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(54) **AUXILIARY CONTACT ASSEMBLY**

(57) An auxiliary contact assembly including a casing provided with a plurality of seats, each adapted to receive a fixed contact unit that has at least one fixed contact pad; a movable member adapted to support one or more moving contacts, which support a pair of moving contact pads; the movable member is movable between two positions, a first contact position and a second contact position; each moving contact can be mounted in the movable member so that the moving contact pads are oriented in different positions. The configuration of auxiliary contact with normally open or normally closed contacts can be obtained by using the same contacts mounted in a different manner instead of using specific and different contacts for each configuration.

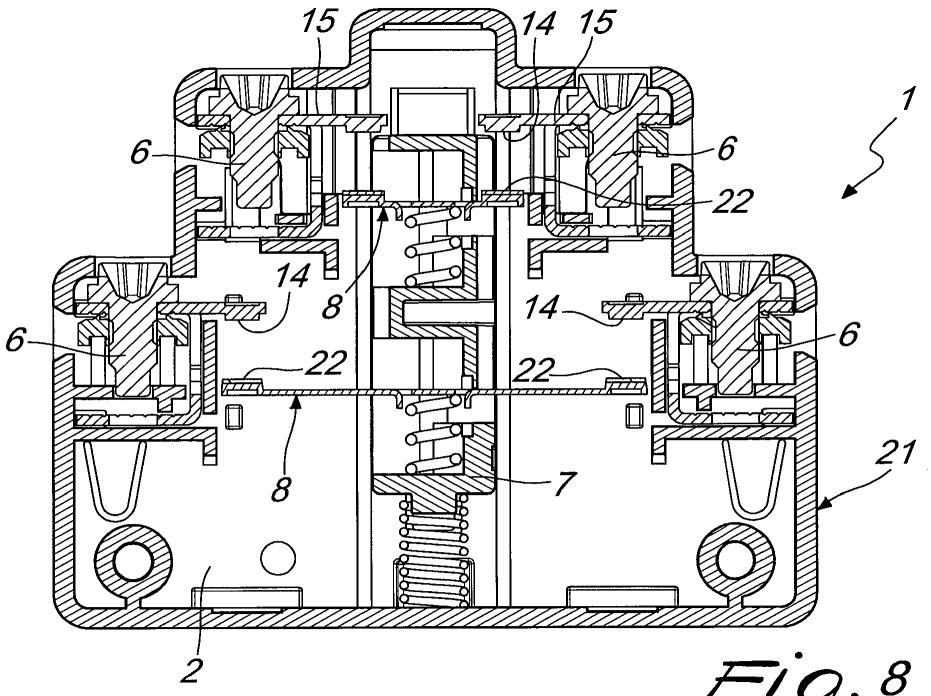

Fig. 8

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Description

[0001] The present invention relates in particular to an auxiliary contact assembly which, when connected to a rotary disconnector or switch, allows to connect auxiliary contacts that have the purpose of signaling a given state of the system. This state might be in the two ON or OFF situations which, in the auxiliary contact assembly according to the invention, correspond respectively to the closed or open state of the contacts.

[0002] Known devices of this type, so called auxiliary contacts, are generally constituted by a casing adapted to contain fixed terminals on which movable contacts, moved by a slider that is connected directly to the disconnector or switch, close or open.

[0003] The position of the contacts with respect to the rotary disconnector/switch can be normally open, in which the movable contacts and the corresponding fixed contacts are at a certain distance, or normally closed, in which the movable contacts and the corresponding fixed contacts are in contact and close a circuit.

[0004] In a commonly used construction, the movable contacts are mounted on a slider or other movable member and the configuration of the apparatus, with normally open or normally closed contacts, is provided by using adapted fixed and movable contacts for each configuration.

[0005] EP0393597 discloses a contact device including a housing, a fixed contact, and a moving contact attached to a support frame, the support frame and moving contact being movable within the housing perpendicular to the fixed contact. A stopping arm projects from the support frame to restrict movement of the support frame within the housing.

[0006] US3892934 discloses an auxiliary contact interlock for use with an electromagnetic contactor having an operating arm, the interlock has stationary and movable contacts within a housing. The movable contacts are mounted on a movable contact carrier, each movable contact has a contact button and an adjacent flexible contact biased toward the corresponding stationary contact and engaging the same before or after the contact buttons when the movable contact carrier is moved in close proximity to or from the closed position with the stationary contact.

[0007] US6483049 discloses a contact assembly having a plurality of pairs of spaced apart fixed contacts supported in an electrically insulating body, an actuator displaceable relative to the body between first and second positions, and a plurality of movable contacts mounted on the actuator. Each movable contact is positioned on the actuator so as to interconnect the contacts of one of the pairs of fixed contacts only when the actuator is in one of the first and second positions. Each fixed contact has two limbs defining an L-shape, one limb defining a single leg which extends through an aperture formed in a partition defined by the body and the other limb extending to one side of the leg to define a head supporting a terminal for gripping a wire. Each movable contact is displaceable into contact with the leg of each of the respective pairs of fixed contacts on the side of the leg from which the head extends and on the side of the partition remote from the head.

[0008] US4550232 discloses an electric switching device of the type having a contact system that includes two stationary contact bars and movable contact bridges for interconnecting the bars. To convert the switching device from a circuit maker to a circuit breaker, or vice versa, a control member is provided in the form of a shiftable slide having insulating projections which in one end position of the slide are displaced between one bridge and a contact bar while the other projection is out of the range of movement of the bridges, and in the other end position the other insulating projection interrupts the contact between the other bridge and the assigned contact bar.

[0009] US3253092 discloses a double pole switch with reversible contact structure designed to positively make and break electrical circuits during repeated opening and closings of the contacts over long operating periods. The normal operative position of the movable contacts elements of the unit may be reversed to convert the contact and the circuits controlled thereby from normally open to normally closed and vice versa.

