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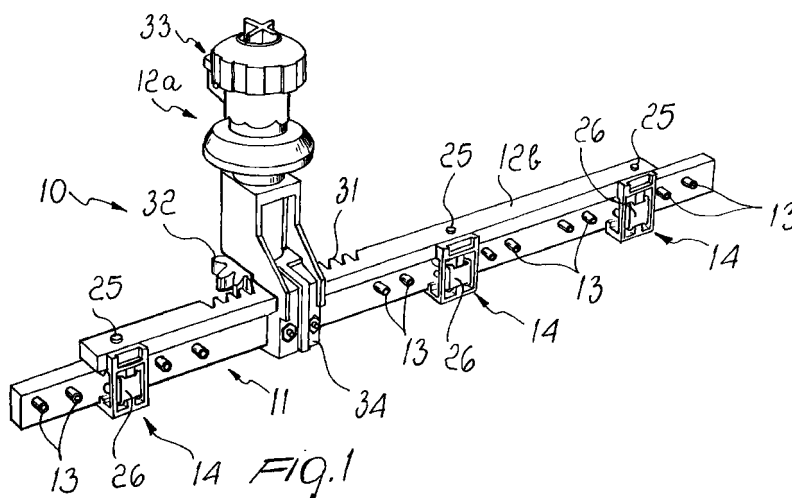
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(54) **Tap changer for electric transformers**

(57) A tap changer (10) particularly for electric transformers, comprising a rod-like body (11) which rigidly supports fixed pin-like contacts (13) arranged at right angles and in series along the rod-like body, the rod-like body constituting a sliding guide for a sliding block (12b) associated with actuation means which can be actuated by the user, the sliding block having at least one support (14) for a corresponding pair of skid-like movable contacts which are slideable on the fixed contacts (13) in mutually opposite positions and are adapted to interfere with two of the fixed contacts (13) alternately and in succession; the at least one support

(14) comprises a base (16) from which two mutually parallel walls (17) for sliding on the rod-like body protrude, the base being shaped so as to form seats for the two movable contacts, each one of the movable contacts being shaped so as to form at least one anchoring tab which is shaped complementarily to a corresponding guide for retaining the base, a spring (23) being provided which is shaped so as to have two pairs of arms which force the movable contacts (15) toward each other.



Description

[0001] The present invention relates to a tap changer for electric transformers.

[0002] Conventional electric tap changers for transformers are substantially composed of a rod-like body which rigidly supports fixed pin-like contacts which are arranged at right angles in series along said body.

[0003] The rod-like body is the sliding guide for a sliding block which is associated with actuation means which can be actuated by the user; the sliding block is provided with at least one support for a corresponding pair of skid-like movable contacts which are slideable on the fixed contacts in mutually opposite positions and are adapted to interfere with two of the contacts alternately and in succession.

[0004] Currently commercially available tap changers are substantially produced by shaping a metal lamina and as a whole are structurally rather complicated and composed of many parts.

[0005] Accordingly, their manufacture is rather expensive and requires a lot of work.

[0006] The aim of the present invention is to provide a tap changer for electric transformers which solves the drawbacks noted above in conventional devices, particularly achieving greater constructive simplicity and a reduced number of components.

[0007] In relation to this aim, an important object of the present invention is to provide a tap changer which nonetheless allows maximum functionality and strength with respect to commercially available tap changers.

[0008] Another object of the present invention is to provide a tap changer which, as a whole, is adapted to reduce production costs and times.

[0009] Another object of the present invention is to provide a tap changer which can be manufactured with conventional technologies and systems.

