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AN ADD-ON ELEMENT ON A CARRIER
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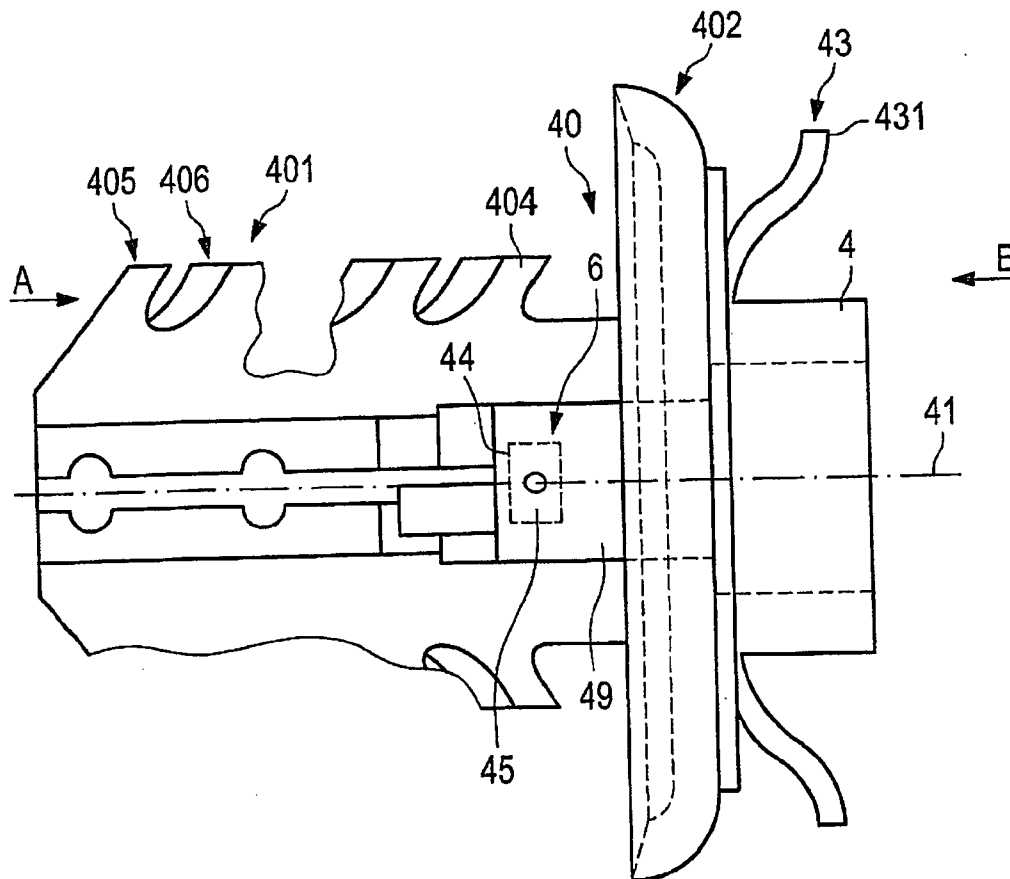
(52) **U.S. Cl.** **24/594.1**(57) **ABSTRACT**(75) **Inventors:** **Laurent Vogler**, Obermodern (FR);
Michel Kuhm, Ingwiller (FR)

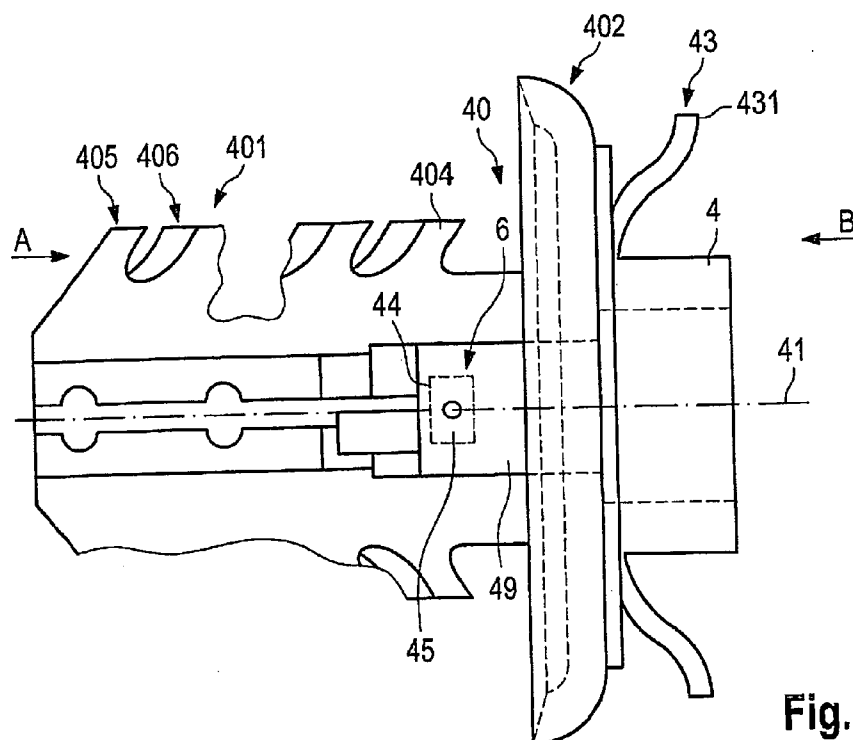
Correspondence Address:

