatic, and it is preferred that the latch bar 51' extend upward as shown in Figures 12 and 13 to slide along a track 52 located above the tubular extension 33. Because the construction of the track is the same whatever its location, the same numeral has been applied to the track shown in Figures 11, 12 and 13 as to that in Figures 2, 3 and 4.

The latch releasing member 54' of Figures 11, 12 and 13 takes the form of a lever 54' pivoted on a pin 56 mounted on track 52. Normally the latch bar lifting end of this lever is held in the downwardly swung position, indicated in dotted lines in Figure 11, by the weight 57 carried by the longer end of the lever. Lifting lever 54' is swung upward into the latch bar lifting position shown in solid lines in Figure 11 by pressure exerted on its shorter end by a second lever 58, also pivotally mounted on track 52 by pivot pin 59.

It will be evident that in order to release latch bar 51' from the notch in track 52 it is merely necessary to raise the left end of lever 58 into the solid line position of Figure 11, whereupon its right end would depress the left end of lever 54' against the force exerted by weight 57. When the levers have been moved into the solid line position, therefore, shaft 35 may be reciprocated farther to the left, as seen in Figures 11 and 12, by pulling knob 40.

Various types of mechanism may of course be utilized to tilt lever 58 for releasing the latch bar, but I prefer to effect this operation by a combination lock mechanism actuated by rotation of a dial 6, preferably arranged concentrically with shaft 35 and knob 40 of the switch controlling mechanism. As best shown in Figure 1 this dial is rotatable on sleeve 41 which carries pointer 42. A cam disk 60 is secured to a tubular extension 61 passing rearwardly through the mounting panel P.

Cam disk 60 has a conformation operable, upon rotation of dial 6 through the proper combination, to swing upward a lever 62 of spring metal pivoted at 63. As shown in Figure 11, lever 62 has an offset portion forming a ledge engaged beneath the left end of lever 58. The lower end of this lever carries a pin 64. Such disk includes a central boss 65 from which extends laterally outward a short spiral rib 66. Adjacent to the convex side of this rib is a second spiral rib 67 directed oppositely and separated from rib 66 by a notch 68. The bottom of the notch projects somewhat outward from the face of the cam disk 60 to form a surface constituting a continuation of the inner end of rib 67 joined to the outer end of rib 66.

If the dial 6 is rotated in a direction to shift cam disk 60 in the clockwise direction as seen in Figure 14 while pin 64 is riding on the central boss 65 of the cam disk, this pin will be forced outward along the convex face of rib 66 until it passes through notch 68. During such movement pin 64 will also be forced somewhat away from mounting plate P against the inherent resilience of lever 62. If rotation of the cam disk 60 in the clockwise direction is continued the pin will drop down from the outer end of rib 66 to engage the periphery of central boss 65 again.

If rotation of disk 60 is reversed, being revolved counterclockwise, before pin 64 drops off the end of rib 66, the pin will pass across notch 68 and will be lifted by engagement with the convex side of rib 67 until it reaches the position of Figure 14. Such upward movement of pin 64 has, of course, similarly swung upward the left end of lever 62 about its pivot 63, and such swinging has had the effect of tilting the levers 58 and 54' from the broken line positions of Figure 11 to their solid line, latch-releasing positions. Such manipulation will raise latch bar 51' to release it from notch 53 in track 52 as previously explained, so

that shaft 35 may be reciprocated outward into the unlatched position of Figures 1 and 10.

If, instead of at the time mentioned, rotation of cam disk 60 is reversed from clockwise to counterclockwise after pin 64 drops down from the end of rib 66, the latch releasing operation described above would not occur. On the contrary, pin 64 would merely ride up the inclined surface 69 and pass over rib 66 to engage again the central boss 65 of the cam disk. Thus the lever 62 would not be swung upward into latch releasing position. On the other hand if the reversal from clockwise to counterclockwise position were effected at the proper time but continued considerably beyond the position of disk 60 shown in Figure 14, pin 64 would drop downward from the outer end of rib 67 so that again levers 58 and 54' would be swung into their broken line positions by the action of weight 57. Simultaneously latch bar 51' would drop back into notch 53 of track 52.

After the combination has been manipulated by an authorized person to release the latch bar from its notch in the manner described, dial 6 would, of course, be rotated far enough in the clockwise or counterclockwise direction to enable levers 58 and 54' to return to their broken line positions of Figure 11, conditioning the latch bar 51' to engage again in notch 53 upon appropriate reciprocation of shaft 35. During normal operation of the switch-closing mechanism, however, it will not be necessary to manipulate the combination latch releasing mechanism.