[0010] This aim, these objects and others which will become apparent hereinafter are achieved by a tap changer particularly for electric transformers which comprises a rod-like body which rigidly supports fixed pin-like contacts arranged at right angles and in series along said rod-like body, said rod-like body constituting a sliding guide for a sliding block associated with actuation means which can be actuated by the user, said sliding block having at least one support for a corresponding pair of skid-like movable contacts which are slideable on said fixed contacts in mutually opposite positions and are adapted to interfere with two of said fixed contacts alternately and in succession, characterized in that said at least one support is constituted by a base from which two mutually parallel walls for sliding on said rod-like body protrude, said base being shaped so as to form seats for said two movable contacts, each one of said movable contacts being shaped so as to form at least one anchoring tab which is shaped complementarily to a corresponding guide for retaining said base, a spring being provided which is shaped so as to

have two pairs of arms which force said movable contacts toward each other.

[0011] Further characteristics and advantages of the present invention will become apparent from the description of an embodiment thereof, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a perspective view of a tap changer according to the invention;

Figure 2 is a perspective view of part of the tap changer of Figure 1;

Figure 3 is a perspective exploded view of a detail of the tap changer of Figure 1;

Figure 4 is a sectional view of the detail of Figure 3; Figure 5 is a sectional view of another detail of the tap changer of Figure 1;

Figure 6 is a perspective exploded view of the detail of Figure 5;

Figure 7 is a perspective exploded view of another embodiment of the components of the upper part of Figure 6.

[0012] With reference to Figures 1 to 6, a tap changer for electric transformers according to the invention is generally designated by the reference numeral 10.

[0013] The tap changer 10 comprises a rod-like body 11 which has a substantially rectangular transverse cross-section and supports fixed pin-like contacts 13 which are rigidly coupled thereto and are arranged at right angles in series along it.

[0014] The rod-like body 11 constitutes a sliding guide for a sliding block 12b which is associated with actuation means, generally designated by the reference numeral 12a and described in greater detail hereinafter, which can be actuated by the user.

[0015] The sliding block 12b carries at least one support and, in this case, three supports 14, one for each corresponding pair of movable skid-like contacts 15 which are slideable on said fixed contacts 13 in mutually opposite positions and are adapted to interfere with two of the fixed contacts alternately and in succession.

[0016] Each one of the supports 14 comprises a base 16 from which two mutually parallel walls 17 for sliding on the rod-like body protrude.

[0017] In particular, the walls 17 have, on their mutually opposite inner faces, ribs 18 which as a whole are adapted to form guides 19 for sliding with respect to the body 11.

[0018] The base 16 is also shaped so as to form a slot 24 for inserting (one at a time) two movable contacts 15, each of which comprises, in this case, a strip 21 made of conducting material which is shaped so as to form, again in this case, two tabs 22 which have a substantially dovetail edge which is shaped complementarily to corresponding regions of the base 16 which

constitute a corresponding number of retention guides for them.

[0019] The tap changer 10 further comprises, for each one of the supports 14, a corresponding locking spring, generally designated by the reference numeral 23, which is adapted to force toward each other two corresponding movable contacts 15, facilitating interference with the interposed fixed contacts 13.

[0020] In this embodiment, the base 16 is substantially frame-like.

[0021] Moreover, the slot 24 for the insertion of the movable contacts 15 is such that once said movable contacts have been inserted and the spring 23 has been applied, disengagement is not possible.

[0022] Furthermore, a pin 25 for anchoring to the sliding block 12b protrudes from each one of the supports 14.

[0023] The spring 23 is instead formed by blanking and plastic deformation from a metal lamina 26 which has four mutually independent arms 27, each of which has a hook-shaped end 28 for coupling to corresponding seats 29 formed in corresponding movable contacts 15.

[0024] In particular, each one of the movable contacts 15 also has, on mutually opposite edges, curved regions 30 which are adapted to facilitate sliding on said fixed contacts 13.

[0025] The actuation means 12a are constituted, in this embodiment, by a longitudinal rack 13 which is integrated with the sliding block 12b and is coupled to a pinion 32 which is fixed to a composite knob 33 which is fixed to the transformer, of which only part of the frame 12c is visible, and which can be actuated manually by the operator.

