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

Stufenschalter für elektrische Transformatoren

Sélecteur de prises pour transformateur électrique

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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. For example, FR-A-2 401 498 discloses the features of a tap changer according to the preamble of claim 1.

[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 correspond-

ing 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] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increas-

ing 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 (10) particularly for electric transformers, which comprises a rod-like body (11) which rigidly supports fixed pin-like contacts (13) arranged at right angles and in series along said rod-like body (11) said rod-like body (11) constituting a sliding guide of a sliding block (12b) associated with actuation means which is adapted to be actuated by the user, said sliding block (12b) having at least one support (14) for a corresponding pair of skid-like movable contacts (15) which are slideable on said fixed contacts (13). In mutually opposite positions and are adapted to interfere with two of said fixed contacts (13) alternately and in succession, said at least one support (18) comprising a base (16) from which two mutually parallel walls (17) for sliding on said rod-like body (11) protrude, said base (16) being shaped so as to form seats for said two movable contacts (15), each one of said movable contacts (15) being shaped so as to form at least one anchoring tab (22) which is shaped complementarily to a corresponding guide for their retention to said base (16), **characterized by** a spring (23) being provided which is shaped so as to have two pairs of arms (27) which force said movable contacts (15) toward each other.
2. The tap changer (10) according to claim 1, **characterized in that** it comprises at least two supports (14), each located at a corresponding group of said movable contacts (15).
3. The tap changer (10) according to claim 1, **characterized in that** said base (16) has, proximate to its edges, at least one recess (24) for the individual insertion of said corresponding movable contacts (15).
4. The tap change (10) according to claim 2, **characterized in that** each one of said supports (14) has a pin (25) for anchoring to said sliding block (12b) and for guiding.
5. The tap change (10) according to claim 1, **characterized in that** each one of said movable contacts (15) has lateral curved regions (30) which are adapted to facilitate sliding on said fixed contacts (13).
6. The tap changer (10) according to claim 1, **characterized in that** each one of said movable contacts (15) has two tabs (22), each tab (22) being substantially dovetail-shaped.

7. The tap changer (10) according to claim 6, **characterized in that** said base (16) is substantially shaped so as to form edge portions which are shaped substantially complementarily with respect to said tabs (22).
8. The tap changer (10) according to claim 1, **characterized in that** said spring (23) is provided with four hook-shaped arms (27) for coupling to corresponding seats (29) formed in said corresponding movable contacts (15).

Patentansprüche

1. Stufenschalter (10), insbesondere für elektrische Transformatoren, mit einem stabartigen Körper (11), an dem stiftartige Festkontakte (13) unter rechten Winkeln und in einer Reihe längs dem stabartigen Körper (11) starr angeordnet sind, wobei der stabartige Körper (11) eine Schiebeführung eines Schiebers (12b) bildet, der mit vom Benutzer betätigbaren Betätigungseinrichtungen versehen ist und mindestens einen Halter (14) für ein entsprechendes Paar von gleitschuhartigen bewegbaren Kontakten (15) aufweist, die so gestaltet sind, dass sie an einander gegenüberliegenden Stellen der Festkontakte (13) gleiten und abwechselnd und nacheinander an zwei der Festkontakte (13) angreifen, wobei der mindestens eine Halter (14) eine Basis (16) aufweist, von der zwei zueinander parallele, an dem stabartigen Körper (11) gleitende Wände (17) ausgehen, wobei die Basis (16) so gestaltet ist, dass sie für die beiden bewegbaren Kontakte (15) Sitze bildet, und wobei jeder der bewegbaren Kontakte (15) mit mindestens einer Verankerungsnase (22) ausgebildet ist, die komplementär zu einer entsprechenden Führung zur Halterung an der Basis (16) geformt ist, **gekennzeichnet durch** eine Feder (23) mit zwei Paaren von Armen (27), die die bewegbaren Kontakte (15) aufeinanderzu drücken.
2. Stufenschalter (10) nach Anspruch 1, **dadurch gekennzeichnet, dass** er mindestens zwei Halter (14) aufweist, deren jeder an einer entsprechenden Gruppe der bewegbaren Kontakte (15) angeordnet ist.
3. Stufenschalter (10) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Basis (16) nahe ihren Kanten mindestens eine Vertiefung (24) zum individuellen Einsetzen der entsprechenden bewegbaren Kontakte (15) aufweist.
4. Stufenschalter (10) nach Anspruch 2, **dadurch gekennzeichnet, dass** jeder der Halter (14) einen Stift (25) zur Verankerung an dem Schieber (12b) und zur Führung aufweist.