**TAROLLI, SUNDHEIM, COVELL & TUMMINO
L.L.P.****1300 EAST NINTH STREET, SUITE 1700
CLEVEVLAND, OH 44114 (US)**(73) **Assignee:** **TRW Automotive Electronics &
Components GmbH**(21) **Appl. No.:** **12/386,411**(22) **Filed:** **Apr. 17, 2009**(30) **Foreign Application Priority Data**

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A connecting assembly (1) for fastening an add-on element (2) on a carrier element (3) includes a foot (4) which can be inserted into an opening (39) of the carrier element (3) and has fixing means (40) for fixing the foot (4) with respect to the carrier element (3) in a direction parallel to the longitudinal axis (41) of the foot (4). The connecting assembly (1) further includes a pin (5) which can be inserted into a passage (20) of the add-on element (2) and has retaining means (50) which counteract a displacement of the add-on element (2) in a direction parallel to the longitudinal axis (51) of the pin (5). The pin (5) is adapted to be inserted into the foot (4) and has locking means (52) which cooperate with complementary locking means (42) of the foot (4) in a radial direction with respect to the longitudinal axes (41, 51). The foot (4) has two elastic axial restoring means (43) with respect to its longitudinal axis (41) which hold a support surface (54) of the pin (5) and a counter support surface (44) of the foot (4) in contact with each other when the locking means (52) of the pin (5) cooperate with the complementary locking means (42) of the foot (4) after the insertion of the pin (5) into the foot (4).