[0026] The composite knob 33 also comprises, again in this embodiment, a shaped support 34 for the body 11, with an axial hole 35 in which a shaft 36 is rotatably inserted; the end of the shaft 36 that is directed toward the inside of the transformer 37 is fixed to the pinion 32, while the other end 38 is fixed to controlled movement means which can be actuated manually by the operator.

[0027] Such movement means comprise, in a substantially coaxial arrangement, a cap 39 (the knob proper), which is actually available for actuation by the user and is associated with a locking element 40 and, thanks to the interposition of an elastic counterthrust element constituted in this case by a helical spring 41, an adjustable positioning element which is substantially constituted by a flanged cup 42 which has an open bottom and a corresponding shaped rim so as to form a series of substantially semicircular protrusions 43 which are kept inserted, until the operator acts in a different direction of rotation, in corresponding seats 44 formed circumferentially in an annular gasket presser 45.

[0028] In particular, the locking element 40 is constituted in this case by an externally threaded tubular portion 46 which has a screw-and-nut coupling with a

threaded hole 47 formed coaxially in the locking head 39.

[0029] A head 48 is also associated with the threaded portion 46 and can be actuated by the user by means of adapted cross-shaped ribs 49.

[0030] The composite knob 33 furthermore has, in this case, annular sealing gaskets, all of which are designated by the reference numeral 50.

[0031] There is also a device for locking the composite knob 33 which comprises a tab 51 protruding radially from the cup 42 and has an axial protrusion 52 inserted in an adapted through hole 53 of a tab 54 which protrudes radially from the cap 39.

[0032] The axial protrusion 52 has two through holes 55 at different levels in which it is possible to insert a padlock, not shown, which locks the movement of the cup 42.

[0033] With reference to Figure 7, in another embodiment the locking element 40 is replaced with two combined elements: an externally threaded bush 40a, to be coupled to the thread of the hole 47, and a knob 40b, to be coupled to the bush 40a.

[0034] The bush in fact has a cross-shaped axial through hole 40c in which a complementarily shaped tab 40d of the knob 40b fits.

[0035] The knob 40b also has a frustum-shaped external protrusion 40e which couples by snap action and elastic deformation with an undercut seat, not shown in the Figures, of the cap 39, with which it is accordingly stably associated.

[0036] In practice it has been observed that the present invention has achieved the intended aim and objects.

[0037] It should in fact be noted that the overall structure of the tap changer according to the invention is much simpler than currently commercially available tap changer structures.

[0038] It should also be noted that the constructive simplicity never detracts from the functionality and strength of the assembly.

[0039] It should also be noted that the structure of the tap changer allows easy adaptability to various kinds of transformer even if already in production.

[0040] It should also be noted that the composite knob 33 is adapted for a plurality of frame thicknesses because axial adaptation of the gasket presser 45 occurs, raising or lowering the cup 42, the spring 41 and the cap 39.

[0041] It should also be noted that if the protrusions 43 are not correctly inserted in the corresponding seats 44 when the cap 39 is operated, the structure of the tap changer is such that when the plug 40, however provided, is fixed, the protrusions 43 are forced toward the correct position.

[0042] Accordingly, the arrangement of the movable contacts 15 is correct with respect to the fixed contacts 13.

[0043] Attention is also drawn to the constructive

effectiveness of the movement means that can be actuated by the user.

[0044] The present invention is susceptible of modifications and variations, all of which are within the scope of the inventive concept.

[0045] The technical details may be replaced with other technically equivalent elements.

[0046] The materials and the dimensions may be any according to the requirements.

[0047] The disclosures in Italian Utility Model Application No. PD98U000094 from which this application claims priority are incorporated herein by reference.

