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ELECTRIC SWITCHGEAR

The invention relates to an electric switchgear, especially an automatic cut-out, with at least one contact set which in each case has a fixed and a movable contact member, which cooperates, via a switch actuating mechanism, with a switch handle and an indicator lever, which indicator lever indicates the switch position of the movable contact member in a window in the housing of the switchgear, arranged near the switch handle.

It is known to provide electric switchgears with switch position indicators, which provide information about the present switch position of the contacts. Switch position indicators can be based both on electronic and on mechanical arrangements. With fitted electric appliances, which are usually provided with switch mechanisms, mechanical switch position indicators are mostly used.

From DE-GM 7,033,859 a circuit breaker of a fitted appliance has been disclosed, with a contact position indicator which is constituted by an indicator lever

which is in direct effective connection with a contact lever. Moreover the indicator lever is arranged between the contact lever and a bar serving for its support. On the one hand it is supported on the bar, and on the other hand it is pivotally connected to the contact lever at the point of actuation of the latter. The indication occurs by means of an indicator surface, which is visible in the end face of the switch beneath a window provided on the housing of the circuit breaker of the fitted appliance, and shows different coloured surfaces or signs corresponding to the contact position.

For actuation of the indicator lever there is a driving pin, which pivotally connects the contact lever to the indicator lever, the latter swinging around the pivot pin already mentioned. Moreover the pivot pin is so arranged that it forced-out a small lever arm with the driving pin and a large lever arm with the indicator surface, so that small swinging movements by the driving pin lead to large swinging movements of the indicator surface.

The known switch position indicator does indeed require only a little space, but on the other hand, requires a not insignificant effort in production and installation,

for there is no provision for adjustment.

The object of the invention is to provide a switch position indicator which needs little effort in production and installation, and hence can be economically manufactured, and which also clearly indicates the open setting of the contacts.

The invention resides in electric switchgear with at least one contact set which in each case has a fixed and a movable contact member, which cooperates via a switch actuating mechanism, with a switch handle and an indicator lever, which indicator lever indicates the switch position of the movable contact member in a window in the housing of the switchgear, the window being arranged near the switch handle, characterized in that the switch actuating mechanism has a pair of levers which forms a toggle joint which is supported in a fixed bearing via a third lever, that one of the levers of the pair of levers is connected to the switch handle and also to the indicator lever, that the other lever of the pair of levers is coupled to the movable contact member, and that upon opening of the contact set, the indicator lever swings in front of the window.

In an advantageous refinement of the invention, in order to even out bearing play consequent on tolerances of fit, and also wear of the contact members and bearings, the movable contact member is provided with a rigid frame of insulating material, in which a conductor member with a contact stud is movably carried and is acted upon by a spring in such a way that the conductor member with the contact stud springs into whichever is the opposite switch position, after a predetermined swinging movement of the frame which results from the switching actuation of the switch handle.

Furthermore, the indicator lever may be formed integrally on the one lever of the pair of levers which is connected to the switch handle, or fixed to it in such a way that it forms a fixed angle with it.

By means of the invention, false indications about the present switch position can be ruled out, especially in the above-mentioned refinement of the invention.

The surface of the indicator lever that faces the window may be of a contrasting colour.

The invention, advantageous refinements and improvements

to the invention, and also further advantages, will be explained and described in more detail with reference to the drawing, in which two exemplary embodiments of the invention are illustrated.

Figure 1 shows the construction in principle of switchgear according to the invention, in the "on" position (in longitudinal section),

Figure 2 shows an arrangement according to Figure 1, in the "off" position (in longitudinal section),

Figure 3 shows another switchgear according to the invention, with non-positive location of the movable contact member, in the "on" position (in longitudinal section),

Figure 4 shows the arrangement according to Figure 3, in an intermediate position (in longitudinal section),

Figure 5 shows the arrangement according to Figure 3, in the "off" position (in longitudinal section).

Figure 1 shows the depiction of a detail of the longitudinal section through a switchgear 10, and its

housing 12, which has a window 16 near to a switch handle 14.

The pivotally mounted switch handle 14 is connected in a pivot 20 to a first lever 22 of a pair of levers and also to an indicator lever 24. The lever 22, together with a second lever 26, forms a pair of levers which are connected together by a common toggle joint 28.

The joint 28 also serves for connection to a third lever, the supporting lever 30, the other end of which is coupled to a supporting bearing 32 arranged on the housing 12.

Below the supporting bearing 32 there is a fixed bearing 34, which carries a movable contact member 18. The movable contact member 18 is formed by a contact arm 36, to which is fixed on the one hand a contact stud 38 and on the other hand a retaining pivot 21.

The retaining pivot 21 receives the other end of the second lever arm 26, which forms a lever pair with the first lever arm 22.

The movable contact member 18, with a fixed contact

member 19, constitutes a contact set 40, which is closed in the example shown in Figure 1.

The indicator lever 24 has an indicator surface 25, which, corresponding to the switch position shown in Figure 1, lies to one side on the window 16.