[0010] US6114639 discloses a configurable switch having a base and interchangeable stationary contacts positioned in adjustable locations with respect to the base. A plunger is slidably mounted with respect to the base so that the plunger moves between a first position and a second position. One or more movable contacts are mounted in a normally open position or a normally closed position. In the first position or the second position, the movable contacts make contact and/or break contact with the stationary contacts depending upon the respective arrangements of the stationary contacts and the movable contacts. The configuration of a four-circuit switch can be altered with a minimum of different components to be, for example, a four normally closed circuit configuration, three normally closed and one normally open circuit configuration, two normally closed and two normally open circuit configuration, etc., with a minimum of expense or retooling.

[0011] The above described constructions entail a relative large number of different components in order to provide an apparatus for each configuration.

[0012] The aim of the present invention is to provide an auxiliary contact assembly that can be manufactured with a reduced number of different components with respect to apparatuses of the known type.

[0013] Within the scope of this aim, an object of the invention is to provide an auxiliary contact assembly that does not require distinct components to provide different configurations, i.e., allows to use the same components for any version of the product.

[0014] Another object of the present invention is to provide an assembly which, by virtue of its particular constructive characteristics, is capable of giving the greatest

assurances of reliability and safety in use.

[0015] This aim and these and other objects which will become better apparent hereinafter are achieved by an auxiliary contact assembly comprising a casing provided with a plurality of seats; each of said seats being adapted to receive a fixed contact unit, said fixed contact unit having at least one fixed contact pad; at least one movable member adapted to support one or more moving contacts; each of said moving contacts supporting a pair of moving contact pads; said movable member being movable between two positions, a first contact position and a second contact position; said fixed contact unit being mounted in a respective said seat with said fixed contact pad oriented in different positions, said moving contact being mounted in said movable member with said moving contact pads oriented in different positions; said movable member being constituted by a slider slidingly mounted in said casing; said fixed contact unit comprising an electric contact member, a screw, a movable plate and said fixed contact pad fixed to a tab; said electric contact member being a metallic blade having portions adapted to contain said movable plate and said screw; said portions being symmetrical and allowing mounting said screw and said movable plate in opposite positions with respect to said fixed contact pad; said assembly being characterized in that said electric contact member has two perforated parallel sides joined by a perpendicular side; said screw being associated with one of said perforated parallel sides; said tab being formed by a portion of said perpendicular side.

[0016] Further characteristics and advantages will become better apparent from the description of preferred but not exclusive embodiments of the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a perspective view of the auxiliary contact assembly;

Figure 2 is a perspective view of the opposite side of the auxiliary contact assembly of the preceding figure;

Figure 3 is a detail perspective view of the slider;

Figure 4 is a perspective view of a fixed contact unit;

Figure 5 is a perspective view of the assembly, shown without the cover and with the slider and the contacts assembled;

Figure 6 is a perspective view of the bottom of the casing, without the functional components;

Figure 7 is a longitudinally sectional front elevation view of the assembly in the configuration with two normally closed contacts, in the closed contact position, which corresponds to the disconnector in the "I" position;

Figure 8 is a view, similar to the preceding one, but showing the assembly in the open contact position, which corresponds to the disconnector in the "O" position;

Figure 9 is a longitudinally sectional front elevation view of the assembly in the configuration with two normally open contacts, in the closed contact position, which corresponds to the disconnector in the "I" position;

Figure 10 is a view, similar to the preceding one but showing the assembly in the closed contact position, which corresponds to the disconnector in the "O" position;

Figure 11 is a longitudinally sectional front elevation view of the assembly in the configuration with one normally open contact and one normally closed contact, in the position in which the upper contact is open and the lower contact is closed, which corresponds to the disconnector in the "I" position;

Figure 12 is a view, similar to the preceding one, but showing the assembly in the position in which the upper contact is closed and the lower contact is open, which corresponds to the disconnector in the "O" position.

[0017] With reference to the cited figures, the auxiliary contact assembly according to the invention, generally designated by the reference numeral 1, includes a casing 21 formed by a bottom 2 and by a cover 3, which are mutually mechanically joined by means of elastic teeth 4 and by two self-tapping screws 5.

[0018] The casing 21 contains a plurality of fixed contact units 6, two or four, and a movable slider 7, on which one or two moving contacts 8 are mounted, each being held in position by a respective spring 9.

[0019] Each moving contact 8 has a pair of moving contact pads 22.

[0020] Each fixed contact unit 6 includes an electric contact member10, a screw 11, a movable plate 12 and a fixed contact pad 14 which is fixed to a tab 15.

[0021] Each fixed contact unit 6 is mounted in an adapted seat 13 formed in the bottom 2.

[0022] The seat 13 is designed so that it is possible to mount the fixed contact with the fixed contact pad 14 directed downward, as can be seen in Figure 4, or upward, simply by rotating the fixed contact unit through 180°.

[0023] The expressions "downward", "upward", "lower" and "upper" used in the present description refer exclusively to the figures and do not relate to the actual orientation of the components and of the assembly in the working position.

[0024] The electric contact member 10 is obtained from a metallic lamina that is appropriately blanked, bent and perforated, so that the part adapted to contain the plate 12 and the screw 11 is symmetrical and can allow to mount them both on the side of the tab 15 with the contact pad and on the opposite side.

[0025] The electric contact member 10 is formed by two perforated parallel sides 101 and 102 joined by a perpendicular side 103.

[0026] The tab 15 is provided by blanking and bending a part of the perpendicular side 103.

[0027] The moving contacts 8 also can be mounted so that the moving contact pads 22 are directed upward or downward by rotating the moving contacts 8 through 180° in the slider 7.

[0028] The possibility to mount in opposite directions both the moving contact pads 22 of the fixed contacts 6 and the moving contact pads 22 of the moving contacts 8 allows to provide the desired configuration: normally open contacts NA, normally closed contacts NC, or one normally open contact and one normally closed contact NA+NC.

[0029] The various functional configurations are obtained by using the same components, as highlighted in Figures 7-12.

[0030] The auxiliary contact assembly 1 thus provided can be coupled to an electrical device, such as a switch or disconnector, not visible in the figures, by means of two upper dovetail engagement members 16 and a lower engagement member 17.

[0031] The assembly 1 is fastened to the electrical device by two lower contrast members 19 and by an upper tooth 18 which is also used for releasing the assembly from the electrical device.

