

The invention relates to a retaining spring for securing electrical insert devices without the use of screwed fasteners in a corresponding recess in a casing or switchboard by means of teeth disposed on the edge of the bent retaining spring.

Known retaining springs of this kind, made of steel or plastics, are used for securing an electrical insert device such as a plug or socket in a corresponding recess of a casing or switchboard without the use of screwed fasteners, the electric insert device having retaining springs on both sides which are pushed through the recess and then secured therein, mainly non-positively, by teeth on the retaining springs. However, the known retaining springs have the critical disadvantage that they cannot hold the device reliably in the recess and powerful tensile forces are exerted on the device, e.g. when disconnecting a plug. Another disadvantage of the known retaining springs is that the internal width of the device-receiving recess has to be varied depending on the wall thickness of the casing or switchboard, i.e. the dimensions of the recess must be different for a casing having a wall thickness of e.g. 1 mm from what they are for a casing having a wall thickness of 1.5 mm or e.g. 3 mm.

A retaining element known from DE-OS 2 430 707 for securing insert devices without the use of screwed fasteners is also designed to be suitable for varying wall thicknesses of up to 2 mm, but is intended specially for hearth screens, which are enamelled on all sides and therefore have a very smooth surface. The known retaining element has a substantially U-shaped cross-section and the two limbs, which are parallel to one another, end in a toothed clamping edge which, when inserted, bears against the inner edge of the device-receiving recess of a hearth screen and extends almost parallel to the inner side thereof. This method is suitable for a smooth enamelled surface, but is not suitable if the casing or switchboard is made of soft metal or plastics into which the toothed clamping edge will become embedded, particularly if the device is frequently stressed by plugging in and pulling out, with the result that the means for retaining the device will become loose after only a short time.

The object of the invention is therefore to construct a retaining spring for securing an electrical insert device without the use of screwed fasteners in a corresponding recess which always has the same dimensions in a casing or switchboard having a wall thickness of 1 mm or 1.5 mm etc. up to a wall thickness of 3 mm. Another aim is to design the spring so that it can withstand large tensile forces, of the order of 120 Newtons or more, acting on the insert device without the device coming loose. To this end, the retaining spring has the features according to claim 1. The advantage of the spring is that, in a housing or switchboard, irrespective of the wall thickness which may vary from 1 to 3 mm with gradations of e.g. 0.5 mm corresponding to the spacing between the teeth on the retaining spring, the device-receiving recess can always be made the same size for securing an insert device even if acted upon by large tensile

forces having the previously-mentioned order of size, without reducing the efficiency or reliability of the retaining spring, which exerts a positive hold.

This method of constructing the retaining spring also ensures a satisfactory electric and magnetic connection to the casings.

Other details and advantages of the invention will be clear from the following description and drawings, which show an embodiment of the retaining spring. In the drawings:

Fig. 1 shows the outline of the retaining spring, on an enlarged scale;

Fig. 2 is a plan view of the spring in Fig. 1, bent ready for use;

Fig. 3 is a side view of the spring in Fig. 2, and

Figs. 4a and b show a retaining spring disposed at the side of an insert device and installed in a casing having a wall thickness  $d_1$  in Fig. 4a and  $d_2$  in Fig. 4b.

The clamping or retaining spring 1 has two limbs 2 and 3 connected in one piece at one end by a web 4. A tongue 5 adjoins the centre of the web 4 connecting the two limbs and is used for securing a retaining spring 1 to the side of an insert device.

Limbs 2 and 3, which are spaced apart and parallel, each have a row of teeth on their parallel edges, i.e. limb 2 of spring 1 has two teeth 7, 8 on its outer edge 6 and two teeth 10 and 11 on its inner edge 9, teeth 10 and 11 being offset, relative to the free end of limb 2, from the teeth 7 and 8 on the opposite edge 6 of the limb. The tooth 10 on the inner edge 9 is disposed about half way between the teeth 7 and 8 on the outer edge 6. More than two teeth can be disposed on each edge, if allowance has to be made for narrower gradations in the thickness of the material of the casing formed with the recess for holding the spring, as will be described hereinafter.

Limb 3 of spring 1, with regard to the number and arrangement of teeth on its inner edge 12, is the mirror image of limb 2 and teeth 10 and 11, and consequently the teeth are given the same reference numbers 10 and 11. The same substantially applies to the teeth 7 and 8 on the outer edge 13 of limb 3. Preferably there can be a slight difference of about 0.1 mm between the distance of teeth 7, 8 from the free end of limb 2 and the corresponding distance of teeth 7, 8 from the free end of limb 3. As also shown in Figs. 1 and 3, teeth 7, 8 and teeth 10, 11 each form a row of teeth (two teeth in each case) decreasing in height in succession towards the free end of the limb, i.e. the height of tooth 8 is greater than the height of tooth 7 and the height of tooth 11 is greater than the height of tooth 10.