In Figure 2 the arrangement disclosed in Figure 1 is shown in the switch position with open contacts 18, 19, the indicator lever 24 with its indicator surface 25 being swung in front of the window 16 in the housing 12 of the switchgear 10.

Moreover the switch actuating mechanism, constituted by the pair of levers 22, 26, the supporting lever 30, the nose formed on the switch handle 14 and also in the retaining pivot 21 on the movable contact member 18, is constructed in such a way that on the one hand the opening of the contact set 40 is sufficiently large, i.e. the contact members 18, 19 lie sufficiently far away from each other, and also on the other hand the indicator lever 24 is swung in front of the window 16 and thus opens up the view of the indicator surface 25.

Figure 3 shows a similar arrangement as already

disclosed in Figure 1, with a switchgear 41 which has a housing 42 and is provided with a switch handle 44 and also directly adjacent to it a window 46.

The conspicuous difference from the arrangement according to Figures 1 and 2 can be seen in the construction of a movable contact member 48 overhung from a bearing. This has a retaining pivot 51, which receives a lever 56, which constitutes a toggle joint 58 with another lever 52, which is connected in a pivot bearing 50 to the switch handle 44, the toggle joint supporting itself by a supporting lever 60 carried in a stationary supporting bearing 62.

The movable contact member 48, which, together with a fixed contact member 49, constitutes a contact set 64, is provided with a carrier frame 66 of insulating material, which carries the retaining pivot 51, and also a conductor member 70 with a contact stud 71.

The retaining pivot 51, to which the lever arm 56 is connected, is also connected pivotally with a fixed bearing 69, via a connecting member 68, by which the movable contact member 48 attains a good mobility.

It is still to be mentioned that an indicator lever 54, which carries an indicator surface 55, is joined to the pivot which connects the switch handle 44 with the lever 52.

The conductor member 70, arranged in a through cavity of the frame 66, serves as the contact carrier, and is acted upon by a spring 72. Furthermore the conductor member has a common pivot axis 74 with the frame 66, around which the conductor member 70 swings as far as the restriction by the frame 66 permits.

The arrangement illustrated in Figure 3 shows the switch condition "closed contacts".

In Figure 4 the arrangement already disclosed in Figure 3 is illustrated, likewise in longitudinal section, the switch handle 44 having been operated so that the switch actuating mechanism, and the movable contact member 48, assume an intermediate position, in which the conductor member 70, with its contact stud 71, is still engaged with the fixed contact member. It is obvious here, however, that the frame 66 and also the conductor member 70 have assumed a new position as compared with Figure 3. The other components correspond to those that have

been thoroughly explained in Figure 3, so that there is a basis for their reference numbers here also.

In Figure 5 likewise, the arrangement disclosed in Figure 3 is shown in longitudinal section, the switch handle 44, in contrast to Figure 3, having now reached its opposite end position, so that the switch actuating mechanism has likewise assumed its end position, which corresponds to the "off" position of the contact set 64.

As a consequence of the further swinging of the frame 66, and hence the displacement of the pivot axis 74, the conductor member 70 swings away with a snap from the fixed contact member 49 so that the contact set 64 is suddenly opened.

Simultaneously with the attainment of the end position of the switch handle 44, the indicator lever 54 with its indicator surface 55 swings in front of the window 46 in the housing 42 of the switchgear 41, by which the "off" position is indicated, i.e. the separation of the contact sets 64.

The arrangements shown in Figure 1 to 5 correspond as regards the principal of their indication of switch position.

The great advantage that is attained with the arrangement according to Figures 3 to 5 lies in the fact that the swinging of the indicator lever 54 only happens at the moment when the movable contact member 48, that is the conductor member 70 with the contact stud 71, has separated from the fixed contact member 49. In this simple manner, a false indication of the switch position can be ruled out, which is of particular importance with regard to electrical safety.

CLAIMS

1. Electric switchgear with at least one contact set which in each case has a fixed and a movable contact member, which cooperates via a switch actuating mechanism, with a switch handle and an indicator lever, which indicator lever indicates the switch position of the movable contact member in a window in the housing of the switchgear, the window being arranged near the switch handle, characterized in that the switch actuating mechanism has a pair of levers which forms a toggle joint which is supported in a fixed bearing via a third lever, that one of the levers of the pair of levers is connected to the switch handle and also to the indicator lever, that the other lever of the pair of levers is coupled to the movable contact member, and that upon opening of the contact set, the indicator lever swings in front of the window.

2. Electric switchgear according to Claim 1, characterized in that the movable contact member is provided with a rigid frame of insulating material, in which a conductor member with a contact stud is movably carried and is acted upon by a spring, and that the conductor member with the contact stud springs into the



opposite switch position after a predetermined swinging movement of the frame.

3. Electric switchgear according to Claim 1 or 2, characterized in that the indicator lever is formed integrally on the one lever of the pair of levers, and forms a fixed angle with it.

4. Electric switchgear according to any one of the preceding Claims, characterized in that the surface of the indicator lever facing the window is contrasted in colour.

5. Electric switchgear substantially as herein described with reference to Figures 1 and 2, or Figures 3 to 5 of the accompanying drawings.

