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"Enclosure, in particular cabinet, having a back incorporating at least one hole blocked by a plug, in particular for electrical equipment"

5 The invention is generally concerned with enclosures of the type used to house and protect electrical equipment of any kind, for example.

 An enclosure of this kind has a body and a door, the body comprising four side walls and a back.

10 The invention is more particularly, although not necessarily exclusively, directed to the situation in which the enclosure is designed to be attached to a support of any kind, for example a wall, in which case it is usually called a cabinet.

15 In this case at least one hole for a fixing member of any kind is usually provided in the back, and in practice there is usually one such hole in each corner area of the back.

 However, being designed to accommodate electrical equipment, an enclosure of the above kind must of itself satisfy sealing criteria in the form of indices specified by applicable standards, however it is to be used and, in particular, however it is to be fixed.

20 It is therefore also standard practice for any hole in the back to be initially blocked by means of a plug.

 At present, the plug is made of a rigid material and it is therefore necessary to remove it if the corresponding hole is to have a fixing member passed through it.

30 To make good the seal at the hole in question, it is also necessary to fit an appropriate sealing washer around the fixing member.

 This complicates installing the enclosure.

35 A general object of the present invention is an arrangement which simplifies installation.



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To be more precise, the present invention consists in an enclosure comprising a body and a door, the body comprising four side walls and a back, with at least one hole in the back for a fixing member of any kind and
5 blocked by a plug, the enclosure being generally characterized in that the plug is made from an elastically deformable material.

Because of the nature of this material, the plug in accordance with the invention can easily be staved in.

10 It can therefore remain in place, i.e. there is no need to remove it, if the hole that it blocks must have a fixing member passed through it.

A fixing member can very easily be forced through it, regardless of the direction of insertion, in other
15 words whether it is inserted from the inside of the enclosure towards the outside thereof or in the opposite direction.

Also because of the nature of the material from which it is made, the plug of the invention of itself
20 provides all the necessary seal around the fixing member, there being no need to provide any particular sealing washer specifically for this purpose.

The features and advantages of the invention will emerge from the following description, which is given by
25 way of example and with reference to the accompanying diagrammatic drawings, in which:

Figure 1 is a perspective view of an enclosure in accordance with the invention,

Figure 2 is a partial perspective view of it, as
30 seen from the rear, and to a larger scale,

Figure 3 is an exploded perspective view corresponding to that from figure 2,

Figure 4 is a partial view of the enclosure of the invention to a different scale and in cross-section taken
35 along the line IV-IV in figure 2,

Figure 5 is a view of the plug of the invention to a larger scale and in axial section taken along the line V-V in figure 3,

5 Figure 6 is a partial view in cross-section derived from that of figure 4 and shows a first method of fixing the enclosure of the invention,

Figure 7 is a partial view in cross-section similar to that from figure 6, for a second method of fixing the enclosure, and

10 Figure 8 is a view in axial section similar to that from figure 5, for a different embodiment of the plug of the invention.

All the figures concern an enclosure 10 comprising a body 11 and a door 12, the body 11 comprising four side
15 walls 13 and a back 14.

Because an enclosure 10 of the above kind is not in itself relevant to the present invention, it is not described in complete detail here.

20 Only its parts necessary to understanding the invention are described.

Suffice to say that, in the embodiment shown, the side walls 13 of the body 11 together form a surround 15 and that the separate back 14 is attached to the surround 15 by means of a support frame 16 formed by a flange 17
25 on the side walls 13.

In the embodiment shown, the envelope 10 has a corner member 20 inside it, in each of the corner areas of the back 14, fixed from behind by a screw 21 (see figures 2 and 3) and incorporating, facing a flange 23
30 pressed against the support frame 16 and incorporating an opening 24, a lug 25 which is initially bent in a U-shape against the flange 23 and can be straightened to expose the opening 24. It has a screwthreaded bore 26 in line with the opening 24 (see figure 4).

35 There is at least one hole 29 in the back 14 for a

fixing member 28, 28' of any kind (see figure 3) and the hole 29 is normally initially fitted in the factory with a plug 30 to provide the seal required at this point. All this is conventional in itself.

5 In practice there is a hole 29 blocked by a plug 30 in each corner area of the back 14 and the hole 29 is in corresponding relationship with the opening 24 in the flange 23 of the corresponding corner member 20, which is in turn in corresponding relationship with the
10 screwthreaded bore 26 in the lug 25 of the corner member 20 which is initially in front of the flange 23.

 In accordance with the invention, the plug 30 for at least one of the holes 29, and in practice that for each of them, is made from an elastically deformable
15 material and is therefore flexible.

 This material is an EPDM thermoplastic elastomer, for example.

 In both embodiments shown, the plug 30 of the invention has an axial part 31 which is generally tubular and which is inserted in the hole 29 in the back 14, a
20 radial guard portion 32 at one end of the axial part 31 and pressed against the outside surface of the back 14, and a web 33 which blocks the passage 34 formed by the axial part 31.