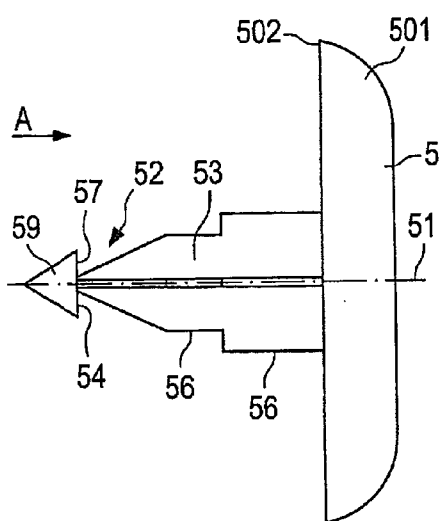


Fig. 8

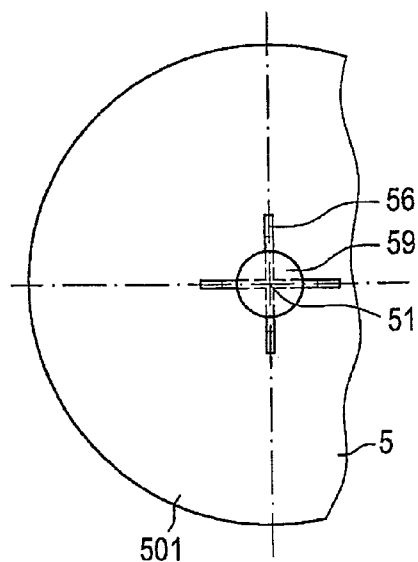


Fig. 9

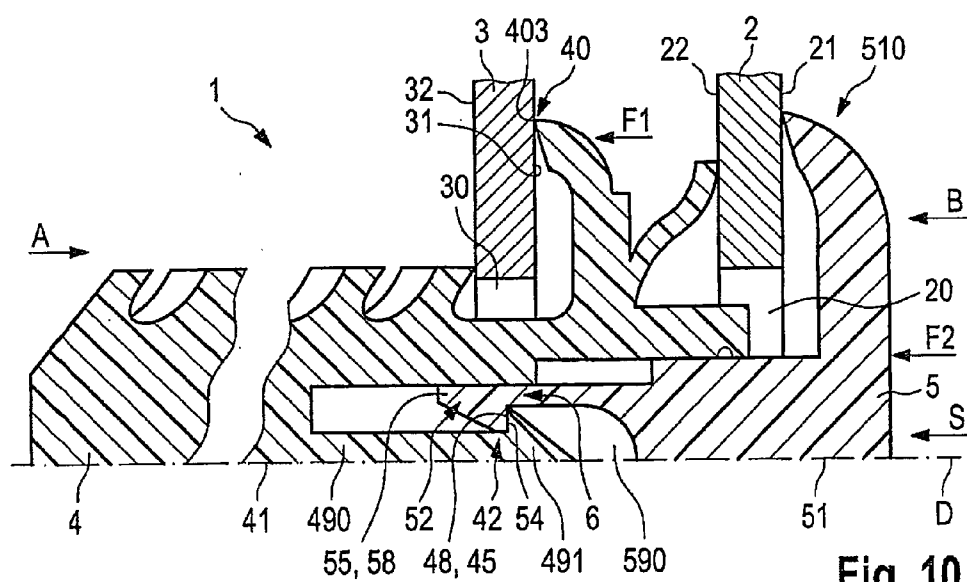


Fig. 10

CONNECTING ASSEMBLY FOR FASTENING AN ADD-ON ELEMENT ON A CARRIER ELEMENT

TECHNICAL FIELD

[0001] The invention relates to a connecting assembly for fastening an add-on element on a carrier element.

BACKGROUND OF THE INVENTION

[0002] Connecting assemblies comprising a foot which can be inserted into an opening of a carrier element and includes fixing means for fixing the foot with respect to the carrier element in a direction parallel to the longitudinal axis of the foot, and comprising a pin which can be inserted into a passage of the add-on element and includes retaining means which counteract a displacement of the add-on element in a direction parallel to the longitudinal axis of the pin, the pin being adapted to be inserted into the foot and having locking means which cooperate with complementary locking means of the foot in a radial direction with respect to the longitudinal axes, are used in particular in the automotive industry for fastening inner lining parts to car body parts of a motor vehicle.

[0003] Different types of devices for fastening add-on elements on carrier elements are known, which are configured as connecting assemblies having two connecting components similar to rivets. A first component (foot) is inserted into an opening formed in the carrier element. A second component (pin) has a shank one end of which is provided with a head. By means of the opposite end, the shank is fitted through an opening (a bore or a slotted hole) of the carrier element and then coaxially into the first component. The add-on element is then clamped between the head of the second component and the carrier element.

[0004] The cooperation between the first and second components can take place in various ways:

[0005] by a clip-on connection by means of a thickened portion or similar at one component and a recess in the other component cooperating therewith, in that the thickened portion and/or the recess is/are elastically deformed when one component is inserted axially, and restored in its/their initial position(s) after an excess stroke;

[0006] by clipping on at least one of the two components by means of one or more elastic tongues integrally formed with the component;

[0007] by locking/unlocking: after the coaxial insertion of the second component in a specific angular orientation relative to the first component, a rotary locking is produced by means of a tool, in which the locking means of the two components cooperate with each other. An unlocking can be realized by a rotation in the opposite direction. Such devices are known under the name of quarter-turn fastenings; or

[0008] by plastic deformation of at least one of the two components. In some connecting assemblies, part of the first component can be expanded on the rear side of the carrier element. This expanding step can be realized either by means of a tool or by a deformation as a result of the cooperation of the first and second components.

[0009] Some connecting assemblies of the prior art are designed such that they can be fastened merely in a carrier opening having a specific shape, which restricts its general usability.

[0010] It is often necessary to remove again an add-on element after the first mounting thereof, particularly to attach particular devices or to carry out maintenance works. In the known connecting assemblies, it is then necessary to remove first the second and then the first component, provided that this is still possible. This means that the connecting parts have to be separated. In some cases it is furthermore necessary to use a tool therefor. A damaging of one of the components during the removal is not unusual. Furthermore, some connecting techniques do not permit a reuse of the connecting assembly under satisfactory circumstances, in particular if the cooperation between the first and second components occurs by plastic deformation.

[0011] In addition, it has to be noted that the connecting techniques known from the prior art often ensure merely a mediocre tightness at the connecting points.

