May 13, 1969 R. CHAVENEAUD ET AL 3,444,340

DEVICE FOR CONTROLLING ELECTRICAL SWITCH ELEMENTS

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Fig. 1

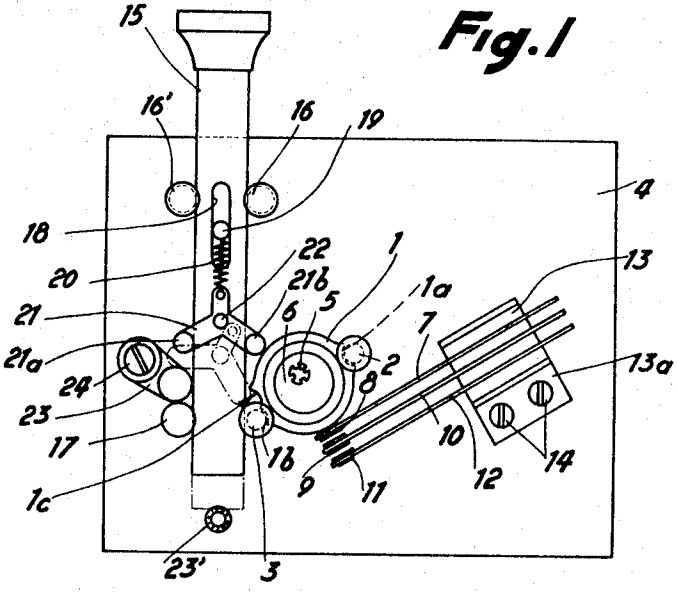


Fig. 2

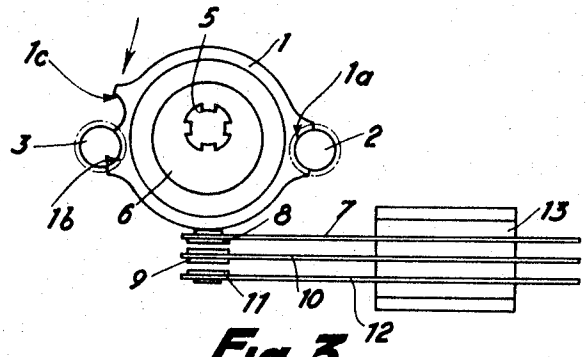
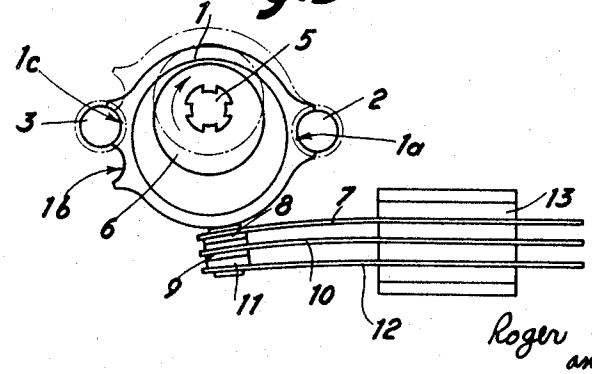


Fig. 3



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Fig.4

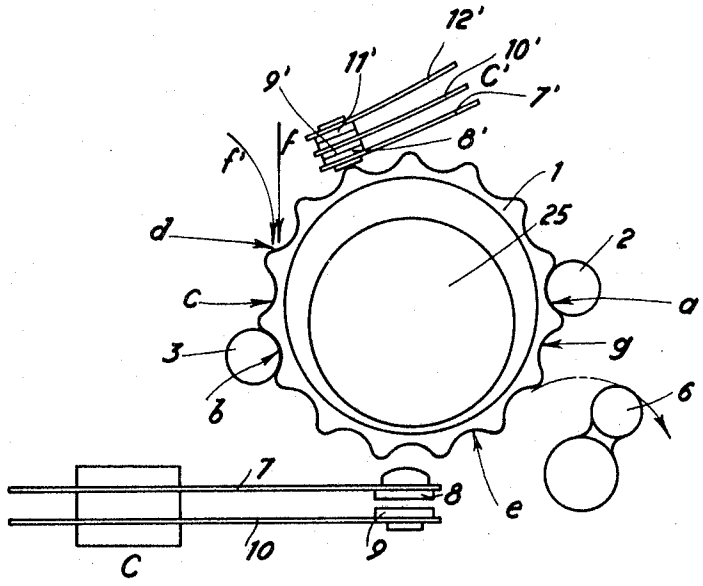
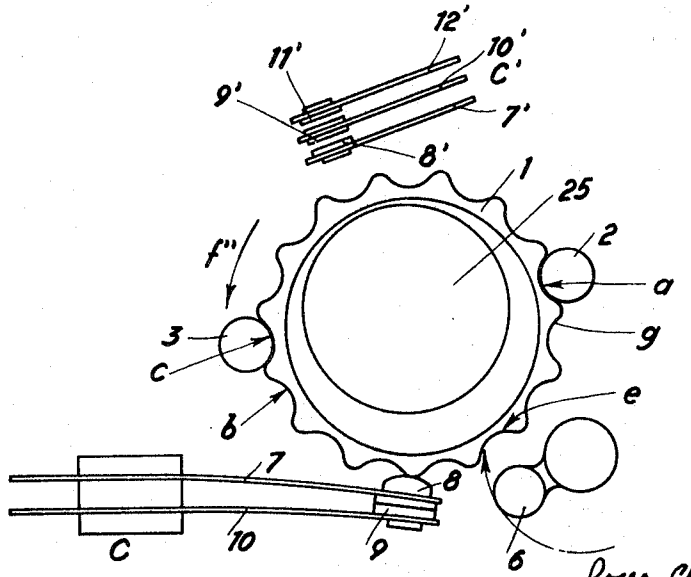