[0032] The movement of the slider 7 is achieved when coupling the slider 7 to the movable slider of the disconnector, which is not visible in the figures.

[0033] This coupling is provided by a protrusion 20 that is formed on the slider 7; the protrusion 20 engages in an adapted window provided in the contact holder of the disconnector, which is not visible in the figures.

[0034] As shown schematically in Figures 7-12, the auxiliary contact assembly according to the present invention can be converted from a device with one or two normally open contacts to a device with one or two normally closed contacts or to a device with one normally open contact and one normally closed contact simply by swapping the position of the moving contacts 8 on the slider 7 by rotating the electrical contact member 10 through 180°.

[0035] By mounting a single moving contact on the slider 7, for example the lower moving contact 8, with the moving contact pads 22 directed upward, the auxiliary contact assembly becomes a device with a single normally open contact, as shown in Figure 8.

[0036] At the same time, the lower fixed contacts 6 are mounted so that the respective fixed contact pad 14 is directed downward. This is achieved simply by arranging each fixed contact 6 in the respective seat 13 with the appropriate orientation, i.e., with the tab 15, which supports the fixed contact pad 14, upward, as in the case of Figure 8. Figure 7 shows the closed contact position.

[0037] The same Figure 8 shows the mounting position of the upper moving contact 8, with the moving contact pads 22 directed upward, which provides a second normally open contact. Figure 7 shows the position that corresponds to both moving contacts 8 closed, i.e., in contact with the respective fixed contacts 6.

[0038] Figures 9-12 show further examples of combinations of the arrangements of the fixed and moving contacts in order to obtain a structure having the required characteristics, in any case always using the same components, regardless of the desired combination.

[0039] It should be noted that, as described above, the fixed contact unit 10 is obtained from a metallic blade that is blanked and bent so that the portions adapted to contain the plate 12 and the screw 11 is symmetrical and can allow the mounting thereof both on the side of the tab 15 with the contact pad and on the opposite side. In other words, the screw 11 can be inserted both in the hole provided on the side of the tab 15 and in the hole of the opposite side, determining the orientation of the fixed contact pad 14.

[0040] In practice it has been found that the invention achieves the intended aim and objects, providing an auxiliary contact assembly, particularly usable with a switch or disconnector, which is provided by means of the same components for all versions, with normally open or normally closed contacts or with both normally open and normally closed contacts.

[0041] The auxiliary contact assembly according to the invention, appropriately connected to a rotary disconnector/switch, allows to connect auxiliary contacts that have the purpose of signaling a given state of the system. This state might be in the two ON or OFF situations which, in the auxiliary contact assembly according to the invention, can correspond to the respective closed or open state of the contacts.

Claims

1. An auxiliary contact assembly comprising a casing (21) provided with a plurality of seats; each of said seats being adapted to receive a fixed contact unit (6), said fixed contact unit (6) having at least one fixed contact pad (14); at least one movable member (7) adapted to support one or more moving contacts (8); each of said moving contacts (8) supporting a pair of moving contact pads (22); said movable member (7) being movable between two positions, a first contact position and a second contact position; said fixed contact unit (6) being mounted in a respective of said seat with said fixed contact pad (14) oriented in different positions, said moving contact (8) being mounted in said movable member (7) with said moving contact pads (22) oriented in different positions; said movable member being constituted by a slider (7) slidingly mounted in said casing (21); said fixed contact unit (6) comprising an electric contact member (10), a screw (11), a movable plate (12) and said fixed contact pad (14) fixed to a tab (15); said electric contact member (10) being a metallic blade having portions adapted to contain said movable plate (12) and said screw (11); said portions being symmetrical and allowing mounting said screw (11) and said movable plate (12) in opposite positions with respect to

said fixed contact pad (14); said assembly being **characterized in that** said electric contact member (10) has two perforated parallel sides (101, 102) joined by a perpendicular side (103); said screw (11) being associated with one of said perforated parallel sides (101, 102); said tab (15) being formed by a portion of said perpendicular side (103).

2. The auxiliary contact assembly according to claim 1, **characterized in that** each of said moving contacts (8) is held in position by a respective spring (9).

3. The auxiliary contact assembly according to claim 1, **characterized in that** said electric contact member (10) is a metallic blade that is blanked, bent and perforated.

4. The auxiliary contact assembly according to claim 1, **characterized in that** said casing (21) comprises two upper dovetail engagement members (16) and a lower engagement member (17), which are configured to couple said assembly to an electric device, such as a switch or disconnector; said assembly being fixed to said electric device by means of an upper tooth (18), formed on said casing (21), and two lower contrast members (19), which are formed on said casing (21).

5. The auxiliary contact assembly according to claim 4, **characterized in that** said slider (7) comprises a protrusion (20) that protrudes from said casing (21) and is configured to engage a movable member of said electric device.

