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(54) Medium voltage circuit breaker arrangement

(57) The invention relates to Medium voltage circuit breaker arrangement comprising several switching pols (1a - 1c) which are adjacently mounted on a support structure (2), wherein the distance between the switching poles (1a - 1c) can be adjusted at the end of the production process, wherein each switching pole (1a - 1 c) is fastened on a corresponding mouting part (6a - 6c) and the mounting parts (6a - 6c) are attached one to another via intermediate connection parts (7a - 7b) for defining the distance between the switching poles (1a - 1c).

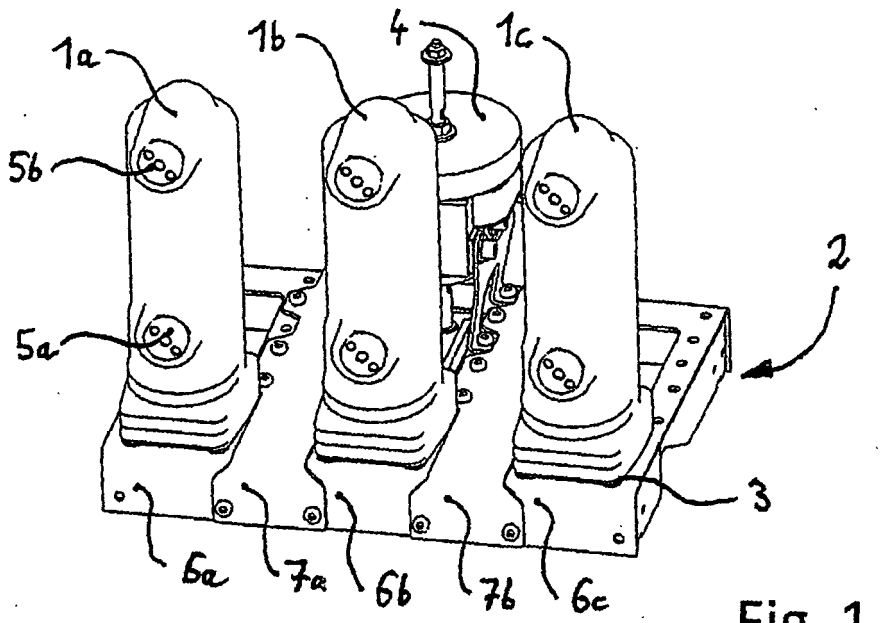

Fig. 1

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Description

FIELD OF THE INVENTION

[0001] The invention relates to a medium voltage circuit breaker arrangement comprising several switching poles which are adjacently mounted on a support structure, wherein the distance between the switching poles depends on the electrical insulating requirements or on customer requirements.

BACKGROUND OF THE INVENTION

[0002] Medium voltage circuit breakers according to the present invention are used for switching 1-72kV of a high current level. These special circuit breakers are preferably used in electrical networks to interrupt short circuit currents as well as load currents under difficult load impedances. The number of switching poles occurs with the number of poles in the electrical network. Mostly, a three pole arrangements is provided. Each switching pole usually comprises vacuum or special gas filled interrupter inserts containing a pair of corresponding electrical contacts, wherein one of both contacts is axial moveable arranged in order to form an electrical switch. The switching pole interrupts the current by creating and extinguishing the arc in the closed vacuum or gas filled container. Modern vacuum circuit breakers tend to have a longer life expectancy than conventional air circuit breakers. Generally, the present invention is not only applicable to vacuum or gas filled circuit breakers having a chamber filled sulphur-hexafluoride gas, but also for conventional air circuit breakers.

[0003] The WO 99/31776A1 discloses an air-insulated withdrawal circuit breaker arrangement for medium voltage applications. The functional features are "connect", "disconnect" and "earth". The circuit breaker arrangement contains a switching module which consists of function-orientated modular units, namely a base unit, a switching pole unit comprising preferably three switching poles, and a drive unit for actuating the moveable electrical contacts of each switching pole simultaneously. The base unit forms a supporting structure for the medium voltage circuit breaker arrangement. On an upper mounting surface of the base unit, the drive unit as well as the pole unit is attached in such a way that it can move in a straight line.

[0004] The arrangement of the foregoing mentioned units depends on electrical insulating requirements in order to ensure the electrical safety. Especially the side by side arrangement of the switching poles with its electrical terminals is critical. Standard pole distances of 150, 210 and 275mm depending on the electrical voltage or on customers requirements are defined.