5. Stufenschalter (10) nach Anspruch 1, **dadurch gekennzeichnet, dass** jeder der bewegbaren Kontakte (15) gekrümmte Seitenbereiche (30) zum leichten Gleiten an den Festkontakten (13) aufweist.
6. Stufenschalter (10) nach Anspruch 1, **dadurch gekennzeichnet, dass** jeder der bewegbaren Kontakte (15) zwei im wesentlichen jeweils schwalbenschwanzförmige Nasen (22) aufweist.
7. Stufenschalter (10) nach Anspruch 6, **dadurch gekennzeichnet, dass** die Basis (16) mit im wesentlichen komplementär zu den Nasen (22) geformten Kantenteilen ausgebildet ist.
8. Stufenschalter (10) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Feder (23) mit vier hakenförmigen Arme (27) zum Ankoppeln an entsprechende, in den jeweiligen bewegbaren Kontakten (15) ausgebildete Sitze (29) versehen ist.

Revendications

1. Commutateur à prises de réglage (10), en particulier pour des transformateurs électriques, qui comprend un corps de type tige (11) qui supporte fermement des contacts de type broche fixes (13) agencés à angle droit et en série le long dudit corps de type tige (11), ledit corps de type tige (11) constituant un guide coulissant d'un bloc coulissant (12b) associé à un moyen d'actionnement, qui est conçu pour être actionné par l'utilisateur, ledit bloc coulissant (12b) ayant au moins un support (14) pour une paire correspondante de contacts mobiles de type patin (15) qui peuvent coulisser sur lesdits contacts fixes (13) dans des positions mutuellement opposées et sont conçus pour interférer avec deux desdits contacts fixes (13) de manière alternée et à la suite, ledit au moins un support (10) comprenant une base (16) à partir de laquelle font saillie deux parois mutuellement parallèles (17) pour coulisser sur ledit corps de type tige (11), ladite base (16) étant configurée de manière à former des surfaces d'appui pour lesdits deux contacts mobiles (15), chacun desdits contacts mobiles (15) étant configuré de manière à former au moins une languette d'ancrage (22) qui est configurée de manière complémentaire à un guide correspondant permettant de les retenir sur ladite base (16), **caractérisé en ce qu'un** ressort (23) est prévu, lequel est configuré de manière à comporter deux paires de bras (27) qui forcent lesdits contacts mobiles (15) en direction l'un de l'autre.
2. Commutateur à prises de réglage (10) selon la revendication 1, **caractérisé en ce qu'il** comprend au moins deux supports (14), chacun étant disposé au niveau d'un groupe correspondant desdits contacts

mobiles (15).

3. Commutateur à prises de réglage (10) selon la revendication 1, **caractérisé en ce que** ladite base (16) comporte, à proximité de ses bords, au moins un évidement (24) pour insérer individuellement lesdits contacts mobiles (15) correspondants.
4. Commutateur à prises de réglage (10) selon la revendication 2, **caractérisé en ce que** chacun desdits supports (14) comporte une broche (25) permettant l'ancrage sur ledit bloc coulissant (12b) et le guidage.
5. Commutateur à prises de réglage (10) selon la revendication 1, **caractérisé en ce que** chacun desdits contacts mobiles (15) comporte des régions incurvées latérales (30) qui sont conçues pour faciliter le coulissement sur lesdits contacts fixes (13).
6. Commutateur à prises de réglage (10) selon la revendication 1, **caractérisé en ce que** chacun desdits contacts mobiles (15) comporte deux languettes (22), chaque languette (22) étant sensiblement en forme de queue d'aronde.
7. Commutateur à prises de réglage (10) selon la revendication 6, **caractérisé en ce que** ladite base (16) est sensiblement configurée de manière à former des parties de bord qui sont configurées de manière sensiblement complémentaire par rapport auxdites languettes (22).
8. Commutateur à prises de réglage (10) selon la revendication 1, **caractérisé en ce que** ledit ressort (23) est doté de quatre bras en forme de crochet (27) permettant l'accouplement avec les surfaces d'appui (29) correspondantes formées dans lesdits contacts mobiles (15) correspondants.