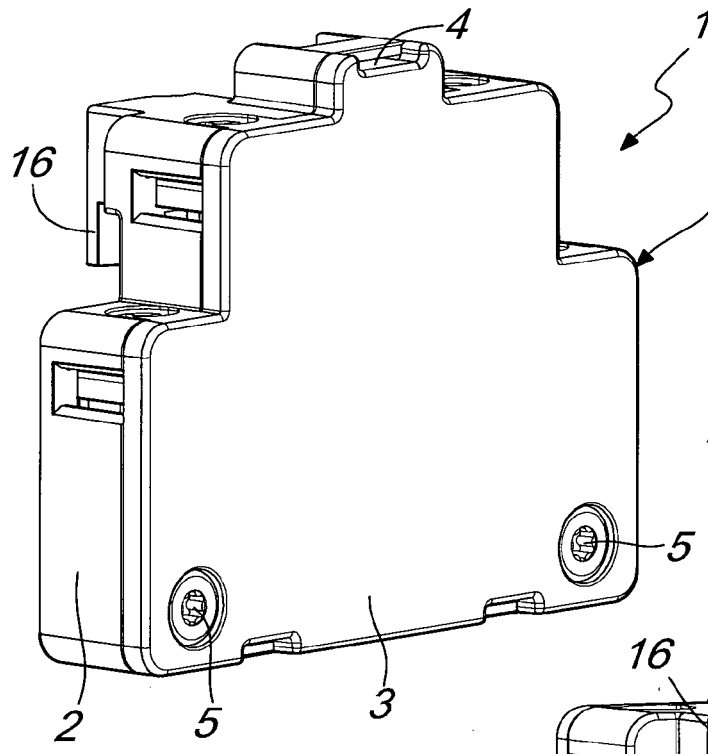

Fig. 1

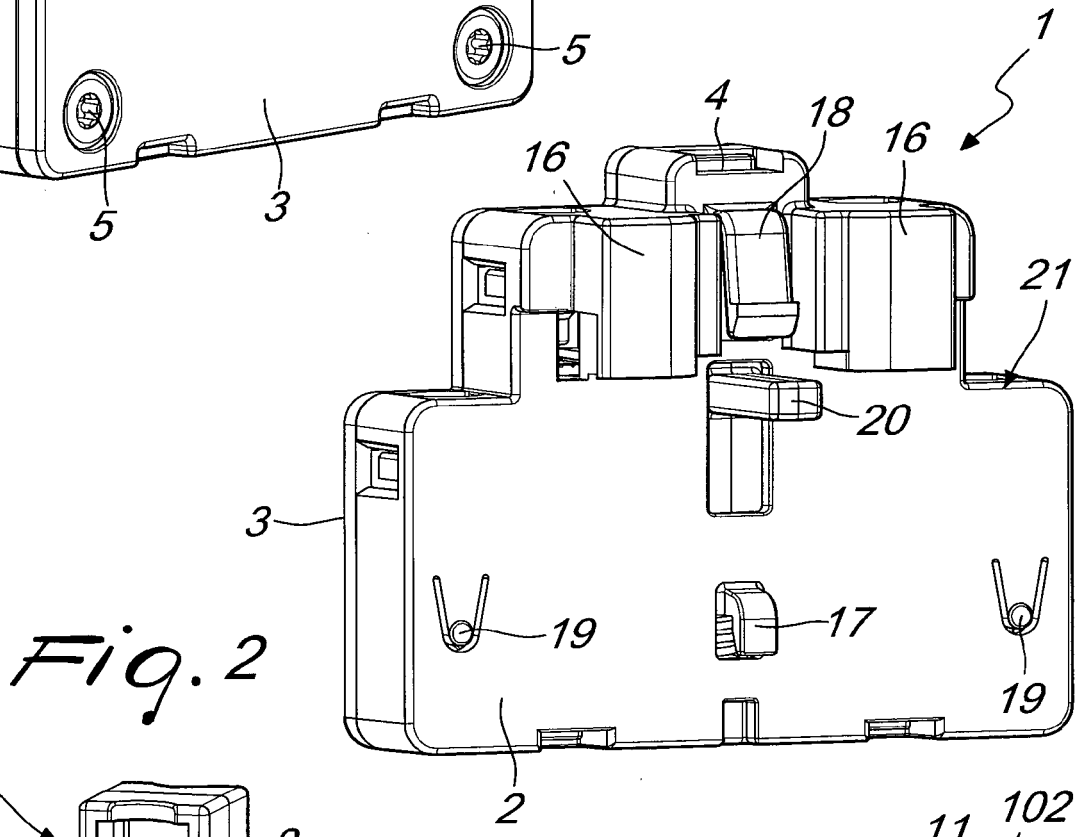

Fig. 2

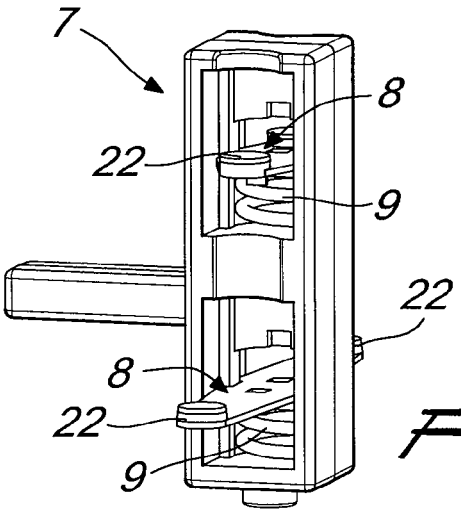

Fig. 3

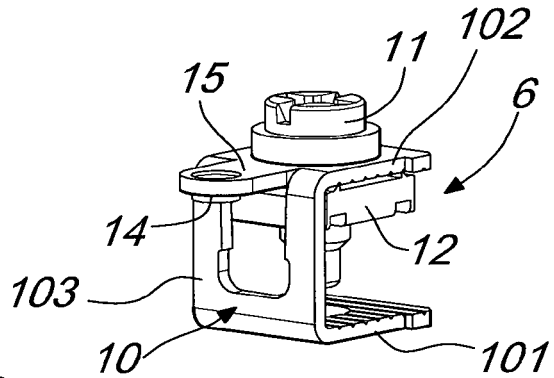