[0005] For each pole distance a corresponding support structure is needed. All variance of supporting structures have to be kept in stock in large numbers. Practical experience from the past teaches that the required number of each variant is difficult to predict as to the ordered types tend to change frequently. Furthermore, the required delivery time for circuit breakers according to the present invention is further than the production time for the individual supporting structures.

SUMMARY OF THE INVENTION

[0006] It is an object of the invention to provide a universal supporting structure for a medium voltage circuit breaker arrangement which is suitable for a large number of different pole distances.

[0007] This object is achieved by the subject matter of the independent Claim 1. Further exemplary embodiments are evident from the dependent Claims.

[0008] According to the invention each switching pole of a medium voltage circuit breaker is fastened on a corresponding mounting part and these mounting parts are attached one to another via intermediate connecting parts for defining the required distance between the switching poles.

[0009] In other words, the invention provides a supporting structure with standard mounting parts for switching pole. In contrast, the intermediate connection parts form a kind of bridge between two adjacent mounting parts, which are available in the required variance in order to define the needed distance between the switching poles. Thus, not the whole support structure has to be produced in the required number of different variants, but only the intermediate connection parts, which are relatively easy to manufacture and store. Thus, the present invention proposes an adjustable supporting structure for a medium voltage circuit breaker, which can form the housing for the circuit breaker. During the assembly process the circuit breaker is adjusted to always the same, for example the smallest, pole distance.

[0010] Alternatively of additionally featured is also disclosed, that each switching pole has an own drive, and the drives of all phases are mechanically coupled with the next switching pole, by a common drive shaft, or a commonly aligned drive shaft arrangement for defining the distance between the switching poles, as well as to synchronize the switching of alle switching poles. In this special very advantageous embodiment the dirve shaft arrangment has a double function. One is to alligne the switches in an adjustable distance. The second function is, that each drive has an own drive, so that each driving force for each switch is generated in each switch as its own. But the coupling of the driveshaft arrangement synchronize the functionally independent drives of each switches together, in order to synchronize a simulatious switching action. So the coupled driveshafts don't introduce the driving force, but only synchronize the 3 drives to a common switching procedure with a low coupling force.

[0011] Preferably, the distance between the switching poles which can be realised by the support structure is in the range of 120-300 Millimeters. This arrangement

covers the foregoing mentioned standard pole distances for the medium voltage application according to the present invention.

[0012] In order to form a simple mounting part it preferably consists of a bended metal sheet which is electrically grounded for electrical safety. The corresponding connection part can also consist of a bended metal sheet which is adapted to the form of the mounting part.

[0013] Preferably, the foregoing mentioned mounting part and connecting part is connected one to another by several screws which are arranged along the common edges of the adjacent parts.

[0014] According to another embodiment of the invention the connection part consists of at least one adjustable rod arrangement in order to modify the distance between the switching poles according to the electrical insulating requirements or customer requirements. Thus, a precise adjustment of the pole distance is possible at the end of the manufacturing process of the medium voltage circuit breaker.

[0015] Preferably, at least one adjustable arrangement should run transverse to the central axis of the switching poles in order to ensure a stable mechanical connection between the mounting parts to be fastened and, moreover, to provide an easy adjustment of the distance between the switching poles. The adjustable rod arrangement is preferably accommodated inside the mounting parts. After adjusting the distance the rods should be fixed inside their bushings to fix the pole distance. A visible gap between the mounting parts is recommended, which can be covered with a light plastic cover after adjustment in order to provide a smooth surface of the supporting structure.

[0016] Preferably, the central axes of the switching poles are arranged parallel one to another in order to ensure equal pole distances by using the support structure according to the present invention. All switching poles of the circuit breaker arrangement should be positioned in line one to another. However, it is also possible to apply the present invention to another arrangement, especially to a triangular arrangement of the switching poles and a further actuating unit if required. Preferably, the switching poles as well as an optional common actuating unit are attached to its corresponding mounting parts of the support structure by several screws for easy maintenance.

[0017] This and other aspects of the invention will be apparent from and elucidated with reference to the embodiments described thereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] Embodiments of the present invention are described in more detail with reference to the attached drawings.