Fig.5



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DEVICE FOR CONTROLLING ELECTRICAL SWITCH ELEMENTS

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Int. Cl. H01h 7/12, 43/10
U.S. Cl. 200—38 9 Claims

ABSTRACT OF THE DISCLOSURE

A control device having a resilient deformable ring with a plurality of spaced peripheral concave notches, two of which, in one position, are engageable with spaced studs; and two of which in another position are engageable with the spaced studs; and means for deforming the ring to move it between the positions, and contact means associated with the periphery of the ring and actuated upon movement of the ring.

This invention relates to a device for controlling electric contact sets or similar apparatus.

This device is more particularly applicable to apparatus in which one or more contact sets may be actuated by first means manually or otherwise, then held in this condition for a predetermined time, and finally, after this time has elapsed, restored to their original condition by means, for example, of a rotary device controlling the timing of the cycle.

According to the invention, a device for controlling electrical contact sets and similar apparatus comprises a resiliently deformable ring having a plurality of peripheral concave notches, two fixed studs engaging two of said notches located in opposite sides of the periphery of the ring, ring displacing means moveable into deforming engagement with the ring whereby to disengage one of said notches from one of said studs and to displace the ring in its own plane so that a notch adjacent said disengaged notch is engaged by said stud, ring replacing means moveable into deforming engagement with the ring whereby to disengage one of said notches from one of said studs and to displace the ring in the opposite direction in its own plane so that a notch adjacent said disengaged notch is engaged by said stud, and at least one actuating member associated with a contact set or like apparatus cooperating with the periphery of the ring between the studs.

The ring may be provided with a pivoting notch permanently engaging one fixed stud and two adjacent securing notches diametrically opposite to said pivoting notch and alternately engaging the other fixed stud.

The ring may have a continuous series of adjacent notches around its entire periphery, the ring displacing means acting to displace the notches relative to one fixed stud, and the ring replacing means acting to displace the notches relative to the other fixed stud, whereby alternate operation of the two means causes rotation of the ring and all the notches are successively engaged by the studs.

In this case the notches in the ring are preferably separated by bosses, and the contact set operating member is a spring blade provided with a rounded protuberance riding the bosses and notches as the ring rotates.

The ring displacing means may comprise a key of conventional type or other similar system acting on the elastic ring.

The ring displacing means may alternatively or additionally comprise an eccentric, a cam, or other eccentric or non-eccentric rotating or oscillating device.

The ring replacing means may likewise comprise of an eccentric, a cam, or other eccentric or non-eccentric rotating or oscillating device, driven continuously or intermittently by an external means.

The ring displacing and replacing means may act on the inside or on the outside periphery of the ring.

If the ring displacing means is operated arbitrarily, for example by means of a key, it is constructed so that its operation does not override that of the ring replacing means.

The embodiments of the device are described below, by way of example only and without limitation on the scope of the invention as defined in the claims, with reference to the accompanying drawings, in which:

FIGURE 1 shows a device having a ring pivotally displaceable in both directions about the same fixed stud;

FIGURE 2 is a detailed view showing the ring illustrated in FIGURE 1, in its position in which the contacts of an associated contact set are open;

FIGURE 3 is another detail view showing the ring in the position in which the contacts are closed;

FIGURE 4 illustrates an alternative form of the device in which the ring, which is notched over its entire periphery, oscillates alternately about the two fixed studs;

FIGURE 5 shows the same alternative in the position in which the contact set conditions are reversed.

In the embodiment which is illustrated in FIGURE 1 the device comprises a ring **1** of resilient material, the material being selected so that its deformation during operation is less than its elastic limit, which ring is provided with peripheral concave notches **1***a*, **1***b*, and **1***c* and is located by two grooved studs **2** and **3** secured to a back plate **4** of a contactor apparatus and which engages the notches **1***a* and **1***b* in the ring.