Fig. 4

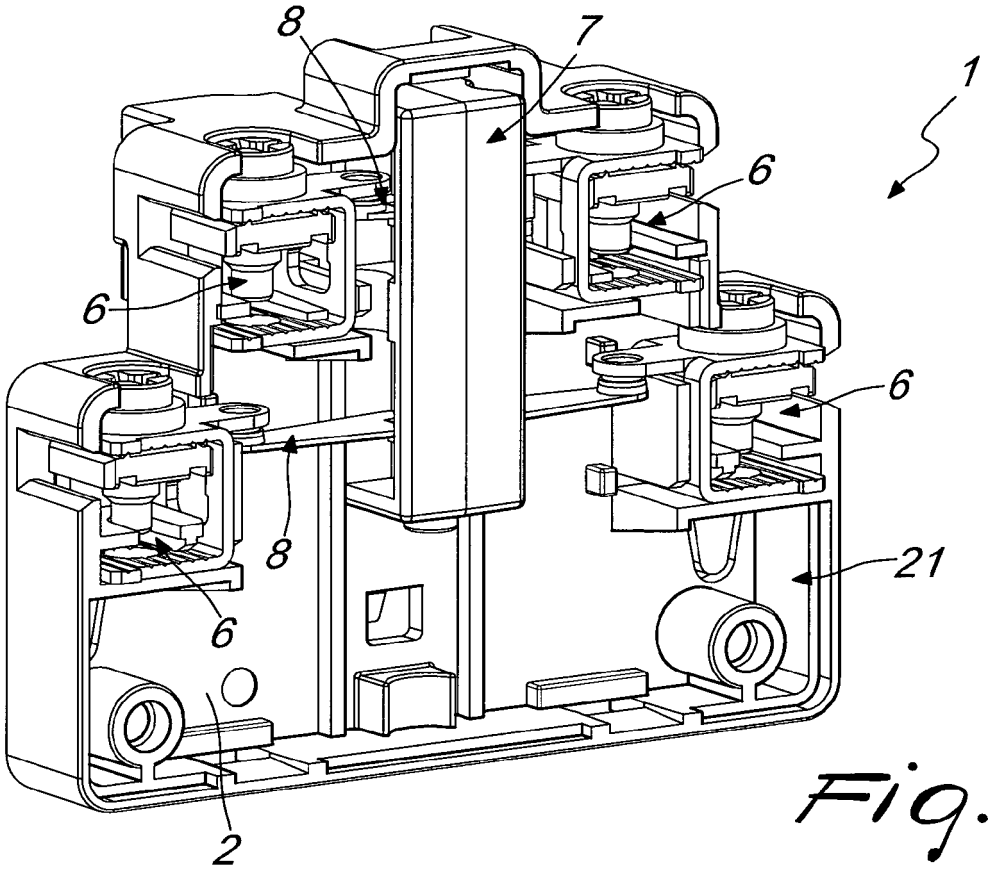

Fig. 5

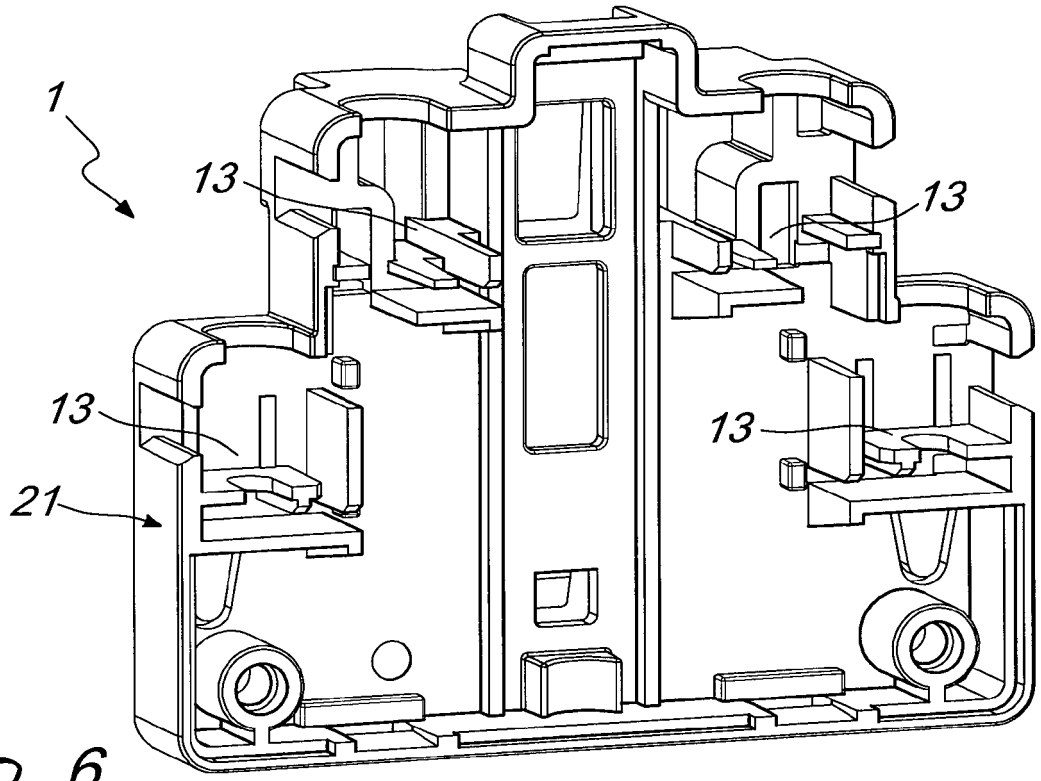

Fig. 6

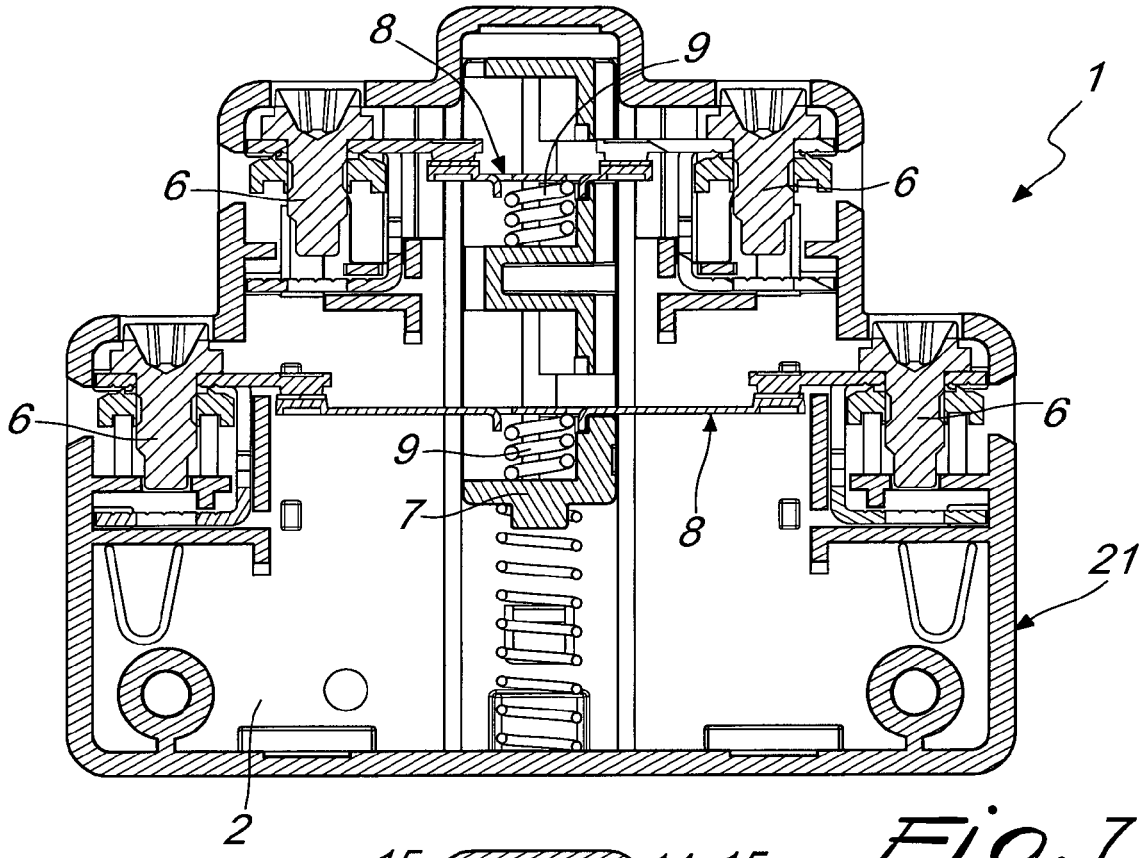

Fig. 7