[0012] Document EP 1 698 785 A1 discloses a connecting assembly of the type initially mentioned, having a pin and a foot. The pin has a shank which can be inserted into an opening of the foot. The foot includes two elastic tongues having arresting means which extend perpendicularly from a plate. The connecting assembly can take a waiting position, in which the pin is retained in the foot and the plate of the foot is clamped between a stop surface and a protrusion of the pin, a locking position and an unlocking position.

[0013] Document DE 37 04 696 A1 shows a fastening device for plates having a plug-in part and a reception part in which a recess is provided for the elongated body of the plug-in part. A surrounding retaining portion is formed in the recess and engages a retaining head of the plug-in part and therefore prevents the plug-in part from being withdrawn axially.

[0014] Document U.S. Pat. No. 4,276,806 shows a reusable fastening assembly comprised of two plastic parts which are initially captively connected to each other at a predetermined breaking point. When the upper part is inserted into the lower part, it provides for an arresting of the lower part in an opening of the element which is to be fastened, and retaining means of the lower part engage behind the rim of an opening of the carrier so that the element is firmly fastened to the carrier. By lifting the head of the upper part, the latter can be brought out of engagement with the lower part. The element along with the assembly can then be detached from the carrier.

[0015] Document EP 1 177 387 B1 discloses a connecting element which is comprised of an upper part and of a lower part extending through the upper part, and by means of which it is possible to connect a carrier to a bearing part. In the mounted state, a region of the upper part connected to the bearing part is expanded behind or into a carrier opening. The upper part includes an upper flange having a central inner toothing in which a counter-toothing of the lower part engages. The lower part has in a latching region between two cylindrical sectors a latching recess in which a counter-latch of the upper part is mounted. A shank provided with slots and the flexible sectors of which are provided with an outer toothing adjoins the upper flange of the upper part.

[0016] Document DE 603 01 994 T2 relates to a plastic fastening element for fastening a plate to a carrier. The fastening element includes a pin part having a head and a shank, and a body part having a flange and a pair of legs extending

therefrom. The legs are to be inserted into a bore formed in the carrier. The flange includes a channel which receives the shank of the pin part. The legs are moved away from each other and brought into pressure contact with an inner surface of the carrier bore to thus fasten the fastening element and then the plate to the carrier. An engagement control mechanism formed outside on a leg of the body part controls the pressure contact between the leg and the inner surface of the carrier bore. The force for inserting the pin part into the body part is thus determined. The engagement control mechanism comprises a bore formed in the leg, the pressure force necessary to drive the shank through the bore in the body part being thus reduced.

[0017] It is an object of the invention to avoid the disadvantages of the prior art and to propose a connecting assembly which ensures a reliable but reversible fastening, which is free of play, of the add-on element on the carrier element.

BRIEF SUMMARY OF THE INVENTION

[0018] According to the invention, a connecting assembly for fastening an add-on element on a carrier element includes a foot which can be inserted into an opening of the carrier element and has fixing means for fixing the foot with respect to the carrier element in a direction parallel to the longitudinal axis of the foot. The connecting assembly further includes a pin which can be inserted into a passage of the add-on element and has retaining means which counteract a displacement of the add-on element in a direction parallel to the longitudinal axis of the pin. The pin is adapted to be inserted into the foot and has locking means which cooperate with complementary locking means of the foot in a radial direction with respect to the longitudinal axes. The foot has two elastic axial restoring means with respect to its longitudinal axis, which hold a support surface of the pin and a counter support surface of the foot in contact with each other when the locking means of the pin cooperate with the complementary locking means of the foot after the insertion of the pin into the foot. The connecting assembly according to the invention has the advantage that the pin and the foot can be manufactured from a rigid material so that they can be mounted by means of automated manufacturing means due to their robustness.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] FIG. 1 shows a schematic view in a partial section of a connecting assembly according to the invention in a plane through the longitudinal axis thereof and in the mounted state;

[0020] FIG. 2 shows a schematic lateral view of the foot of the connecting assembly;

[0021] FIG. 3 shows a schematic view of the foot of FIG. 2 in the direction A;

[0022] FIG. 4 shows a schematic view in a partial section of the foot of FIG. 2 in the plane C-C through the longitudinal axis thereof;

[0023] FIG. 5 shows a schematic sectional view of the foot of FIG. 2 in the plane D-D perpendicular to the longitudinal axis and in the direction A;

[0024] FIG. 6 shows a schematic sectional view of the foot of FIG. 2 in the plane E-E which is perpendicular to the longitudinal axis and in the direction B;

[0025] FIG. 7 shows a schematic view of the foot of FIG. 2 in the direction B;

[0026] FIG. 8 shows a schematic lateral view of the pin of the connecting assembly;

[0027] FIG. 9 shows a schematic view of the pin of FIG. 8 in the direction A; and

[0028] FIG. 10 shows a schematic view in a partial section of a connecting assembly according to a variant of the invention in a plane through its longitudinal axis.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0029] Though the invention is preferably applicable in the field of the lining of structures, and in particular in the field of motor vehicles and the lining of the car body with an inner lining, the invention is described below generally on the basis of a reversible fastening of an add-on element on a carrier element, in which the add-on element can be an inner lining part and the carrier element can be a car body part of a motor vehicle.