Inside the ring **1** there is situated a shaft **5** passing through the plate **4** and adapted to be continuously or intermittently rotated by any known manual, mechanical, electro-mechanical, or other means.

On the shaft **5** there is keyed an eccentric **6** capable of acting on the inner periphery of the ring **1**.

A first contact blade **7**, of which the contact **8** can be applied against the contact **9** of a second contact blade **10**, bears against the outer edge of the ring. This contact **9** can also be applied against the contact **11** of a third contact blade **12**. It should be noted that this number and arrangement of contacts may be varied according to the intended function of the contact set. The blades **7**, **10**, and **12** are carried by an insulating block **13** mounted on a support **13***a*, which is fixed by screws **14** to the plate **4**.

On that side of the ring **1** opposite to the stud **2** is located a key **15**, which may form part of a keyboard, each key of which can act to displace a similarly mounted ring.

The stem of the key **15** is guided at spaced locations by two grooved studs **16** and **16'** and by the stud **3** and a grooved stud **17**. The stem is formed with a longitudinal aperture **18**, through which passes a slim post **19** which is fixed to the plate **4** and to which is secured one end of a spring **20**, the other end of which is secured to one arm of a three armed lever pivoted on a shaft **22** fast to the stem of the key.

It will be seen that by depressing the key **15** an arm **21***a* of the lever **21** will be brought into contact with a stop member **23** fixed by a screw **24** to the plate **4**, and that the lever **21** is then constrained to rock on its shaft **22**, causing an arm **21***b* of the lever to be applied to the boss bounding the top side of the notch **1***c* in the ring **1**. A thrust is thus applied to the ring which forces the notch **1***c* to take up the position previously occupied by notch **1***b* in engagement with the stud **3**. This change comes

about through pivotal movement of the ring about the notch **1***a* on the stud **2**, the elasticity of the ring permitting disengagement of the notch **1***b* from the stud **3**.

In the example illustrated in FIGURE 1, the eccentric **6** and the shaft **5** are so disposed that the key **15** can be operated at any time, whatever the position of the eccentric and even when the latter is rotated into the position in which it acts to return the ring to its original position, as illustrated in FIGURE 2.

In this last case, the resilience of the ring permits its deformation by the arm **21***b* without bodily displacement, which is prevented by the eccentric **6**, and thus the key can be actuated without the ring moving so as to act on the electric contact set with which it cooperates.

A stop **23'** limits the stroke of the key **15**.

FIGURES 2 and 3 illustrate on a larger scale different phases of the operation of the device.

FIGURE 2 shows the ring **1** in the same position as in FIGURE 1, that is to say in a position in which the first contact blade **7** bears against the periphery of the ring without touching the second blade **10**. The contact set is in the condition in which the electric circuits controlled are open.

FIGURE 3 shows the ring **1** after the notch **1***c* has moved into engagement with stud **3**. The ring then occupies the position shown in solid lines and is held there by its own resilience, which forces the notches **1***a* and **1***c* to bear against the studs **2** and **3**. In this position the ring has moved in its own plane and has pushed back the blade **7**, which has deflected and caused contact between all the contacts **8**, **9**, and **11**. The contact set is therefore in the condition in which the electric circuits controlled are closed.

It should be observed that such a displacement of the ring **1** can take place only if the eccentric **6** occupies a suitable position in which its portion of great eccentricity is situated below (as seen in the drawing) the line passing through the axes of the studs **2** and **3**. It is however to be understood that in the course of its rotation, in either direction, the eccentric on passing above said line will come into contact with the inner periphery of the ring and act to replace the ring by forcing the latter to assume the position shown in broken lines in FIGURE 3, that is to say the original position illustrated in FIGURE 2. At this stage the notch **1***b* has returned into engagement with the stul **3** and the contact blades **7**, **10** and **12** have resumed their separated condition, with consequent breaking of the circuits controlled.

The ring displacing means may obviously be of alternative construction to that described with reference to FIGURE 1. The key **15** may be replaced, for example, by a rotating finger or a cam acting on the top boss of the notch **1***c*.

In the example described above the ring **1** has only three notches, but it may have a pivoting notch similar to the notch **1***a* and several securing notches similar to the notches **1***b* and **1***c* if the dimensions of the various parts make this possible.

It is moreover possible to produce a ring having continuous notches over its entire periphery, as in the embodiment illustrated in FIGURE 4.

In this construction the ring **1** pivots alternately about the fixed studs **2** and **3**, and the eccentric **6** is placed outside the ring and has a shape adapted to the outliine created by even distribution of the notches around the entire ring.