Shaft 35 would be reciprocated inwardly far enough to engage the latch mechanism in only the three instances, mentioned above: first, when an authorized operator positively locks the circuit-closing device by intentionally engaging head 37 in an aperture 30 of partition 3 other than that with which the circuit-closing means abutment element, such as block 73 or contacts 16, registers; second, when an unauthorized person tampers with the circuit-closing device and inadvertently shifts shaft 35 inward to engage head 37 in slot 31 or in a hole 30 other than that with which the circuit-closing means abutment element is in registry; or third, to withdraw head 37 from notch 31 after the selected rotative position of the circuit-closing means abutment element has been altered by an authorized person.

I claim as my invention:

1. Control mechanism for an electric circuit, comprising circuit-switching means including a rotor, an abutment element carried by said rotor, and a control element operable by engagement with said abutment element to effect closing of the electric circuit, means guiding said rotor for rotation, and means guiding said control element for rotation independently of said rotor, and for reciprocation in a direction parallel to the axis of rotation of said control element into engagement with said abutment element only when said control element and said rotor are in corresponding rotative positions, to effect closing of the electric circuit.

2. Control mechanism for an electric circuit, comprising circuit-switching means including a rotor, an abutment element carried by said rotor, and a control element operable by engagement with said abutment element to effect closing of the electric circuit, means guiding said rotor for rotation, and means guiding said control element for rotation independently of said rotor about the rotor's axis of rotation and for reciprocation in a direction parallel to such axis of rotation into engagement with said abutment element only when said control element and said rotor are in corresponding rotative positions, to effect closing of the electric circuit.

3. Control mechanism for an electric circuit, comprising circuit-switching means including a rotor, an abutment element carried by said rotor, and a control element operable by engagement with said abutment element to effect closing of the electric circuit, means guiding said rotor for rotation to move said abutment element into any selected one of a plurality of operative positions, means operable to hold said rotor to maintain said abutment element in such selected position, a shaft supported coaxially with said rotor and carrying said control element, and means guiding said shaft for rotation and for lengthwise reciprocation to move said control element into engagement with said abutment element only when said two elements are in corresponding rotative positions, to effect closing of the electric circuit.

4. Control mechanism for an electric circuit, comprising circuit-switching means including a rotor, an abutment element carried by said rotor and projecting from one side thereof, and a control element operable by engagement with the projecting end of said abutment element to effect closing of the electric circuit, means guiding said rotor for rotation to move said abutment element into any selected one of a plurality of operative positions, means operable to hold said rotor to maintain said abutment element in such selected position, a shaft supported coaxially with said rotor and carrying said control element, and means guiding said shaft for rotation and for lengthwise reciprocation to move said control element into engagement with the projecting end of said abutment element only when said two elements are in corresponding rotative positions, to effect closing of the electric circuit, and to move said control element into engagement with a side of said abutment element for effecting rotation of said rotor to dispose said abutment element in a different selected operative position.

5. Control mechanism for an electric circuit, comprising a cylindrical casing, a partition secured in said casing, a rotor rotatively journaled in said partition centrally thereof and including a disk adjacent to said partition, a second partition secured in said casing, spaced from said disk, and having a plurality of apertures arranged in a circle concentric with the axis of rotation of said rotor, an abutment element carried by and projecting from the disk of said rotor in a position capable of registering successively with each of such apertures upon rotation of said rotor, a shaft rotatable about the axis of rotation of said rotor, an arm extending laterally from said shaft on the side of said apertured partition opposite said abutment element, and having a head mounted thereon for alignment with any one of the apertures in said second partition when said shaft is disposed in the corresponding rotative position, and means guiding said shaft for lengthwise reciprocation to project said head through that aperture in said second partition with which said abutment element registers into engagement therewith.

6. Control mechanism for an electric circuit, comprising a cylindrical casing, a partition secured in said casing, a rotor rotatively journaled in said partition centrally thereof and including a disk adjacent to said partition, a second partition secured in said casing, spaced from said disk, and

having a plurality of apertures arranged in a circle concentric with the axis of rotation of said rotor, a pair of contacts projecting from the disk of said rotor in a position capable of registering successively with each of such apertures upon rotation of said rotor, a shaft rotatable about the axis of rotation of said rotor, an arm extending laterally from said shaft on the side of said apertured partition opposite said pair of contacts and having a head of conducting material mounted thereon for alignment with any one of the apertures in said second partition when said shaft is disposed in the corresponding rotative position, and means guiding said shaft for lengthwise reciprocation to project said head through that aperture in said second partition with which said pair of contacts registers to complete a circuit therebetween.