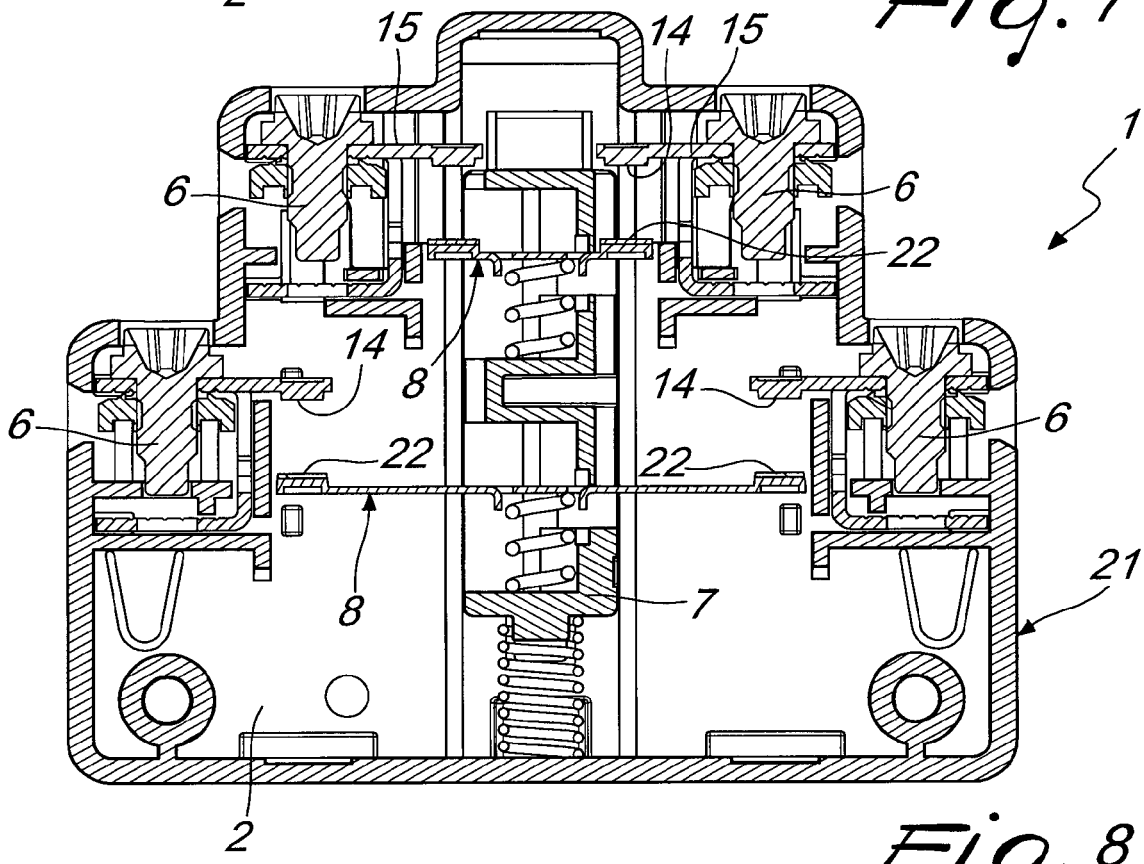

Fig. 8

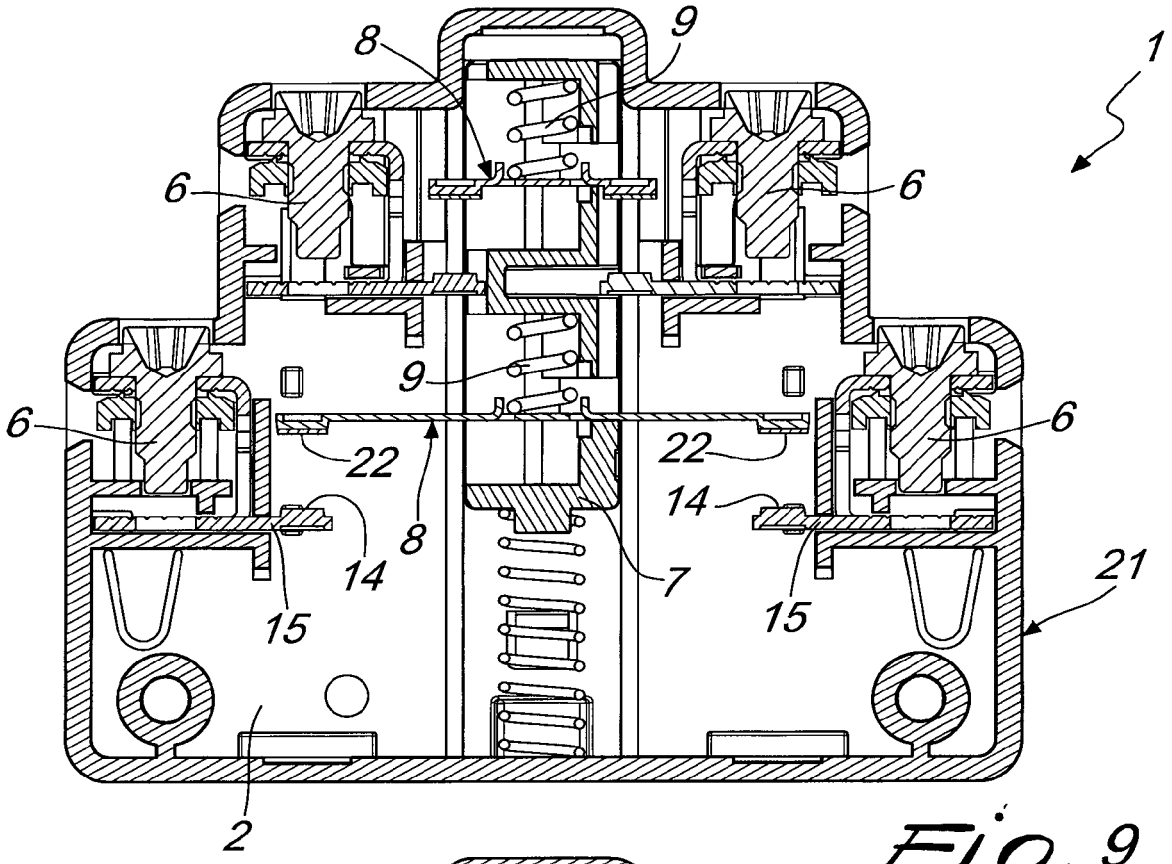

Fig. 9

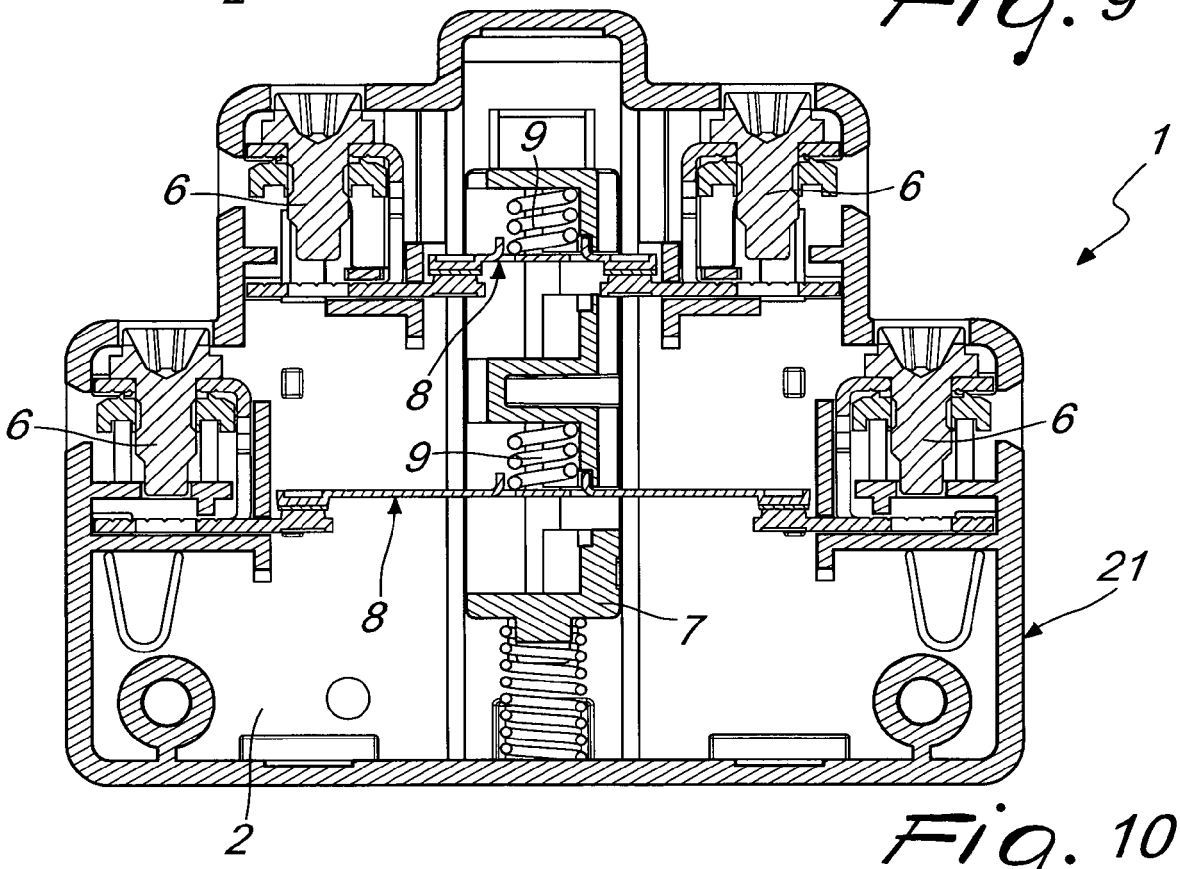

Fig. 10

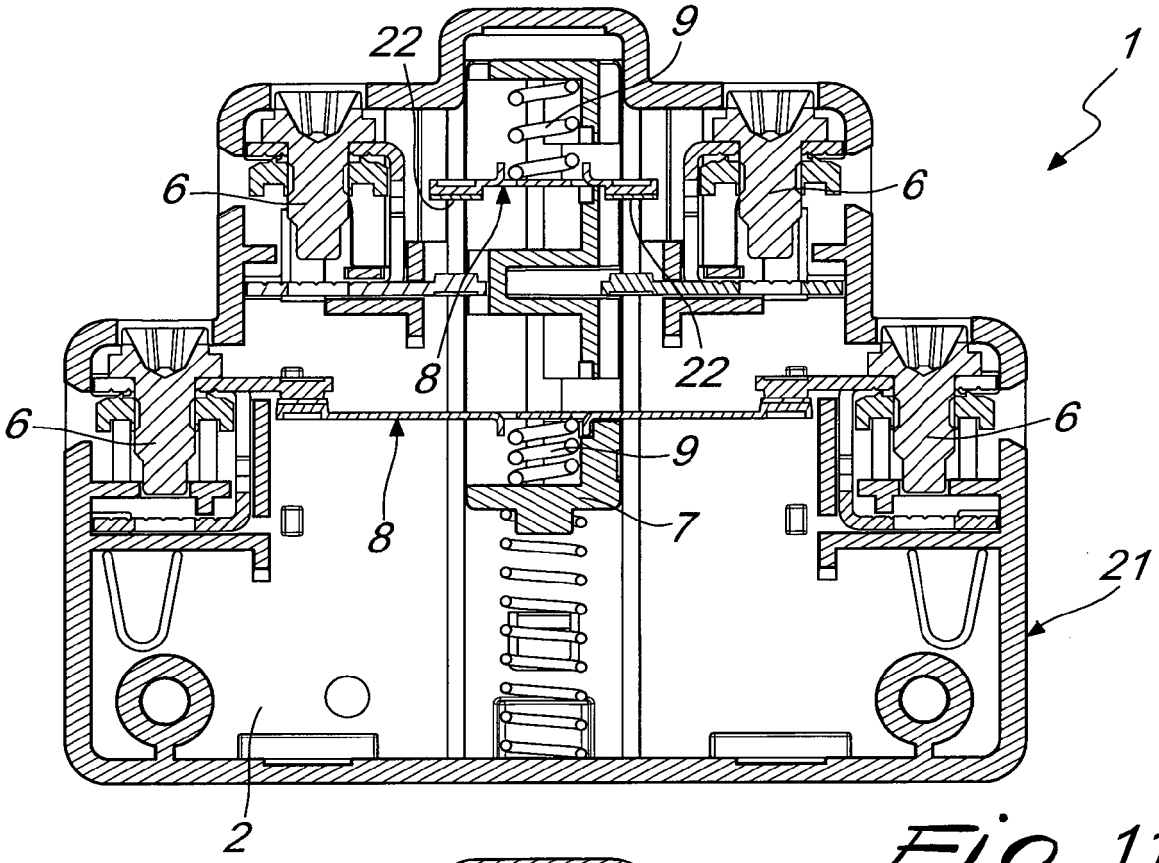