[0048] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A tap changer particularly for electric transformers, which comprises a rod-like body which rigidly supports fixed pin-like contacts arranged at right angles and in series along said rod-like body, said rod-like body constituting a sliding guide for a sliding block associated with actuation means which can be actuated by the user, said sliding block having at least one support for a corresponding pair of skid-like movable contacts which are slideable on said fixed contacts in mutually opposite positions and are adapted to interfere with two of said fixed contacts alternately and in succession, characterized in that said at least one support comprises a base from which two mutually parallel walls for sliding on said rod-like body protrude, said base being shaped so as to form seats for said two movable contacts, each one of said movable contacts being shaped so as to form at least one anchoring tab which is shaped complementarily to a corresponding guide for retaining said base, a spring being provided which is shaped so as to have two pairs of arms which force said movable contacts toward each other.
2. The tap changer according to claim 1, characterized in that it comprises at least two supports, each located at a corresponding group of said movable contacts.
3. The tap changer according to claim 1, characterized in that said base has, proximate to its edges, at least one recess for the individual insertion of said corresponding movable contacts.
4. The tap changer according to claim 2, characterized in that each one of said supports has a pin for

anchoring to said sliding block and for guiding.

5. The tap changer according to claim 1, characterized in that each one of said movable contacts has lateral curved regions which are adapted to facilitate sliding on said fixed contacts.
6. The tap changer according to claim 1, characterized in that each one of said movable contacts has two tabs, each tab being substantially dovetail-shaped.
7. The tap changer according to claim 6, characterized in that said base is substantially shaped so as to form edge portions which are shaped substantially complementarily with respect to said tabs.
8. The tap changer according to claim 1, characterized in that said spring is provided with four hook-shaped arms for coupling to corresponding seats formed in said corresponding movable contacts.
9. A tap changer comprising a rod-like body provided with fixed pin-like contacts rigidly coupled thereto, said contacts being arranged at right angles in series along said body, said rod-like body constituting a guide for the sliding of a sliding block which is associated with actuation means which can be actuated by the user, said sliding block supporting at least one support for a corresponding pair of skid-like movable contacts which are slideable on said fixed contacts in mutually opposite positions and are adapted to interfere alternately and in succession with two of said fixed contacts, said tap changer being characterized in that said actuation means comprise a longitudinal rack which is coupled to a corresponding pinion which is fixed to a composite knob which can be actuated by the operator and is rigidly coupled to the transformer.
10. The tap changer according to claim 9, characterized in that said rack is integrated in said sliding block.
11. The tap changer according to claim 9, characterized in that said composite knob comprises a contoured support for said rod-like body, with an axial hole in which a shaft is rotatably inserted, the end of said shaft that is directed toward the inside of said transformer being fixed to said pinion, the other end being associated with controlled movement means which can be actuated by the operator.
12. The tap changer according to claim 11, characterized in that said movement means comprise, in a coaxial arrangement, a locking head which can be actuated by the user and is associated with a locking element and, thanks to the interposition of an

elastic counterthrust element, with an adjustable positioning element which is constituted by a cup which has an open bottom and a corresponding edge shaped so as to form a series of substantially semicircular protrusions which are kept inserted by the action of said counterthrust element in corresponding seats formed circumferentially in an annular gasket presser element. 5

13. The tap changer according to claim 12, characterized in that said counterthrust element is constituted by a conical helical spring. 10

14. The tap changer according to claim 13, characterized in that said locking element is composed of a threaded tubular portion which is coupled, by means of a screw-and-nut coupling, to a threaded hole formed axially in said locking head, said threaded portion being associated with a head which can be actuated manually by the operator by means of cross-shaped ribs. 15 20

15. The tap changer according to claim 13, characterized in that said locking element comprises two combined components, an externally threaded bush to be coupled to the thread of the internal hole of said cap and a knob to be coupled to said bush, said bush having a cross-shaped axial through hole in which a complementarily shaped tab of said knob fits, said knob also having a frustum-shaped external protrusion which couples by snap action and elastic deformation to an undercut seat of said cap. 25 30

16. The tap changer according to claim 15, characterized in that it comprises a device for locking said knob comprising a tab which protrudes radially from said cup and has an axial protrusion which is inserted in an adapted through hole of a tab which protrudes radially from said cap, said axial protrusion having at least one through hole in which it is possible to insert a padlock which locks the movement of said cup. 35 40

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