25 In both embodiments shown, the axial part 31 forms a snap-fastener bead 35 projecting outwards at the end opposite the radial part 32.

 In both embodiments shown the web 33 is in the axial part 31 and, as described in more detail later, at
30 least the peripheral portion of the web 33 is generally concave, with the concave side facing away from the radial part 32.

 In accordance with the invention, the radial part 32 of the plug 30 of the invention is compressible in the
35 axial direction.

To this end, in both embodiments shown, the radial part 32 forms a recessed tapered surface 38 concentric with the axis A of the plug around the passage 34 in the axial part 31 on the front face 36 opposite the axial part 31.

The tapered surface 38 is generally frustoconical, for example, as shown here.

In the embodiment shown in figures 1 to 7, the tapered surface 38 of the radial part 32 of the plug 30 of the invention extends as far as the immediate vicinity of the periphery of its front face 36.

In other words, it occupies virtually all of the front face 36.

In this embodiment, the radial part 32 has a groove 41 on the outside of its edge 40 and extending annularly around the axis A of the plug.

As shown here, for example, the groove 41 has a triangular profile in axial section symmetrical about a transverse plane through its bottom and perpendicular to the axis A of the plug.

In the embodiment shown, the flank of the groove 41 nearer the tapered surface 38 is substantially parallel to it.

As shown here, for example, the depth P of the groove 41 is less than half the width L of the radial part 32 as measured in the radial direction from the outside surface of the axial part 31, being in practice in the range from one quarter to one half the width L.

In the embodiment shown in figures 1 to 7, the radial part 32 of the plug 30 of the invention forms a plane outside surface 42 substantially perpendicular to the axis A of the plug where it joins onto the axial part 31.

Let D denote the distance between the plane surface 42 and the snap-fastener bead 35.

In practice, the distance D corresponds to the thicknesses of two walls, that of the back 14 plus that of the support frame 16, because the snap-fastener bead 35 is required to adopt a position beyond the latter.

5 In the embodiment shown in figures 1 to 7, the snap-fastener bead 35 has a rounded profile in axial section, to be more precise a semicircular profile.

10 In this embodiment, the web 33 is at the opposite end of the axial part 31 to the radial part 32, being rooted in the axial part 31 at the level of the snap-fastener bead 35.

In this embodiment, the web 33 is continuously concave from its peripheral portion to its central portion.

15 It is generally conical, for example, as shown here.

As already mentioned above, the enclosure 10 of the invention is initially fitted with a plug 30 in each of the holes 29 in its back 14 in order to guarantee it is sealed.

20 The plugs 30 are in practice identical from one hole 29 to another.

The envelope 10 can be attached to a support of any kind, for example a wall 44, as shown in figure 6 and 7, by either of the following two methods.

In a first fixing method (see figure 6), the enclosure 10 is attached to the wall 44 by means of lugs 45, there being one lug 45 for each corner area of its back 14.

30 In this case, each of the lugs 45 is first attached to the enclosure 10 from behind by a fixing member 28, via the corresponding hole 29 in the back 14, and in practice this fixing member is a screw adapted to inter-engage with the screwthreaded bore 26 in the lug 25 of
35 the corresponding corner member 20.

The enclosure 10 fitted with lugs 45 in this way is then attached to the wall 44 by screws or anchor bolts 46 using the lugs 45.

5 In the second fixing method (figure 7), after removing the lug 25 from the corresponding corner member 20, the enclosure 10 is attached directly to the wall 44 from the front, by fixing members 28', via the holes 29 in the back 14, there being one fixing member in each of the holes 29, and in practice these fixing members are
10 screws or anchor bolts.

In either case, a plug 30 of the invention is left in position in each of the holes 29 in the back 14 and the corresponding fixing member 28, 28' is simply forced through it.

15 In either case, the radial part 32 of the plug 30 is greatly compressed, to the benefit of the seal between the corresponding hole 29 and the fixing member 28, 28' used, as shown in figure 6 for the fixing method using the lugs 45.

20 The compressibility of this radial part 32 of the plug 30 of the invention is clearly due not only to the nature of the material from which it is made but also to its structure.

For example, and without implying any limitation on
25 the invention, good results have been obtained with an angle of the tapered surface 38 of the radial part 32 in the range from 100° to 140°, for example around 120°, and an angle of the groove 41 of the radial part 32 in the range from 30° to 90°, for example around 60°.

30 In the embodiment shown in figure 8, the radial part 32 of the plug 30 of the invention forms a plane surface 48 substantially perpendicular to the axis A of the plug around the tapered surface 38 of its front face 36 facing away from the axial part 31.

35 As shown here, for example, the plane surface 48

extends more than half the width L of the radial part 32 from its periphery.

