

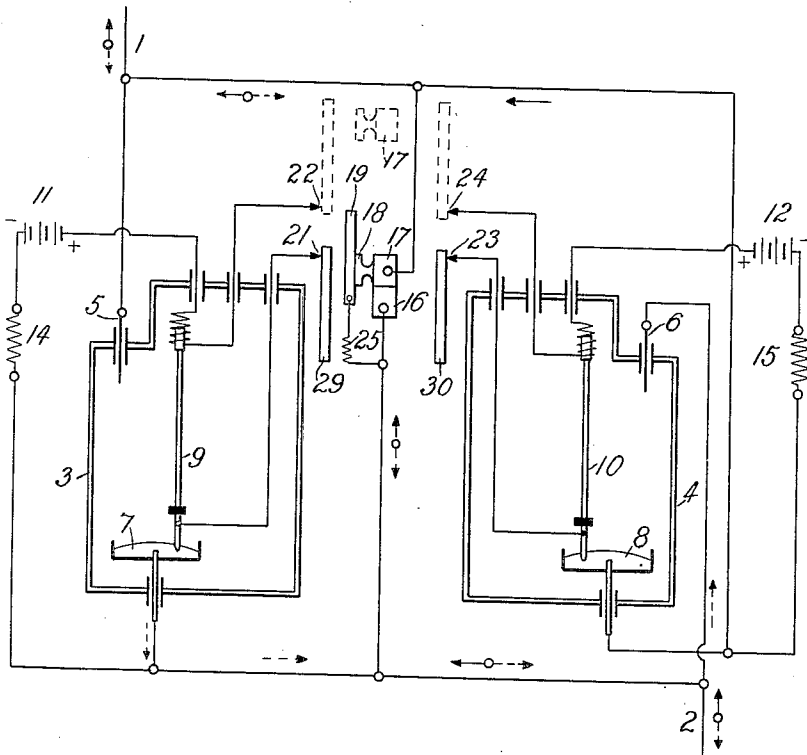
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H. EGG

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VACUUM SWITCH FOR ALTERNATING CURRENTS

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INVENTOR.

Hartmann Egg

by Spear, Middleton, Ducas & Hall
ATTY.

UNITED STATES PATENT OFFICE

HARTMANN EGG, OF ZURICH, SWITZERLAND, ASSIGNOR TO THE FIRM MASCHINEN-FABRIK OERLIKON, OF OERLIKON, NEAR ZURICH, SWITZERLAND, A CORPORATION OF SWITZERLAND

VACUUM SWITCH FOR ALTERNATING CURRENTS

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This invention relates to a vacuum switch for alternating currents.

In high frequency practice it is known to switch alternating currents by means of vacuum valves, in such a manner, that for each semi-cycle one vacuum valve is employed, in which case by virtue of the starting-up and continuous excitation of the valves, the alternating current is switched on and maintained, whilst the interruption of the alternating current is effected by interrupting the excitation.

If this arrangement is employed for switching heavy currents, the disadvantage is encountered that in the vacuum valves in consequence of the arc voltage, a continuous loss is encountered and must be led off in the form of heat. The vacuum valves must consequently be dimensioned for a correspondingly high continuous load. These disadvantages can be overcome by short-circuiting the vacuum valves under normal conditions of operation by means of mechanical switches and initiating the starting-up and excitation of said valves immediately before the switching operation is commenced and interrupting same after the mechanical switch has opened. This measure has the result that the vacuum valves have to conduct the current only during the period during which the mechanical switch is open, that is to say during a few semi-cycles, so that no appreciable loss of energy and heating takes place. It is consequently possible to employ vacuum valves which are dimensioned for relatively small permanent currents, since such valves can be loaded without difficulty for a short period with a multiple of their permanent load current.

The mechanical switch is for its own part only dimensioned for a switching off load which corresponds to the arc voltage of the vacuum valves.

