Dec. 6, 1949 H. FORWALD 2,490,624

OPERATING DEVICE FOR THE DISCONNECTING SWITCH ARMS OF ELECTRIC CIRCUIT BREAKERS

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Fig. 1.

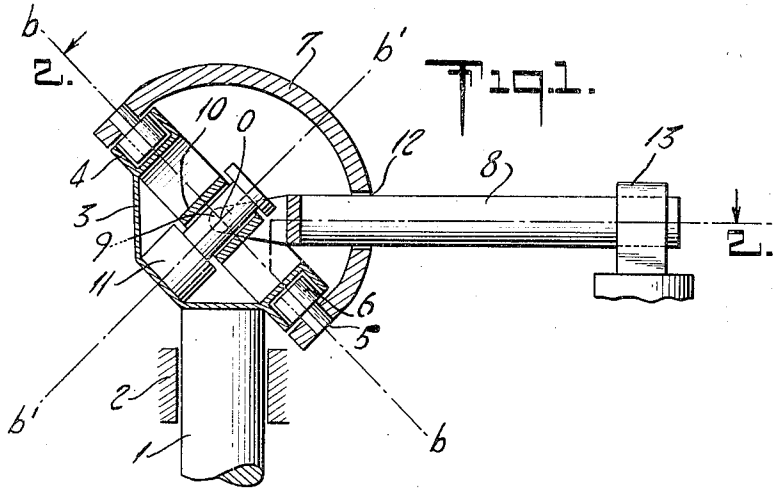



Fig. 2.

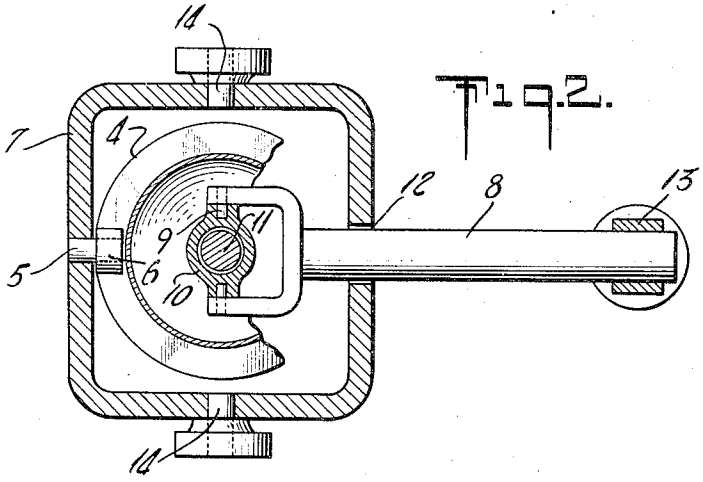



Fig. 3a.

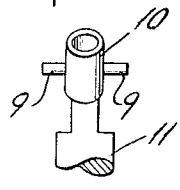



Fig. 3b.

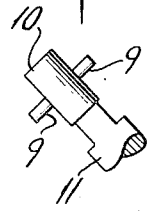
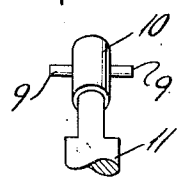



Fig. 3c.

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## OPERATING DEVICE FOR THE DISCONNECTING SWITCH ARMS OF ELECTRIC CIRCUIT BREAKERS

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3 Claims. (Cl. 74—96)

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The present invention has for its object to provide a mechanism for operating the contact arm of a disconnecting switch arm. In accordance with this invention, a combined swinging and turning motion of the arm is effected by very simple means. The turning motion has the advantage that the ice or welds at the contacts are readily broken. This arrangement also has the advantage that the velocity of the swinging motion is retarded at the ends of the swinging stroke with constant speed for the driving shaft, whereas the turning motion has its maximum speed when the arm is in contact with its counter contact.

On the accompanying drawing, Figs. 1 and 2 are views—partly in section—looking at right angles to each other, showing one form of the invention intended for the operation of the disconnecting switch arm of electric circuit breakers, Fig. 2 being a sectional view along the line 2—2 in Fig. 1, and Figs. 3*a*, 3*b* and 3*c* are detail views showing a portion of the mechanism in three different positions.

By this arrangement, at the initial turning of the operating shaft 1, the movement transmitted to the disconnecting switch arm is almost entirely a turning movement, and it is only after this initial movement that a swinging motion is imparted to said arm.