[0030] The connecting assembly 1 according to the invention which is illustrated in the figures serves to fasten an add-on element 2 on a front side 31 of a carrier element 3 and cooperates with the rim of an opening 30 formed in the carrier element 3.

[0031] The connecting assembly 1 includes as essential elements a foot 4 and a pin 5. In the embodiments shown in the figures, they form the two single components of the connecting assembly 1. The foot 4 and the pin 5 are made of plastic and in particular fabricated by injection molding. The foot 4 and the pin 5 are thus suitable for a mass production. However, unlike the known connecting assemblies, the foot 4 and the pin 5 are made of a hard and rigid plastic material which permits the cooperation of their contact regions in the elastic and not in the plastic deformation range. The realization from a hard and rigid material furthermore facilitates the handling by automated means such as robots.

[0032] The foot 4 which includes a cavity 49 around its longitudinal axis 41 is provided for insertion into the opening 30 of the carrier element 3. The foot 4 has means 40 for fixing the foot 4 to the carrier element 3 in a direction parallel to the longitudinal axis 41 of the foot 4. This axial fixing takes place under the action of a force F1 exerted in this direction. The fixing means 40 can tightly seal the opening 30.

[0033] As can be seen in FIG. 1, the fixing means 40 include, on the one hand, arresting means 401 and, on the other hand, first elastic axial restoring means 402 which are located on opposite sides of the carrier element 3 after the insertion of the foot 4. The first axial restoring means 402 which are configured as a cup rest against the front side 31 of the carrier element 3 via a contact surface 403.

[0034] In contrast thereto, the arresting means 401 are configured as barbs 404 which can cooperate with the rear side 32 of the carrier element 3 and/or with the inner surface of the opening 30 so that the connecting assembly 1 can also be used in a blind hole. The foot 4 includes several axial rows 405, 406 of barbs 404 along different surface lines which extend parallel to the longitudinal axis 41 (cf. FIG. 2). The rows are axially spaced apart from each other. The foot 4 can thus be used in openings 30 that are stamped in metal sheets of different thicknesses, the distance between the barbs of two alternating rows being smaller than within the same row so that a good pressure support is ensured for each metal sheet thickness.

[0035] The pin 5 shown separately in FIG. 8 is provided for insertion into a passage 20 of the add-on element 2 and

includes retaining means 50 that counteract a displacement of the add-on element 2 in a direction parallel to the longitudinal axis 51 of the pin 5 (cf. FIG. 1). The pin 5 is additionally provided for insertion into the cavity 49 of the foot 4 in a coaxial orientation in alignment of the longitudinal axes 41 and 51 (common axis D). The pin 5 slides in a direction of insertion S.

[0036] The connecting assembly 1 formed by the foot 4 and the pin 5 is first pre-mounted to the add-on element 2. The connecting assembly 1 is then fastened to the carrier element 3 under the action of a force F2 exerted onto the pin 5 in the direction S. The fact that the pin 5 slides inside the foot 4 due to the effect of force is comprehensible because of the fixing means 40 which ensure a firm (and tight) mounting of the foot 4 to the opening 30 of the carrier element 3.

[0037] The pin 5 furthermore includes locking means 52 which are intended to cooperate with complementary locking means 42 formed in the foot 4 under the action of radial elastic restoring means 6 in a radial direction with respect to the axis D. The cooperation of these locking means 52 with the complementary locking means 42 is possible merely in a restricted axial region after the insertion of the pin 5 into the foot 4.

[0038] In order to ensure that the add-on element 2 perfectly rests on its carrier, it has to be taken into consideration that the add-on element 2 has manufacturing tolerances, that means that its thickness can vary in a particular range. The cooperation of the locking means 52 with the complementary locking means 42 takes these tolerances into account and permits a particular functional play with respect to the axis D.