Operation is as follows:

In the position illstrated in FIGURE 4, the ring **1** does not act on the first contact blade **7** of a contact set C. It can, if so required, act on the blades **7'**, **10'** and **12'** of a contact set C' and close the associated circuits.

It will be seen that if a thrust is applied to one of the notches *d* of the ring, in the direction of the arrow *f* or of the arrow *f'*, the ring is caused to pivot on the stud **2**

which is engaged by a notch *a* situated opposite the notch *b* engaging with the stud **3**. Because of its elasticity the ring is deformed and the notch *c* takes the place of the notch *b*. The ring **1** is thus displaced to the position shown in FIGURE 5 and, as a result of its displacement, acts on the contact blade **7**, the contact **8** of which is applied against the contact **9** of the blade **10** of the contact set C. The circuit associated with the latter is thus closed. On the other hard, in the case where the system contains a second contact set C', on displacement of the ring it ceases to press against the blade **7'** of this contact set, thus having the effect of opening the circuits associated with the blades **7'**, **10'**, and **12'**.

As in the embodiment illustrated in FIGURE 1, the eccentric **6** must be suitably loacted to permit displacement of the ring **1**. In the course of its rotation in the direction of the arrow, the eccentric **6** comes into contact with a notch *e* on the ring and obliges the latter to pivot about the stud **3** with which the notch *c* is in engagement subsequent to the initial displacement of the ring. The ring is then deformed, and another notch *g* takes the place of the notch *a* in engagement with the stud **2**. This change therefore returns the ring to the position illustrated in FIGURE 4. The circuit completed by the contact set C is broken and the cricuits controlled by the contact set C' are closed.

It should be remarked immediately that in the course of this displacement/replacement cycle the ring has turned one notch in the direction of the arrow *f''* (FIGURE 5), which is the opposite direction to that of the rotation of the eccentric **6**. In other words, after each pivotal movement of the ring about the stud **2**, the ring is then caused to perform a pivotal movement about the stud **3** which has the effect of turning the ring about a core **25**, the only purpose of which is to limit the movement of the ring and to prevent its accidental escape from between the two studs **2** and **3**. Each notch can thus serve successively both as a pivoting notch and a securing notch in conjunction with the studs **2** and **3**.

Although in the embodiment illustrated in FIGURE 1 an eccentric appears to be the most suitable means for replacing the ring in its starting position, this eccentric may be replaced in the second embodiment by any other mechanical, electric, hydraulic, pneumatic, or other means moveable into deforming engagement with the ring. For example, the ring may be driven by a starwheel the teeth of which engage with the notches of the ring.

The device may have numerous applications if the modifications necessitated by each such application are made to it, without thereby departing from the scope of the invention.

What we claim is:

1. A device for controlling electrical contact sets and similar apparatus, characterized in that it comprises a resiliently deformable ring having a plurality of peripheral concave notches, two fixed studs engaging two of said notches located in opposite sides of the periphery of the ring, ring displacing means moveable into deforming engagement with the ring whereby to disengage one of said notches from one of said studs and to displace the ring in its own plane so that a notch adjacent said disengaged notch is engaged by said stud, ring replacing means moveable into deforming engagement with the ring whereby to disengage one of said notches from one of said studs and to displace the ring in the opposite direction in its own plane so that a notch adjacent said disengaged notch is engaged by said stud, and at least one actuating member associated with a contact set cooperating with the periphery of the ring between the studs.

2. A device according to claim **1**, characterized in that the ring has a pivoting notch permanently engaging one fixed stud, and two adjacent securing notches diametrically opposite to said pivoting notch and engaging alternately the other fixed stud.

3. A device according to claim 1, characterized in that the ring has a continuous series of adjacent notches around its entire periphery, the ring displacing means acting to displace the notches relative to one fixed stud, and the ring replacing means acting to displace the notches relative to the other fixed stud, whereby alternate operation of the two means causes rotation of the ring and all the notches are successively engaged by the studs.

4. A device according to claim 2, characterized in that the notches are separated by bosses, and the contact set operating member is a spring blade provided with a rounded protuberance riding the bosses and notches as the ring rotates.

5. A device according to claim 1, characterized in that the ring displacing means comprise a depressible key acting on the periphery of the ring.

6. A device according to claim 1, characterized in that at least one of the ring displacing means and the ring replacing means comprises an eccentric device acting on the ring.

7. A device according to claim 6, characterized in that the eccentric acts on the outer periphery of the ring.

8. A device according to claim 6, characterized in that the eccentric acts on the inner periphery of the ring.

9. A device according to claim 1, characterized in that the ring displacing means is operable at any time but will be overridden by the ring replacing means should the two be operated simultaneously.

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