7. Control mechanism of an electric circuit, comprising a cylindrical casing, a partition secured in said casing, a rotor rotatively journaled in said partition centrally thereof and including a disk adjacent to said partition, means guiding said rotor for axial reciprocation, contacts in the electric circuit adapted to be bridged by said rotor upon axial reciprocation thereof in one direction, a second partition secured in said casing, spaced from said disk, and having a plurality of apertures arranged in a circle concentric with the axis of rotation of said rotor, an abutment element projecting from the disk of said rotor in a position capable of registering successively with each of such apertures upon rotation of said rotor, a shaft rotatable about the axis of rotation of said rotor, an arm extending laterally from said shaft on the side of said apertured partition opposite said abutment element, and having a head mounted thereon for alignment with any one of the apertures in said second partition when said shaft is disposed in the corresponding rotative position, and means guiding said shaft for lengthwise reciprocation to project said head through that aperture in said second partition with which said abutment element registers into engagement therewith to move said rotor axially for engaging said contacts thereby.

8. Control mechanism comprising a control element, cooperating means including an abutment element movable into any selected one of a plurality of operative positions and extending toward said control element farther than the portions of said cooperating means in the unselected operative positions, means guiding said control element for shifting into positions corresponding to the several operative positions of said abutment element, said control element being engageable with said abutment element while in the position corresponding to the selected operative position of said abutment element, and locking means operable, by shifting of said control element toward said cooperating means into any position corresponding to one of the several operative positions of said abutment element other than that corresponding to such selected operative position of said abutment element and to an extent beyond said abutment element, to restrain shifting of said control element into the position corresponding to such selected operative position of said abutment element.

9. Control mechanism as defined in claim 8, in which the abutment element is rotatable and the control element is rotatable and reciprocable and the locking means include a latch member engageable with the control element to hold it against return reciprocation when reciprocated toward the cooperating means while in any rotative position corresponding to one of the several operative positions of the abutment element other than the rotative operative position in which the control element can engage the abutment element when reciprocated, but inoperative to latch the control element against return reciprocation when reciprocated into engagement with the abutment element.

10. Control mechanism for an electric circuit, comprising a casing, circuit-switching means including an abutment element, means supporting said abutment element for angular shifting relative to said casing into a selected one of a plurality of operative positions, a control element, means independent of said supporting means, mounting said control element inside said casing and guiding said control element for angular shifting thereof relative to said casing, and means guiding said control element for reciprocation into engagement with said abutment element in various corresponding rotative positions of said two elements, said control element being operable by such engagement with said abutment element to effect closing of the electric circuit.

11. Control mechanism for an electric circuit, comprising a casing, and circuit-switching means including an abutment element rotatable relative to said casing into any selected one of a plurality of rotative positions, and a control element engageable with said abutment element and rotatable relative to said casing while thus engaged and thereby being operable to effect such rotation of said abutment element relative to said casing, and further being rotatable independently of said abutment element into a plurality of positions other than that corresponding to the selected one of such plurality of rotative positions in which said abutment element is disposed.

12. Control mechanism comprising an abutment element, means supporting said abutment element for rotation into any selected one of a plurality of rotative positions, a control element, and means supporting said control element for rotation into any one of a plurality of positions corresponding respectively to operative positions of said abutment element, further supporting said control element for axial movement into engagement with said abutment element while in the one of such rotative positions corresponding to the selected rotative position in which said abutment element is disposed, and further supporting said control element first for axial movement while in a rotative position other than that corresponding to the selected rotative position in which said abutment element is disposed, and thereafter rotatively into engagement with said abutment element to shift it rotatively from its selected rotative position into a different selected rotative position.

13. Mechanism comprising an abutment element, a control element engageable therewith, an indicator element, means supporting said control element and said indicator element for conjoint rotation, an index cooperating with said indicator element to designate, each by a different symbol, various rotated positions of said indicator element, means operable to effect relative reciprocation of said abutment element and said control element to effect engagement thereof in only a predetermined rotative relationship of said indicator element with respect to said index, and means for adjusting the relative rotative positions of said indicator element and said index for a given rotative positioning of said control element,

for thereafter effecting switching engagement of said control element with said abutment element only when said indicator element is in one particular established rotative relationship to said index which is different from such predetermined relationship.