[0039] To eliminate this play and ensure the resting of the add-on element 2 against the assembly formed by the carrier element 3 and the foot 4 inserted therein, the foot 4 additionally includes second elastic axial restoring means 43 with respect to its longitudinal axis 41. These second elastic axial restoring means 43 are intended to hold a support surface 54 of the pin 5, which is formed between the insertion means 59 and the retaining means 50 (cf. FIG. 8), and a counter support surface 44 of the foot 4 (cf. FIGS. 2, 4, 5 and 7) in contact with each other when the complementary locking means 42 of the foot 4 cooperate with the locking means 52 of the pin 5 in the mounted state of the connecting assembly 1. The support surfaces 54 and 44 are substantially perpendicular to the longitudinal axis 51 of the pin 5 and to the longitudinal axis 41 of the foot 4, respectively.

[0040] According to a first embodiment which is shown in FIGS. 1 to 9, the elastic radial restoring means 6 are integrated into the foot 4. They are formed by one or more elastic tongues 45 which are symmetrically or regularly distributed about the axis 41 so that the restoring forces are concentrated to this axis. The support surface 44 is formed at the end of the tongue(s) 45.

[0041] The locking means 52 are arranged so as to surround the longitudinal axis 51. This arrangement ensures the possibility of a cooperation between the pin 5 and the foot 4 in each angular position with respect to the axis D so that in contrast to known connecting assemblies, a definitive locking is possible in each angular position.

[0042] The retaining means 50 of the pin 5 are comprised of a head 501 which is located at a first axial end of a shank 53. This shank 53 is provided for slidable cooperation with the foot 4 along the axis D. As shown in FIGS. 4 and 8, the pin 5 has guiding means 56 surrounding the longitudinal axis 51. The foot 4 has complementary guiding means 46 which sur-

round the longitudinal axis 41 and the form of which is at least partially complementary to the guiding means 56. The guiding means 56 and 46 are intended to permit the coaxial sliding of the pin 5 relative to the foot 4 along the axis D. The shank 53 slides inside the cavity 49 of the foot 4 where it is guided to the level of the complementary guiding means 46 which are configured as one or more bores in the foot 4.

[0043] At the second axial end of the shank 53 that can be rotated about the longitudinal axis 51, this end being opposite to the retaining means 50, the pin 5 has insertion means 59. The insertion means 59 are intended to counteract the radial restoring means 6 to permit the insertion of the insertion means 59 into the cavity 49 of the foot 4 and the passage of the locking means 52. The insertion means 49 are configured so as to be pointed, conical, ogival or similar.

[0044] As shown in FIGS. 2, 4, 5 and 7, the elastic tongues 45 form at the same time the elastic radial restoring means 6 and the complementary locking means 42 of the foot 4. The complementary locking means 42 include more precisely at least one finger 47 which is integrated into the elastic tongue 45. The elastic tongues 45 are movable in a radial direction with respect to the longitudinal axis 41 and have a circumferential surface which forms the counter support surface 44 of the foot 4.

[0045] Behind the insertion means 59, the shank 53 of the pin 5 has an undercut 57 which forms the locking means 52 along with the insertion means 59. The undercut 57 includes the support surface 54 which is provided for cooperation with the counter support surface 44 by abutment. The undercut 57 also permits a deflection of the elastic tongues 45 about their connecting point so that they can be restored towards the longitudinal axis 41 of the foot 4.

[0046] When the pin 5 is inserted into the foot 4 under the effect of the axial force F2 after the insertion of the pin 5 into the passage 20 of the add-on element 2, the tongues 45 forming the radial elastic restoring means 6 are moved away from the longitudinal axis 41 up to a maximum radial position due to the forward displacement of the insertion means 59. In case of a further insertion of the pin 5, the undercut 57 enables the restoring effect of the radial elastic restoring means 6 so that the tongues 45 move back to the axis 41 of the foot 4 and the insertion means 59 are enclosed in the cavity 49 of the foot.

[0047] A removal of the pin 5 from the foot 4 to permit a reverse passage of the insertion means 59 is not possible without a tool for expanding the tongues 45. As soon as the tongues 45 are folded in the undercut 57 and their surface 44 acts as a stop which counteracts a further movement of the pin 5 after a specific slight displacement opposite to the direction S, it is not possible anymore by a simple axial pulling along the axis D opposite to the direction S to act upon the radial elastic restoring means 6 such that the pin 5 is released. This is because the displacement ends in a position in which the surface 44 of the tongues 45 cooperates with the support surface 54 of the pin 5. In this state, the add-on element 2 is held in a clamped condition between the retaining means 50 of the pin 5 which are in particular formed by the head 501, and the foot 4.