Figure 1 shows a perspective view of a medium voltage circuit breaker arrangement with three pole parts mounted on a support structure according to the present invention,

Figure 2 shows a perspective view of a second embodiment of the support structure for wide distances,

Figure 3 shows a third embodiment of a support structure for short distances, and

Figure 4 shows a perspective view of the fourth embodiment of a support structure using an adjustable rod arrangement.

Figure 5 fifth embodiment.

[0019] The reference symbols used in the drawings, and their meanings, are listed in summary form in the list of reference symbols. In principle, identical parts are provided with the same reference symbols in the figures. All the figures are schematic.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0020] According to Figure 1 the medium voltage circuit breaker arrangement consists of three switching poles (1 a-1 c) which are mounted one to another on a supporting structure (2) the switching poles (1a-1c) are attached to the supporting structure (2) by several screws (3) (exemplary). The supporting structure (2) forms the housing for accommodating - not shown - drive means for operating the switching poles (1 a-1 c) by an actuator unit (4) which is also attached to the supporting structure (2).

[0021] Each pole part (1a-1c) comprises a - not shown - inner vacuum insert for accommodating a pair of corresponding electrical contacts, wherein a moveable electrical contact is operated by the said actuator unit (4) simultaneously. The moveable electrical contact is electrically connected to a lower electrical terminal (5a) (exemplary); the other electrical contact is fixedly arranged inside the respective pole part (1a-1c) and is electrically contacted to an upper electrical terminal (5b) (exemplary).

[0022] Each switching pole (1 a-1 c) is fastened on a corresponding mounting part (6a-6c) respectively by the said screws (3). The mounting parts (6a-6c) are attached one to another via intermediate connection parts (7a and 7b) in order to define the required distance between the switching poles (1a-1c).

[0023] The mounting parts (6a-6c) consist of a bended metal shield which is electrically grounded. The corresponding connection parts (7a and 7b) also consist of a bended metal shield which is adapted to the form of the mounting parts (6a-6c). The connection parts (7a and 7b) are attached to the mounting parts (6a-6c) by several screws (8) which are arranged along the corresponding overlapping edges. In the shown embodiment the sup-

port structure (2) forms a kind of lower basis for the switching poles (1a-1c) as well as the actuator unit (4) which are mounted on a common mounting surface of the support structure (2).

[0024] According to Figure 2 a rectangular support structure (2) is provided for attaching the switching poles (1 a-1 c) thereon. All drive means are accommodated in a vertical section of the support structure (2). The intermediate connection parts (7a and 7b) are large in order to provide a correspondingly large distance between switching poles (1a-1c) which are mounted on the respective mounting parts (6a-6c).

[0025] In Figure 3 another embodiment is shown wherein short versions of intermediate connection parts (7a and 7b) are provided in order to define a short distance between the switching poles (1a-1c) which are mounted on respective mounting parts (6a-6c). The medium voltage circuit breaker arrangement according to that embodiment is intended for lower voltage applications, since a small distance between the switching poles (1a-1c) is suitable in that case.

[0026] Figure 4 shows another embodiment of the invention. The three switching poles (1a-1c) are mounted on the corresponding mounting parts (6a-6c) as usual. In contrast to the foregoing described embodiments the connecting part (7) consists of an adjustable rod arrangement. Due to the adjustable rod arrangement it is possible to modify the distance between the switching poles (1a-1c) according to the electrical insulating requirements.

[0027] If the switching poles (1a-1c) should switch a high voltage load or if the customer requests a large pole distance, then it is possible to extend the connection part (7) in order to define a large distance between the switching poles (1 a-1 c) which meets the requirements of the electrical safety or of the customer. The connection part consists of two single rods which are guided in corresponding sleeves (8a and 8b) which are attached on the middle mounting part (6b)' of the support structure (2)'. Furthermore, a jack shaft arrangement (9) with adjustable pole distance of the gear means is provided for simultaneously switching the three switching poles (1 a-1 c) by a - not shown - actuator unit as described above.

[0028] Figure 5 shows shows as an example a design with an individual pole drive. The three phases are connected with a light shaft for synchronisation and mechanical tripping. The shaft can be inserted laterally through all phases at the end of the production line and does not have to be adjustable. The three housings can be connected as shown in the Figures 4 and 5 to form a complete CB. These connections can be relatively light, as they do not have to transfer the full force of the drives.