14. Mechanism comprising an abutment element, a control element engageable therewith, an indicator element, means supporting said control element and said indicator element for conjoint rotation, an index cooperating with said indicator element to designate, each by a different symbol, various rotated positions of said indicator element, means operable to effect relative reciprocation of said abutment element and said control element to effect engagement thereof in only a predetermined rotative relationship of said indicator element with respect to said index, and means rotatively supporting said abutment element, said control element being operable to engage and shift said abutment element rotatively relative to said index for thereafter effecting switching engagement of said control element with said abutment element only when said indicator element is in one particular established rotative relationship to said index which is different from such predetermined relationship.

15. Switching mechanism comprising a contact member, a switch member engageable therewith, an indicator member, means supporting said switch member and said indicator member for conjoint rotation, a graduated dial bearing symbols, cooperating with said indicator member to designate various rotated positions of said indicator member, means operable to effect reciprocation of said supporting means for effecting switching engagement of said switch member with said contact member in only a predetermined rotative relationship of said indicator member with respect to said dial, and means for adjusting the relative rotative positions of said indicator member and said dial for a given rotative positioning of said switch member for thereafter effecting switching engagement of said switch member with said contact member only when said indicator member is in one particular established rotative relationship to said dial which is different from such predetermined relationship.

16. Control mechanism for an electric circuit, comprising a casing, circuit-switching means including an abutment element, means supporting sad abutment element for angular shifting relative to said casing into a selected one of a plurality of operative positions, a control element, means independent of said supporting means guiding said control element for angular shifting thereof relative to said casing, means guiding said control element for reciprocation into engagement with said abutment element in various corresponding rotative positions of said two elements, said control element being operable by such engagement with said abutment element to effect closing of the electric circuit, and means operable to lock said control element against further movement upon reciprocation thereof toward said abutment element when the abutment element and the control element are in other than corresponding rotative positions.

17. An electric switching device comprising a housing, a switching member rotatably mounted within said housing and having projecting contact means rotatable into any of various selectable switching positions, a coacting switch-actuating member rotatably mounted within said housing independently of but coaxially with said switching

member and including a rotatable radial arm and a contact finger carried thereby in generally parallel relation to the rotative axis of said switch activating member, extending toward said switching member and movable axially into switch-actuating engagement with the contact means of said switching member only when rotated into positional correspondence therewith, and separating means normally interposed between said switching and switch-actuating members, and having contact finger passages defining a plurality of switching positions, and a radial passage adapted to pass said radial arm and said finger to permit engagement of said finger with a side of said contact means to effect changing the position of the switching member by then rotating said arm from registry with one to registry with another of said contact finger passages.

18. The electric switching device defined in claim 17, and a latch engageable with the switch-actuating member upon passage of the contact finger through one of the contact finger passages other than the one with which the contact means is in registry.

19. An electric switching device comprising a housing, a switching member rotatably mounted within said housing and rotatable into any of various selectable switching positions, a coacting switch-actuating member rotatably mounted within said housing coaxially with said switching member and rotatable into any of various positions corresponding to said selectable switching positions, mounting means operable to guide said switch-actuating member for movement axially into switch-actuating engagement with said switching member, means limiting axial movement of said switch-actuating member short of that necessary for switch-actuating engagement thereof with said switching member when in rotative positions other than those corresponding to said selectable switching positions, and means guiding said switch-actuating member for movement into abutment with said switching member by rotative movement of said switch actuating member and thereafter for conjoint rotation of said switch-actuating member and said switching member.

20. A device as defined in claim 19, and positional indicator means associated with the housing, cooperative indicator means carried by the switch-actuating member, and means for adjusting the relative rotative positioning of said cooperative indicator means and the switch-actuating member.

21. A device as defined in claim 19, and locking means coacting with and operable to lock the switch-actuating member when moved axially in a rotative position corresponding to a selectable switching position other than that corresponding with the position of the switching member.

22. Control mechanism comprising a partition having a plurality of apertures therein, means at one side of said partition movable relative to said partition into registry with any selected one of such partition apertures, a control member located at the side of said partition opposite said means, movable relative to said partition independently of said means into a plurality of positions corresponding respectively to various partition apertures, and projectable through such partition apertures, being engageable with said means when projected through the selected partition aperture with which said means is then in registry and operable thereby to effect controlling

operation of said means, and means supporting said control member for movement through an aperture of the partition other than that with which said first means is then in registry for engagement with such means to effect movement thereof from registry with a selected one of the partition apertures into registry with another partition aperture selected from the plurality of such apertures.

EDWARD STANLEY GIFFIN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
557,646	Booth	Apr. 7, 1896
597,470	Norden	Jan. 18, 1898
794,792	Earle	July 18, 1905
1,116,264	Germany	Nov. 3, 1914
2,136,307	Michel	Nov. 8, 1938