5 In this embodiment, the radial part 32 has no groove on its edge 40 but has an external groove 50 extending annularly around the axis A of the plug where it joins onto the axial part 31.

In the embodiment shown, the radially innermost flank of the groove 50 is cylindrical and is in practice formed by the outside surface of the axial part 31.

10 The radially outermost flank of the groove 50 is generally frustoconical.

In practice, the distance D between the bottom 51 of the groove 50 and the snap-fastener bead 35 corresponds to the sum of the thicknesses of two walls, as previously.

In the embodiment shown, the snap-fastener bead 35 has a triangular profile in axial section and its flank at the greater distance from the radial part 32 is less steeply inclined than the other flank.

20 In the embodiment shown, the web 33 is between the two ends of the axial part 31, substantially half-way along the height of the passage 34 formed thereby.

In this embodiment, the web 33 has a central portion 52 which is also generally concave but whose concave side faces towards the radial part 32.

25 Accordingly, in this embodiment, the web 33 has two separate annular portions, namely a peripheral portion 53 whose concave side faces away from the radial part 32, as previously, and a central portion 52 whose concave side faces the opposite way to that of the peripheral portion 53.

30 The compressibility of the radial part 32 of the plug 30 in the embodiment shown in figure 8 clearly results from the nature of the material from which the plug 30 is made and its structure, as previously.

However, regarding the groove 50, the radial part 32 is to some extent turned back relative to the axial part 31, in a generally U-shaped configuration, which makes the assembly more compact.

5 Also, and most importantly, the plug 30 of the invention can then advantageously adapt to different wall thicknesses, a great deal, if not most, of the compressibility of its radial part 32 being provided by
10 of the groove 50 and the snap-fastener bead 35 on the axial part 31.

For example, and without this implying any limitation on the invention, satisfactory results have been obtained with an angle of the radially outermost
15 flank of the groove 50 in the range from 80° to 120°, for example around 100°.

The present invention is clearly not limited to the two embodiments shown but encompasses any variant execution and/or combination of their various component
20 parts.

CLAIMS

1. An enclosure comprising a body (11) and a door (12), the body (11) comprising four side walls (13) and a back (14), with at least one hole (29) in the back (14) for a fixing member (28, 28') blocked by a plug (30) made from an elastically deformable material, the plug (30) having a tubular axial part (31) engaged in the hole (29) of the back (14), a radial guard part (32) at one end of the axial part (31) and pressed against the back (14) and a web (33) which blocks the passage (34) formed by the axial part (31), characterized in that the plug (30) is pressed against the outside surface of the back (14) and that the radial part (32) is axially compressible to the benefit of the seal between the hole (29) and the fixing member (28, 28')

2. An enclosure according to claim 1, characterized in that the radial part (32) forms a recessed tapered surface (38) centred on the axis (A) of the plug around the passage (34) in the axial part (31) on its front face (36) facing away from the axial part (31).

3. An enclosure according to claim 2, characterized in that the tapered surface (38) of the radial part (32) extends as far as the immediate vicinity of the periphery of its front face (36).

4. An enclosure according to claim 2 or claim 3, characterized in that the radial part (32) has a groove (41) on the outside of its edge (40) and extending annularly around the axis (A) of the plug.

5. An enclosure according to any one of claims 2 to 4, characterized in that the radial part (32) forms a plane external surface (42) substantially perpendicular to the axis (A) of the plug where it joins onto the axial part (31).

6. An enclosure according to claim 2, characterized in that the radial part (32) forms a plane surface (48) substantially perpendicular to the axis (A) of the plug around the tapered surface (38) of its front face (36).

7. An enclosure according to claim 2, characterized in that the radial part (32) forms an external groove (50) extending annularly around the axis (A) of the plug where it joins onto the axial part (31).

8. An enclosure according to claim 79, characterized in that the radially innermost flank of the groove (50) is cylindrical and the radially outermost flank is generally frustoconical.

9. An enclosure according to claim 8, characterized in that the radially innermost flank of the groove (50) is formed by the outside surface of the axial part (31).

5 10. An enclosure according to any one of claims 1 to 9, characterized in that the axial part (31) forms a snap-fastener bead (35) projecting outwards at the end opposite the radial part (32).

11. An enclosure according to anyone of claims 1 to 10, characterized in that the web (33) is in the axial part (31).

10 12. An enclosure according to claim 11, characterized in that the web (33) is at the end of the axial part (31) opposite the radial part (32).

13. An enclosure according to claim 11, characterized in that the web (33) is between the two ends of the axial part (31).

15 14. An enclosure according to anyone of claims 11 to 13, characterized in that at least the peripheral portion of the web (33) is generally concave with its concave side facing away from the radial part (32).

15. An enclosure according to claim 14, characterized in that the web (33) has a central portion (52) which is also generally concave but whose concave side faces towards the radial part (32).