REFERENCE SIGNS

[0029]

1 Switching pole

2 Support structure

3 Screw

4 Actuator unit

5 Electrical terminal

6 Mounting part

7 Connection part

8 Sleeve

9 Drive shaft arrangement

Claims

1. Medium voltage circuit breaker arrangement comprising several switching pols (1a - 1c) which are adjacently mounted on a support structure (2), wherein the distance between the switching poles (1a -1c) can be adjusted at the end of the production process;
characterized in that, each switching pole (1a -1c) is fastened on a corresponding mouting part (6a - 6c) and the mounting parts (6a - 6c) are attached one to another via intermediate connection parts (7a - 7b) for defining the distance between the switching poles (1a-1c).

2. Medium voltage circuit breaker arrangement comprising several switching pols (1a - 1 c) which are adjacently mounted on a support structure (2), wherein the distance between the switching poles (1a - 1 c) can be adjusted at the end of the production process, or according to claim 1
characterized in that, each switching pole (1a -1c) has an own drive, and the drives of all phases are mechanically coupled with the next switching pole, by a common drive shaft (9), or a commonly aligned drive shaft arrangement (9) for defining the distance between the switching poles (1a - 1 c), as well as to synchronize the switching of alle switching poles.

3. Medium voltage circuit breaker arrangement according to Claim 1 or 2,
characterized in that, the distance between the switching poles (1a- 1c) is in the range of 150 to 300 Millimeters.

4. Medium voltage circuit breaker arrangement according to Claim 1 or 2,
characterized in that, the mounting part (6a - 6c; 6a' - 6c') consists of a bended metal sheet, which is electrically grounded.

5. Medium voltage circuit breaker arrangement according to Claim 4,
characterized in that, the connection part (7a - 7b; 7a' - 7b'; 7a" - 7b") consists of a bended metal sheet which is adapted to the form of the mounting part (6a - 6c; 6a' - 6c').

6. Medium voltage circuit breaker arrangement according to Claim 5,
characterized in that, the connection parts (7a - 7b; 7a' - 7b'; 7a" - 7b") are attached to the mounting parts (6a - 6c; 6a' - 6c') by several screws arranged along the corresponding edges.

7. Medium voltage circuit breaker arrangement according to Claim 1 or 2,
characterized in that, the connection part (7) consists of at least one adjustable rod arrangement in order to modify the distance between the switching poles (1a - 1 c) according to the electrical insulating requirements.

8. Medium voltage circuit breaker arrangement according to Claim 7,
characterized in that, the at least one adjustable rod arrangement runs transverse to the central axis of the switching poles (1a - 1 c).

9. Medium voltage circuit breaker arrangement according to one of the preceeding Claims,
characterized in that, the central axis of the switching poles (1a - 1c) are arranged parallel one to another.

10. Medium voltage circuit breaker arrangement according to one of the preceeding Claims,
characterized in that, the switching pole (1 a; 1 b; 1 c) is attached to the respective mounting part (6a; 6b; 6c) by several screws (3).

11. Medium voltage circuit breaker arrangement according to one of the preceeding Claims,
characterized in that, the supporting structure (2) forms a housing for accomodating drive means for operating the switching poles (1a - 1c).