[0048] Merely the actual attachment of the add-on element 2 relative to the foot 4 and thus to the carrier element 3 remains. To this end, the foot 4 includes two elastic axial restoring means 43 with respect to the axis D which are intended to hold the support surface 54 of the pin 5 and the counter support surface 44 of the foot 4 in contact with each other. The second elastic axial restoring means 43 ensure that

the pin 5 is moved back along the axis D opposite to the direction S until the abutment position of the support surfaces 44 and 54 of the tongues 45 and the pin 5, respectively is reached.

[0049] The second elastic axial restoring means 43 are furthermore dimensioned such that they exert a force onto the add-on element 2 beyond reaching this abutment position and hold the latter firmly clamped between a support surface 431 which is formed at the second elastic axial restoring means 43 opposed to the rear side 22 of the add-on element 2, which faces the carrier element 3, and a support surface 502 which is formed at the head 501 of the pin 5 on the front side 21 of the add-on element 2, which is opposite to the rear side 22. As shown in FIGS. 1 to 4, the second elastic axial restoring means 43 are configured as a cup or as a segment of a cup or similar.

[0050] The pin 5 furthermore includes third elastic axial restoring means 510 formed at the head 501 thereof and acting in a direction parallel to the longitudinal axis 51. At the support surface 502, the third elastic axial restoring means 510 are in contact with an opposed support surface 21 of the add-on element 2 and are intended to exert a thrust force in the direction S onto the add-on element 2.

[0051] In particular owing to the design of the arresting means 401 and of the first, second and third elastic axial restoring means 402, 43 and 510, respectively, the connecting assembly ensures a perfect tightness at the connecting points.

[0052] FIG. 10 shows a second embodiment of the connecting assembly according to the invention, which is basically similar to the first embodiment. Concerning the components which correspond to that of the first embodiment and have the same function, the same reference numerals were used despite possible differences in the concrete design of these components. Merely the essential differences are discussed below.

[0053] Unlike in the first embodiment, the elastic radial restoring means 6 of the second embodiment are integrated into the pin 5 and formed by at least one elastic tongue 55. The elastic tongues 55 are movable in a radial direction with respect to the longitudinal axis 51 and include a circumferential surface which forms the support surface 54.

[0054] One or more elastic tongues 44 form the locking means 52, the locking means 52 including more precisely at least one finger 58 which is integrated into the tongue 44.

[0055] The complementary locking means 42 surround the longitudinal axis 41 and are formed by at least one undercut 48.

[0056] At the end of a shank 490 surrounding the longitudinal axis 41, on the end face intended to cooperate with the pin 5, the foot 4 also includes insertion means 491 which counteract the elastic radial restoring means 6 to permit the insertion of the insertion means 491 into a cavity 590 formed in the pin 5. On the side opposed to that side which is to cooperate with the pin 5, in the vicinity of the insertion means 491 at an end of the undercut 48 forming part of the complementary locking means 42, the shank 490 has the counter support surface 45.

[0057] The connecting assembly 1 according to the invention, in particular the embodiments described, permits a firm and tight connection of the add-on element 2 and the carrier element 3, the fastening being basically reversible. However, the removal of the add-on element 2 from the carrier element 3 cannot take place in a simple way so that an undesired separation of the add-on element from the carrier element is

avoided. The extraction of the pin 5 from the foot 4 to permit a removal of the add-on element 2 is possible only by means of a tool. It is therefore possible after the first mounting of the add-on element 2 to the carrier element 3 to remove the add-on element 2 to mount devices or carry out maintenance works, and then to fasten the add-on element 2 again perfectly to the carrier element 3.

[0058] Of course, the invention is not limited to the described embodiments and examples for application. Rather, variants and modifications are possible without leaving the scope of the invention.

1. A connecting assembly (1) for fastening an add-on element (2) on a carrier element (3), comprising

a foot (4) which can be inserted into an opening (39) of the carrier element (3) and includes fixing means (40) for fixing the foot (4) with respect to the carrier element (3) in a direction parallel to the longitudinal axis (41) of the foot (4), and

a pin (5) which can be inserted into a passage (20) of the add-on element (2) and includes retaining means (50) which counteract a displacement of the add-on element (2) in a direction parallel to the longitudinal axis (51) of the pin (5),

the pin (5) being adapted to be inserted into the foot (4) and including locking means (52) which cooperate with complementary locking means (42) of the foot (4) in a radial direction with respect to the longitudinal axes (41, 51),

the foot (4) having two elastic axial restoring means (43) with respect to its longitudinal axis (41) which hold a support surface (54) of the pin (5) and a counter support surface (44) of the foot (4) in contact with each other when the locking means (52) of the pin (5) cooperate with the complementary locking means (42) of the foot (4) after the insertion of the pin (5) into the foot (4).