Fig. 11

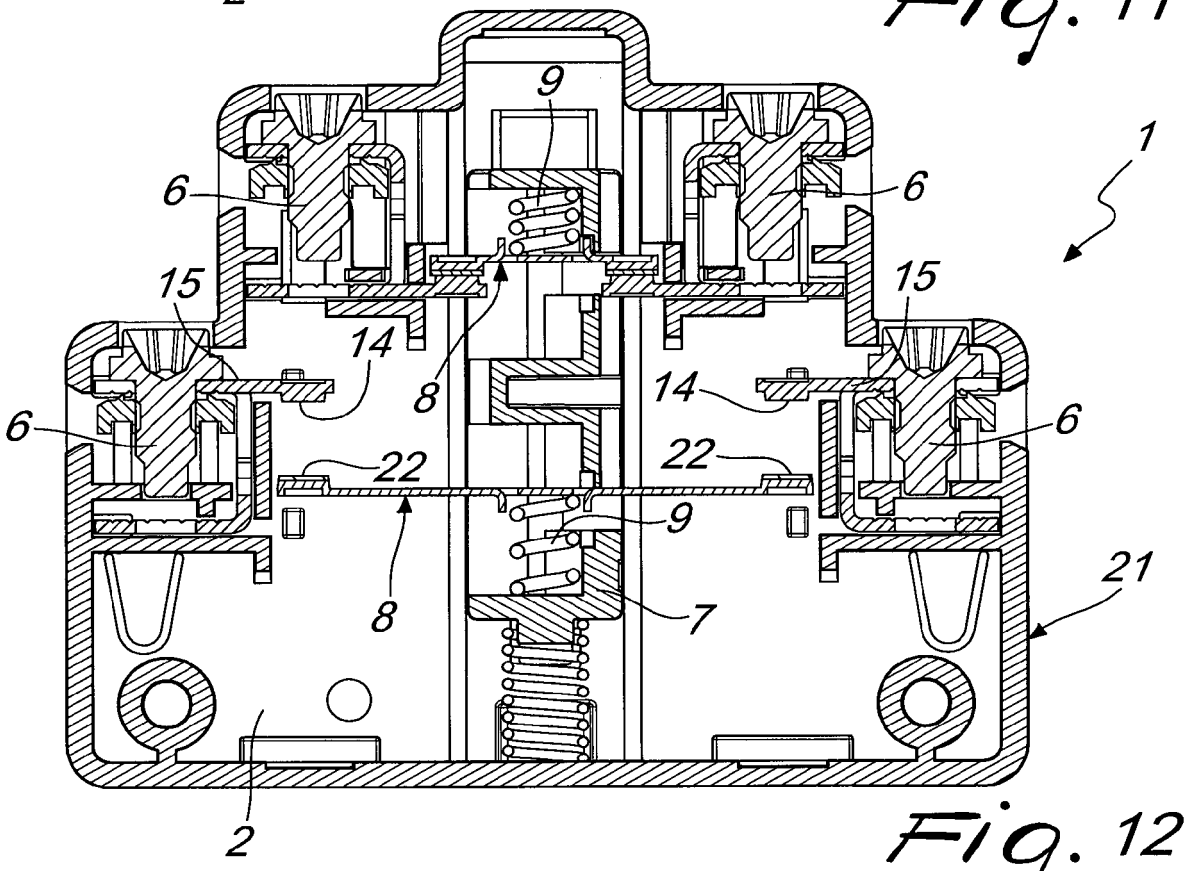

Fig. 12

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EUROPEAN SEARCH REPORT

Application Number
EP 17 00 1338

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	31 August 2017	Alberti, Michele

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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