According to the present invention, the initiation of the starting-up and excitation of the vacuum valves as well as the interruption thereof at the termination of the movement of the mechanical switch, is effected in a positive manner in dependence on the position on the mechanical switch, in such a manner that

the interruption of the current by this latter cannot take place before the starting-up and excitation of the vacuum valves has been initiated and completed, and that this latter is interrupted only after the current has been interrupted by the mechanical switch to such an extent that arcing across the latter is no longer possible.

In order more clearly to understand the invention, reference is made to the accompanying drawing which illustrates diagrammatically and by way of example one embodiment of an arrangement according to the invention.

In said drawing:—

1 and 2 indicate respectively the input and output leads of the alternating current which is to be interrupted. 3 and 4 indicate the vacuum valves which are constituted as mercury vapour valves. 5 and 6 are the anodes, 7 and 8 the mercury cathodes of the respective valves, the permeability of which is indicated by the direction of the arrows. 9 and 10 indicate electromagnetically actuated starting-up devices which after completion of the starting-up simultaneously act as continuous exciters by means of the direct current supplied by the batteries 11 and 12. The resistances 14 and 15 serve to limit the starting-up and excitation current. 16 is the fixed and 17 the movable contact of the mechanical switch. These contacts 16 and 17 are in parallel with the valves 3 and 4. 18 is an auxiliary contact which moves upwardly with the contact 17 on switching off and in so doing glides on the immovable contact rail 19 until movable contact rails 29 and 30, which are positively mechanically connected with the movable contact 17 but insulated from each other and from said contact 17, have interconnected stationary contacts 21, 22 and 23, 24 and thus effected the starting-up and excitation of the valves. The valves are thus completely energized prior to the opening of the contacts 18 and 19.

The flow of current now takes place through the valves, and the auxiliary contact 18 can now glide off from the contact rail 19 without danger of arcing. When the contact 17 has receded so far from the contact

- 16 that arcing is definitely out of the question, the contact rails 29 and 30 interrupt the excitation, whereupon the current is extinguished in the valves. On switching-on, the valves first come into operation. 25 indicates a small resistance which serves to take the load off the auxiliary contact 18 when the switch is closed and to divert the arcing voltage into the vacuum valves.
- 10 Both valves with their current leads mutually insulated in a suitable manner may be combined into a single vacuum chamber. Moreover a plurality of vacuum valves may be connected in cascade.
- 15 I claim:—
1. In a vacuum switch for alternating currents, vacuum valves permeable to opposite semi-cycles of said current connected in parallel, starting-up and excitation circuits of said valves, switches in said starting-up and excitation circuits, and mechanical switching means arranged in parallel with said valves, said switches closing said starting-up and excitation circuits prior to opening of said mechanical switching means and opening said excitation circuits after opening beyond arcing range of said mechanical switching means.
2. In a vacuum switch for alternating currents, vacuum valves permeable to opposite semi-cycles of said current connected in parallel, starting-up and excitation circuits of said valves, contacts in said circuits, contact rails movable across said circuit contacts, a switch contact connected to one side of said valves, and a movable switch contact connected to the opposite side of said valves and mechanically connected to said switch rails, said contact rails and movable switch contact moving in unison to interconnect said circuit contacts prior to interruption of direct electric interconnection of said switch contacts and to disconnect said circuit contacts on recession of said switch contacts beyond arcing range.
3. In a vacuum switch for alternating currents, vacuum valves permeable to opposite semi-cycles of said current connected in parallel, starting-up and excitation circuits of said valves, contacts in said circuits, contact rails movable across said circuit contacts, a switch contact connected to one side of said valves, a contact rail, a resistance interconnecting said switch contact and said contact rail, a movable switch contact connected to the opposite side of said valves and mechanically connected to said movable switch rails, and an auxiliary contact connected to said movable switch contact and contacting with said resistance-connected contact rail, said first mentioned contact rails, said movable switch contact and said auxiliary contact moving in unison to interconnect said circuit contacts prior to said auxiliary contact leaving said resistance-connected contact rail and to disconnect said circuit contacts on recession of said switch contacts beyond arcing range.
- In testimony whereof, I affix my signature.
- HARTMANN EGG.

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