2. The connecting assembly (1) according to claim 1, wherein the locking means (52) are configured so as to surround the longitudinal axis (51) of the pin (5).

3. The connecting assembly (1) according to claim 1, wherein the complementary locking means (42) are configured so as to surround the longitudinal axis (41) of the foot (4).

4. The connecting assembly (1) according to claim 1, wherein the locking means (52) of the pin (5) cooperate with the complementary locking means (42) of the foot (4) under the action of radial elastic restoring means (6) in the radial direction.

5. The connecting assembly (1) according to claim 4, wherein the radial elastic restoring means (6) are integrated into the foot (4) and formed by at least one elastic tongue (45).

6. The connecting assembly (1) according to claim 5, wherein the elastic tongue (45) forms the complementary locking means (42).

7. The connecting assembly (1) according to claim 5, wherein the elastic tongue (45) is movable in a radial direction with respect to the longitudinal axis (41) of the foot (4) and has a circumferential surface which forms the counter support surface (44).

8. The connecting assembly according to claim 1, wherein the complementary locking means (42) have at least one finger (47) or one undercut (48).

9. The connecting assembly (1) according to claim 4, wherein the radial elastic restoring means (6) are integrated into the pin (5) and formed by at least one elastic tongue (55).

10. The connecting assembly (1) according to claim 9, wherein the elastic tongue (55) forms the locking means (52).

11. The connecting assembly (1) according to claim 9, wherein the elastic tongue (55) is movable in a radial direction with respect to the longitudinal axis (51) and has a circumferential surface which forms the support surface (54).

12. The connecting assembly (1) according to claim 1, wherein the locking means (52) have at least one undercut (47) or one finger (58).

13. The connecting assembly (1) according to claim 5, wherein the pin (5) has a shank (53) surrounding its longitudinal axis (51) and having insertion means (59) which counteract the radial restoring means (6) to permit an insertion of the insertion means (59) into a cavity (49) formed in the foot (4).

14. The connecting assembly (1) according to claim 13, wherein between the insertion means (59) and the arresting means (50), the shank (53) has an undercut (47) having the support surface (54), the support surface (54) forming at least part of the locking means (52).

15. The connecting assembly (1) according to claim 5, wherein the foot (4) has a shank (490) surrounding its longitudinal axis (41) and having insertion means (491) which counteract the radial restoring means (6) to permit an insertion of the insertion means (491) into a cavity (590) formed in the pin (5).

16. The connecting assembly (1) according to claim 15, wherein the shank (490) has an undercut (48) having the counter support surface (45), the counter support surface (45) forming at least part of the complementary locking means (42).

17. The connecting assembly (1) according to claim 1, wherein the fixing means (40) of the foot (4) are formed from arresting means (401) and first elastic axial restoring means (402).

18. The connecting assembly (1) according to claim 17, wherein the arresting means (401) comprise barbs (404) which ensure an elastic support at the opening (30) of the carrier element (3).

19. The connecting assembly (1) according to claim 18, wherein the barbs (404) are arranged in several rows (405, 406) which are spaced apart in a direction parallel to the longitudinal axis (41) of the foot (4).

20. The connecting assembly (1) according to claim 1, wherein the pin (5) has third elastic axial restoring means (510) with respect to a direction parallel to its longitudinal axis (51).

21. The connecting assembly (1) according to claim 1, wherein the pin (5) has guiding means (56) surrounding its longitudinal axis (51), and in that the foot (4) has complementary guiding means (46) which surround its longitudinal axis (41) the form of which is at least partially complementary to the guiding means (56) of the pin (5) and configured such that they permit a coaxial sliding of the pin (5) relative to the foot (4) along an axis (D).

22. The connecting assembly (1) according to claim 1, wherein the pin (5) can be inserted into a cavity (49) formed in the foot (4) by orienting the longitudinal axes (41, 51) of the foot (4) and of the pin (5) along an axis (D) and by coaxial sliding in a direction of insertion (S) along the axis (D).

23. The connecting assembly (1) according to claim 1, wherein the fixing means (40) tightly seal the opening (30).

24. The connecting assembly (1) according to claim 1, wherein the second elastic axial restoring means (43) clamp the add-on element (2) between a support surface (431) of the second elastic axial restoring means (43) and a support surface (502) of the pin (5).

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