On the drawing, the operating shaft 1 is journalled in a bearing 2. At its upper end, the shaft 1 carries a bow member 3, which is provided with a circular peripheral slot 4, accommodating rolls 6 mounted on pivots 5, which are attached to a member 7, mounted on transmission pivots 14 (Fig. 2) having an axis extending through the meeting point O of the axes of the disconnecting switch arm 8 and of the operating shaft 1. The disconnecting switch arm 8 is pivoted at one end by means of pivots 9 to a socket 10, freely turnable about a stud 11 attached to the said bow member 3. The disconnecting switch arm 8 traverses an opening or journal 12 in the member 7 and is, in this opening, so journalled or guided that it can turn around its own axis. 13 designates the stationary contact, with which the contact in the outer end of the disconnecting switch arm 8 engages.

In operation, when the shaft 1 is turned through 180°, the member 7 is swung over to the position indicated by the center line *b'*—*b'* from the shown position indicated by the center line *b*—*b*. That the member 7 must take this position is clear from the fact that it is journalled in the fixed pivots 14 and thus cannot follow the turning

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motion of shaft 1 without swinging around the anchoring pivots 14. By this motion the arm 8 is swung upwardly from the horizontal position shown at Fig. 1 to the vertical position, i. e., a motion of 90°. During this motion the arm 8 is turned about its own axis. This motion is caused by the fact that the arm 8 at one end is pivoted in the sleeve or socket 10 which turns freely around the stud 11, whereas the arm 8 can turn about its own axis but can swing only in one plane (that of the surface of the drawing). The turning motion of the arm 8 is readily understood when it is borne in mind that an axis through the pivots 9 is perpendicular to the surface of the drawing (in Fig. 1) and must remain in this plane due to the fact that member 7 can swing only in the same plane (surface of the drawing, Fig. 1). When the shaft 1 is rotated through an angle of 90° so that the axis of the stud 11 will be in a plane perpendicular to the surface of the drawing, the axis through pivots 9 must remain in this plane; this is possible only by sleeve 10 rotating around the stud 11 and at the same time tilting through 45°. In Figs. 3*a*, 3*b* and 3*c*, the stud 11 and sleeve 10 and pivots 9 forming parts of the universal joint are shown in three different positions. The plane of the drawing, Fig. 1 is in this detail figure represented by the dash-dotted lines. In Fig. 3*a* the stud 11 has the position shown in Fig. 1. In Fig. 3*b*, the stud 11 and the pivots 9 are shown after a 90° turning of shaft 1, and in Fig. 3*c* after a 180° turning of the shaft. When the shaft is turned through 180°, the arm 8 is swung through 90°, but is turned through 45° about its own axis, and back again.

The invention may of course be modified in a number of different ways without departing from the spirit of the invention. For example, the pivots, projecting into the slot may be replaced by a ring freely sliding in the slot, and which ring is connected by pivots projecting into it and attached to the swinging member.

I claim as my invention:

1. Mechanism for actuating a disconnecting switch, comprising a swinging and rotating contact arm, an operating shaft arranged with its axis intersected by the swinging and rotating axes of said arm, a member secured to said shaft, a second member pivoted to swing about a fixed axis intersecting the axes of the shaft and arm at a common point, means connecting the said member with the said second member so as to permit relative rotary movement, a universal joint connecting the second member with one end of said arm and having its center of rotation co-

inciding with said common point, and a journal carried by the second member in spaced relation to said common point and serving to impart the swinging movement to the arm while permitting said arm to turn about its own axis.

2. Mechanism for actuating the contact arm of a disconnecting switch, comprising a shaft forming an angle with the contact arm, and having its axis intersecting the axis of said arm, a member carried on the end of said shaft, a second member in sliding engagement with said first member along a circle in a plane disposed at an angle to said shaft, said second member being pivoted along an axis passing through the point of intersection of the axes of said shaft and said arm, a stud mounted on said first member and extending perpendicularly to said plane, a pivot connection between one end of said arm and said stud, with a pivotal axis coinciding with the axis of said second member, said pivotal connection being rotatably mounted in relation to the axis of said stud, and a journal in said member for said arm.

3. Mechanism for actuating the control arm of a disconnecting switch, comprising a shaft forming an angle with and intersecting the axis



of said arm, a member carried on the end of said shaft, a circular race forming part of said member, and arranged in a plane forming an acute angle with said shaft, a second member slidably engaging said race, pivots for said second member having an axis extending through the point of intersection of the axes of said arm and said shaft, a stud carried on said first member and arranged perpendicularly to said circular race, a sleeve rotatably mounted on said stud, a pivot on said sleeve with an axis coinciding with the axis of the second member, a journal in said second member for said arm, and a fork-shaped part on said arm engaging said pivot.

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