Fig. 4a shows the reason for this feature and for the offsetting of the teeth on the opposite edges of each limb 2 and 3. As shown in Fig. 4a, a retaining spring 1 is secured to one side of a partially-shown insert device 20, by inserting the tongue 5 on the middle of spring 1 into a groove 21 at the side of device 20. A partly-shown casing 22 or switchboard is formed with a device-receiving recess 23 in which the device 20, e.g. a plug or socket, is secured without the use of screwed fasteners by retaining springs 1 disposed on each side, only the spring on one side being shown in Fig. 4a. Casing 22 has a wall thickness  $d_1$  but may alternatively have a smaller thickness  $d_2$  as shown in Fig. 4b. For example,  $d_1 = 2$  mm and  $d_2 = 1$  mm. Recess 23 is designed to be the same size in each case. In the housing 22 having the wall thickness  $d_1$  spring 1 is disposed so that the larger tooth 8 on each limb 2, 3 of spring 1 abuts the inner edge 24 of the device-receiving recess 23, thus holding device 20 in recess 23. When spring 1 is in the position shown in Fig. 4b, in a casing 22 having a wall thickness  $d_2$ , the tooth 7 of each limb 2, 3 of spring 1 bears against the inside edge 25 of recess 23. Fig. 1 shows lines pointing towards teeth 7, 8 and marked with the previously-mentioned wall thicknesses at which teeth 7 and 8 operate respectively, i.e. 1 mm or 2 mm.

Since the teeth 10, 11 on the two inner edges 9, 12 are offset from the teeth 7, 8 on the opposite edge of the limb, teeth 10 and 11 are of use for other wall thicknesses  $d_3$ ,  $d_4$  of casing 22. Accordingly, the line  $d_3$  between lines  $d_1$  and  $d_2$  is assigned to a wall thickness of 1.5 mm and line  $d_4$  to a wall thickness of 2.5 mm. Teeth 10, 11 on the two inner edges of limbs 2 and 3 operate in the same manner as shown in Fig. 4 with respect to teeth 7 and 8. The retaining spring 1, as a result of the pressure loading the preceding inner teeth 7, 8 or 10 in recess 23, is brought into a different position in which the teeth 10, 8 or 11, which lock during operation, can be slightly raised by slightly twisting limbs 2 and 3 and thus reliably pressed against the respective lower edge of the recess.

Also, spring 1 has an integrally-moulded tongue 14 adjacent the exterior of limbs 2 and 3, and bent towards the convex side of limb 2, 3 as shown in Fig. 3. The end of tongue 14 is at a yet greater distance from the free end of limb 2, 3 than the largest tooth at the edge of the limb, and consequently the tongue is adapted to bear against the inside of a casing 22 having an even greater wall thickness than e.g. 3 mm. In this case also, spring 1 has two tongues 14, corresponding to the teeth, which abut the casing 22. A flange 26 on the front end of device 20 covers recess 23 and its edge bears against casing 22.

Besides securing the electrical insert device in a casing, the retaining spring also constitutes a high-frequency earth, thus eliminating the need for an additional charge-eliminating connection between the device and the casing.

### CLAIMS

1. A retaining spring for securing electrical insert devices (20) without the use of screwed fasteners in a corresponding recess (23) in a casing (22) or switchboard by means of teeth (7, 8; 10, 11) disposed on the edge of the bent retaining spring (1), characterised in that the retaining spring (1, 2) has limbs (2, 3) which are bent into a convex shape at a constant distance from one another in a common surface having an identical profile and which are unitary at one end (4), and on the opposite longitudinal edges (6, 9; 12, 13) of each limb (2, 3) the retaining spring (1, 2) has teeth (7, 8; 10, 11) which are staggered relatively to one another as referred to their distance from the free end of the limb and which are bent round towards the convex side of the limb, two of the teeth being adapted to engage the inside edge (24, 25) of a device-receiving recess (23).
2. A spring according to claim 1, characterised in that the teeth (7, 8; 10, 11) on each of the limb longitudinal edges (8, 9; 12, 13) form a row in which the teeth are of consecutively greater height as considered from the free end of each limb.
3. A spring according to claim 1, characterised in that the teeth (7, 8; 10, 11) on the opposite longitudinal edges (6, 9; 12, 13) of each limb (2, 3) are staggered relatively to one another by approximately one-half of tooth pitch.
4. A spring according to claim 1, characterised in that the teeth (10, 11) on the inner longitudinal edges (9, 12) of the two limbs (2, 3) are of mirror image construction to one another and are disposed at substantially equal distances from the free end of the limbs.
5. A spring according to claim 1, characterised in that the teeth (7, 8) on the outside longitudinal edges (6, 13) of the two limbs (2, 3) are of mirror image construction to one another and are disposed at substantially the same distances from the free end of the limbs.
6. A spring according to claim 5, characterised in that the teeth (7, 8) on the two outer longitudinal edges (6, 13) of the two limbs (2, 3) are offset by approximately 0.1 mm from one another to allow for tolerances in the thickness of the material of the casing or switchboard.
7. A spring according to claims 4 and 5, characterised in that each tooth row on the longitudinal edges (6, 9; 12, 13) of each of the two limbs (2, 3) comprises two teeth (7, 8; 10, 11) and the first tooth (10) of the row on the inside limb edge (9, 12) is disposed substantially midway between the teeth (7, 8) on the outer limb edge (6, 13).
8. A spring according to claim 1, characterised in that in addition to the two toothed limbs (2, 3), a formed-on tongue (14) is bent

towards the convex side of the limbs (2, 3) at a distance from the outside longitudinal edges (6, 13) of the limbs (2, 3), and the tongue end adapted to engage the inside of a casing (22) or switchboard is further away from the free end of the limb (2, 3) than the largest tooth (8) of the row on the limb edge (6, 13).

9. A spring according to any of claims 1 - 8, characterised in that it is made of an electrically conductive material and is operative as a high-frequency earthing to discharge current to the casing.