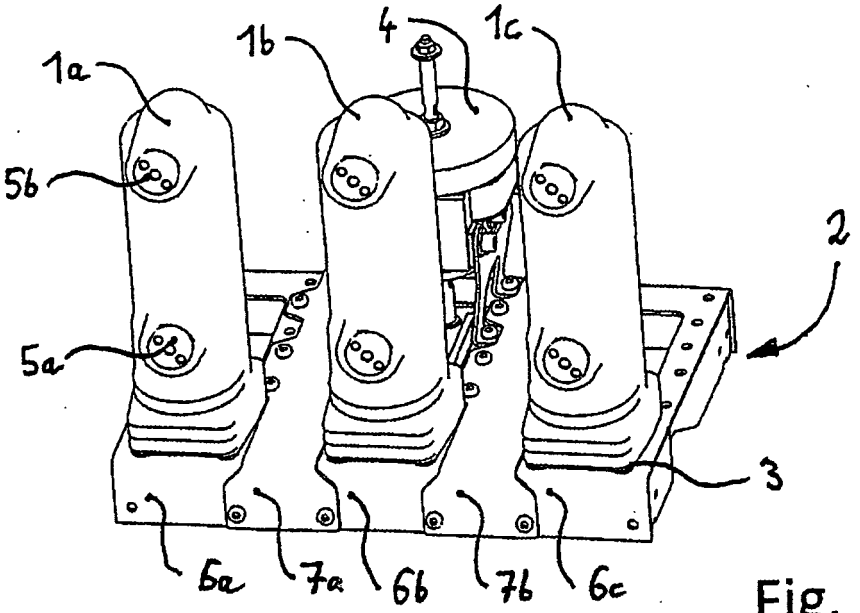

Fig. 1

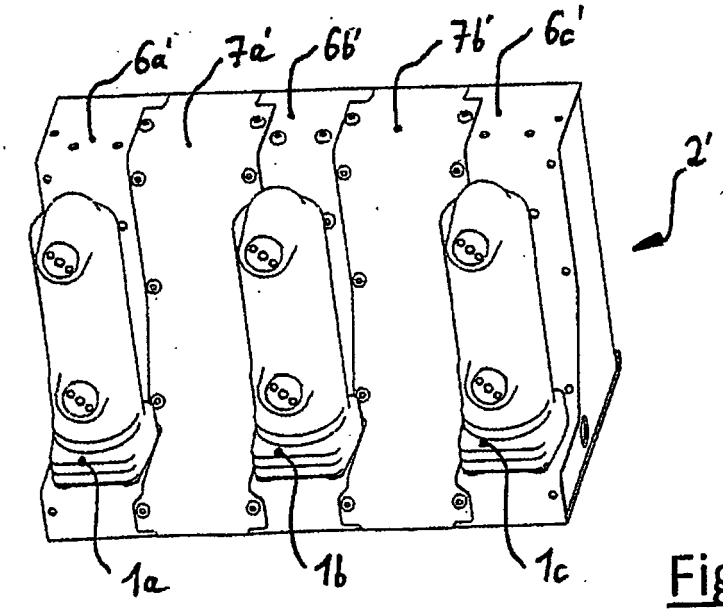

Fig. 2

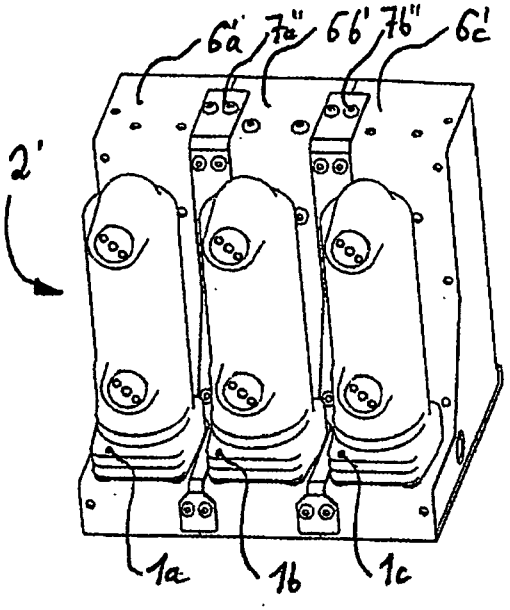

Fig. 3

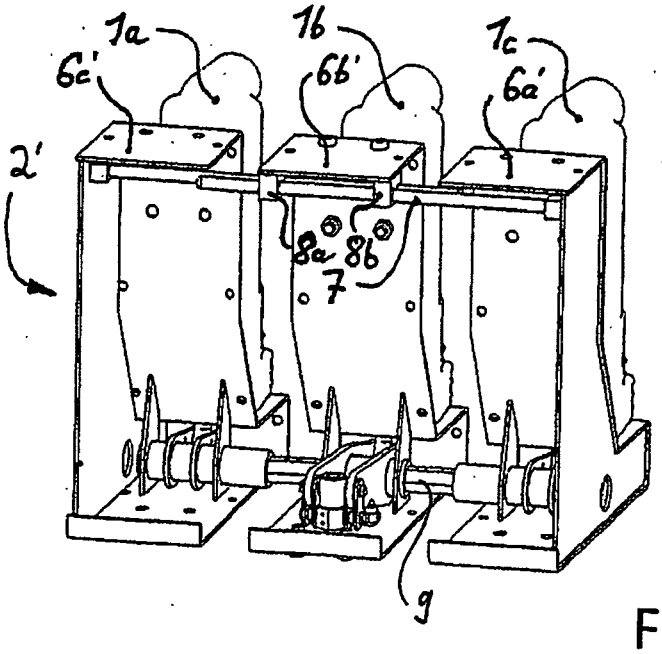

Fig. 4

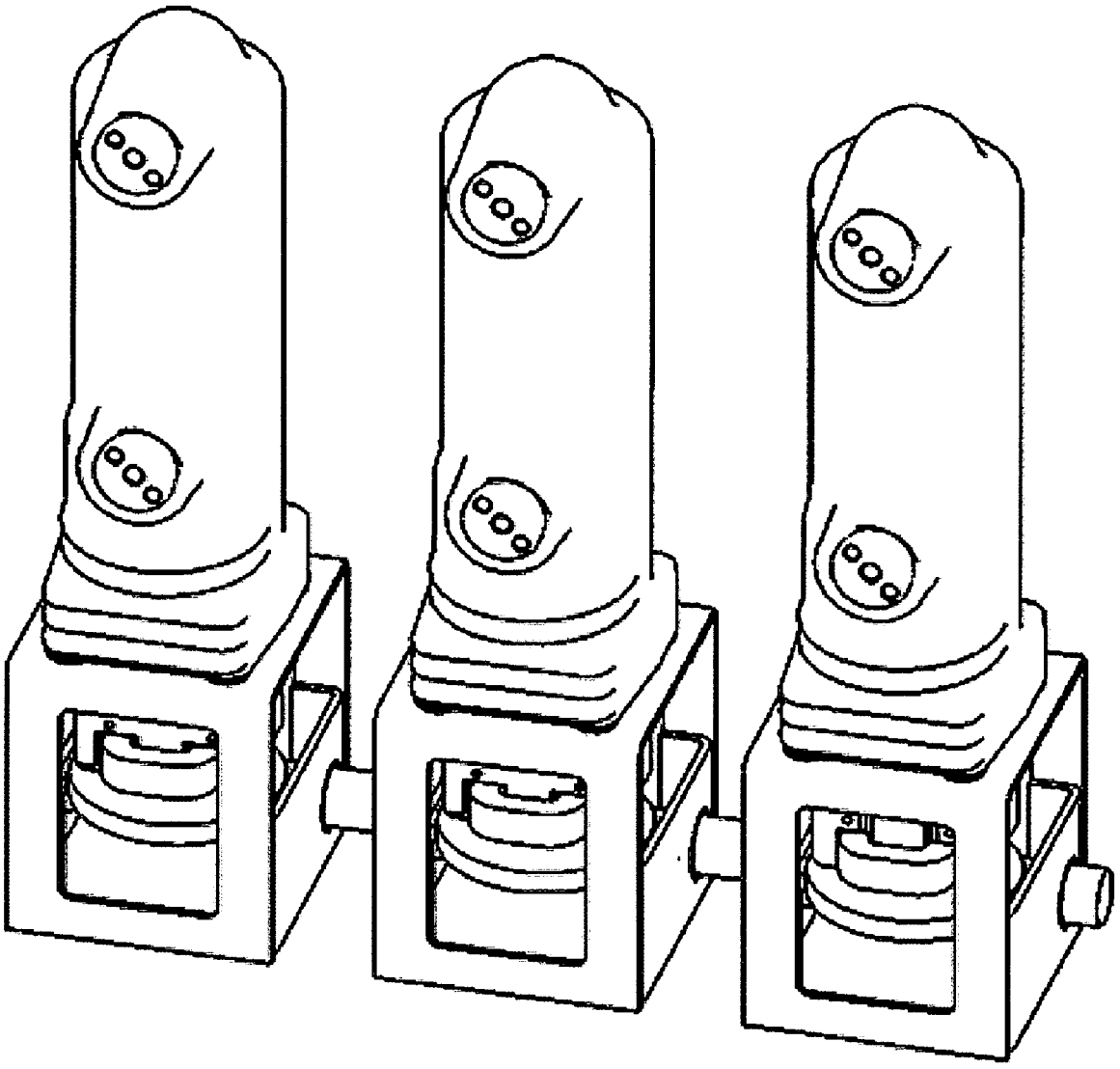

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 10 01 1389

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

H01H
H02B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	22 February 2011	Findeli, Luc

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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1

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 01 1389

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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