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Three-phase gasinsulated medium voltage switching device

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The invention relates to a three-phase gasinsulated medium voltage switching device with a disconnecting device between medium voltage levels and voltage transformers with disconnecter contacts which are arranged on a rotatable shaft, in that way, that by a partly rotation of the shaft, the disconnecter contacts switch connected voltage transformers between medium voltage level and ground level.

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To protect voltage transformers (VT) a state-of-the-art solution is to use a disconnecting device, which is opening the electrical connection between the VT and the high voltage circuit of the panel. As the bushings or the contacts for the VT's in three-phase insulated GIS are very often located side-by-side, the axis of the shaft operating the contacts is parallel to the panel front. To allow the operation from the front, the cinematic chain has to be moved by 90 degree. This is done using transmissions or gears inside the encapsulations.

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The disadvantages of the movement of the cinematic chain inside the encapsulation are the following:

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- A high number of components and a complicated mechanics increase the risk of a malfunction inside the gastight compartment, which is hard to fix.

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- At a deforming of the encapsulation (caused e.g. by overpressure) the result can be a displacement of components of the mechanics, which can result in a blocking.

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- The assembly inside the encapsulation is more complicated then outside, due to limited space and access.

5 - The space requirement close to high voltage components can cause dielectric problems.

So it is an object of the invention, to overcome these disadvantages in a very efficient way.

10 According to the invention, a gasinsulated medium voltage switching device having a special construction for the rotatable shaft, which is passing through the side wall of a gastight compartment and/or a housing. Important is that the shaft is passing trough the side wall. By this it is possible to arrange further mechanical operation means perpendicular to the outer side wall area, so that it can be arranged between the
15 compartments or panels which are arranged side by side. As the bushing of the contacts for the voltage transformer in three phase insulated medium voltage switching device are very often located side-by-side, the axis of the shaft operating the contacts is parallel to the front of the housing, which is called panel front.

20 This inventive construction allows the operation from the front of the panel in that way, that the cinematic chain of the manual operating means can be moved by 90 degree, in a very simple and effective way.

Further gears or complicated transmissions are obsolete by this inventive construction.

25 Preferably, the hand driven actuating elements for mechanical operation of the rotation of the shaft are arranged along the outer side wall of the compartment from the backside to the front of the switching device.

30 According to this, an advantageous result is, that in case of an arrangement of several compartments beside, the actuating elements are arranged between the compartments. This is a very compact solution.

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To realize, that the housings (panels) can be arranged very dense side by side, the hand driven actuating elements are constructed out of metal sheet material, in order to be flat enough, that they can be arranged between the compartments.

5 For this, the actuating elements have a lever, which is mechanically coupled between the shaft and the hand driven actuating element in form of a flat rod. So only a space of some millimetres is necessary, to arrange this rod between the panels.

10 Furthermore the rotatable shaft is made of insulating material. This important, to have insulation between several contact arranged on the shaft in electrical three phase use.

By this, the insulating material can be plastic or fiber reinforced material. It is important to have mechanical stiff shaft as well as a good insulation.

15 Furthermore the three contact elements, which are arranged on the rotation shaft, are contacted to voltage transformers by an electrical conductive elements. This conductive element has to be flexible enough, to compensate the partly rotation movement of the contact means.

20 Therefore, an advantageous embodiment of the invention is, that the conductive element is a spring made out of conductive material.

The foregoing and other aspects of the invention will become apparent following the detailed description of the invention when considered in conjunction with the enclosed drawing.

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Figure 1: side view into a Gas insulated switchgear

30 Figure 1 shows a part of a switching device, which is named furthermore panel. The front side 2 is the operating interface for the operating personell. In this housing or panel 4 are gastight compartments with switching devices. A further gastight compartment 5 is arranged at the backside 3 of the panel 1. In this compartment is arranged the disconnecter switch 6 between High- or medium voltage level and the ground level positioned voltage transformer.

For each phase is arranged one voltage transformer.

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The disconnecter switch 6 is driven for all three phases with one common rotatable shaft 8. Between the voltage transformer and the disconnecter switches 6 is arranged a metal spring 11 for each of the three phases.

10 So the figure shows a detail of the gastight compartment 5 at the backside 3 of the panel. Figure 2 shows the compartment in an open view into, that means through the normally gastight closed wall of the compartment 5. In this compartment 5 are arranged the disconnecter switches or contacts 6. These are arranged for all three phases on a rotatable shaft 8 which is made out of an insulating material. The shaft 8 extends
15 through the gastight SIDE-wall of this compartment. There are located mechanical means 9 in Form of a lever, which corresponds with a further hand driven actuating element 10 in form of a flat rod. This rod is arranged between two panels, which stand side by side. The rod is extended from the lever up to the front side 2 of the panel 1. The rod 10 is made of flat metal sheet material, in order to be flat enough, to be
20 arranged in that compact and effective way between the panels.

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Position numbers:

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| | 1 | Three-phase insulated medium voltage switchgear |
| | 2 | Front side of the housing (panel) |
| 5 | 3 | Back side of the housing (panel) |
| | 4 | Compartment |
| | 5 | Compartment |
| | 6 | Disconnecter elements or contacts |
| | 7 | Voltage transformer |
| 10 | 8 | Rotatable shaft |
| | 9 | lever |
| | 10 | hand driven actuating element |
| | 11 | conductive spring |

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Claims

- 1 Three-phase gasinsulated medium voltage switching device with a disconnecting device between medium voltage levels and voltage transformers with disconnecter contacts which are arranged on a rotatable shaft, in that way, that by a partly rotation of the shaft, the disconnecter contacts switch connected voltage transformers between medium voltage level and ground level,
characterized in,
that the shaft is passing through the side wall of a gastight compartment and/or a housing and in that the three contact elements, which are arranged on the rotation shaft, are contacted to the voltage transformers by an electrical conductive element and that the conductive element is extendable, like a spring, in order to compensate the rotation movement of the shaft.
- 2 Three-phase gasinsulated medium voltage switching device according to claim 1,
characterized in,
that hand driven actuating elements for mechanical operation of the rotation of the shaft are arranged along the outer side wall of the compartment and/or from the backside to the front of the switching device.
- 3 Three-phase gasinsulated medium voltage switching device according to claim 1,
characterized in,
that in case of an arrangement of several switchgears beside, the actuating elements are arranged between the switchgears.
- 4 Three-phase gasinsulated medium voltage switching device according to claim 1,
characterized in,
that the hand driven actuating elements are constructed out of metal sheet material, in order to be flat enough, that they can be arranged between the compartments and/or housings.

5. Three-phase gasinsulated medium voltage switching device according to claim 4,
characterized in,
that the actuating elements have a lever, which is mechanically coupled
between the shaft and the hand driven actuating element in form of a flat rod.
6. Three-phase gasinsulated medium voltage switching device according to one of the
aforesaid claims, **characterized in,**
that the shaft is made of insulating material.
7. Three-phase gasinsulated medium voltage switching device according to claim 6,
characterized in,
characterized in that the insulating material is fiber reinforced plastic.
8. Three-phase gas insulated medium voltage switching device, according to one of the
aforesaid claims,
characterized in,
that the voltage transformers are arranged in a gastight compartment of the
switching device.
9. Three-phase gasinsulated medium voltage switching device, according to one of
the aforesaid claims,
characterized in,
that the voltage transformers are arranged outside of the gastight compartment, but
connected with the same.