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(54) Title: HOTMELT PLUG SYSTEM

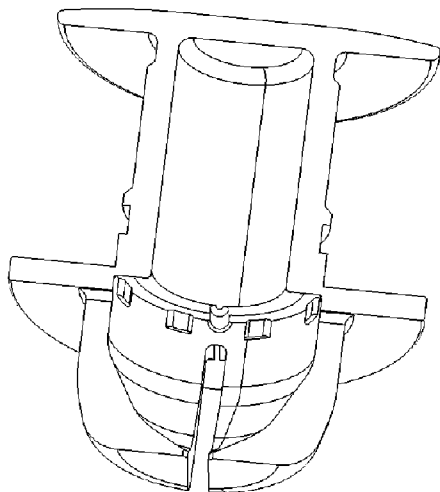


Fig. 1b

(57) Abstract: The invention relates to a plug system, in particular having a rivet and preferably a separate hot-melt bush. A closure plug system (1) having an expanding rivet (10) for closing an opening (110) in a vehicle part (100), in particular in a panel of a vehicle body, wherein the expanding rivet (10) is composed of an expanding part (11) and a pin part (12), wherein the pin part (12) in the fitted state of the expanding rivet (10) in the opening (110), hereunder referred to as the fitted state, is introduced into the expanding part (11) up to a terminal position and expands the latter in the opening (110), wherein the expanding part (11) and the pin part (12) are integrally manufactured and in an original position are initially interconnected by a default breaking point (13), wherein the default breaking point (13) has to be breached in order for the pin part (12) to be introduced up to the terminal position in the expanding part (11), wherein the expanding rivet (10) has a latching mechanism (30) by way of which the expanding part (11) and the pin part (12) in relation to one another are prelatchable in a prelatched position which differs from the terminal position if and when the default breaking point (13) has been breached. A corresponding method for closing an opening of a vehicle part is likewise the subject matter of this invention.

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HOTMELT PLUG SYSTEM

The invention relates to closure plugs, in particular to hot-melt closure plugs. Closure plugs of this type, when including hot-melt material, are usually embodied in an integral manner and protect one side of the sheet metal panel of a vehicle against corrosion. Furthermore, there are integral closure plugs which with the aid of sealing lips protect two sides of the sheet metal panel against corrosion, for example EP 1375308 A1, but these are associated with a complex and expensive tool design, in particular when hot-melt material is applied to the lips, and with high fitting forces, especially in the case of small diameters, for example of less than 20 mm.

It is an object of the invention to provide an improved closure plug which is particularly suitable for employment as a hot-melt closure plug. In order for a solution to be found therefor, the inventor has departed from the previous approach of providing an integral closure plug and, has considered the field of expanding-rivet fasteners which are disclosed, for example, in DE 298 20 121 U1 and which fasten two components to one another, despite said expanding-rivet fasteners being more complex in manufacturing and shipping.

In order for the object to be achieved, a closure plug system having an expanding rivet for closing an opening in a vehicle part, in particular in a panel of a vehicle body, is proposed in particular, wherein the expanding rivet is composed of an expanding part and a pin part, wherein the pin part in the fitted state of the expanding rivet in the opening, hereunder referred to as the fitted state, is introduced into the expanding part up to a terminal position and expands the latter in the opening, wherein the expanding part and the pin part are integrally manufactured and in an original position are initially interconnected by a default breaking point, wherein the default breaking point has to be breached in order for the pin part to be introduced up to the terminal position in the expanding part, wherein the expanding rivet has a latching mechanism by way of which the expanding part and the pin part in relation to one another are prelatchable in a prelatched position which differs from the terminal position if and when the default breaking point has been breached.

Accordingly, as a solution a method for closing an opening of a vehicle part by means of a closure plug system is proposed in particular, wherein

- a default breaking point between an expanding part and a pin part of an expanding rivet of the closure plug system is breached, and
- the pin part is pushed into the expanding part up to a terminal position, the pin part thus expanding the expanding part in the opening when the expanding rivet is introduced into the opening, wherein the expanding rivet is preferably introduced into the opening once the default breaking point has been breached, wherein the expanding part and the pin part, once the default breaking point has been breached and preferably before the expanding rivet has been introduced into the opening, in a prelatched position which differs from the terminal position are prelatched to one another by means of a latching mechanism.

On account thereof, a very advantageous closure plug system which is integrally manufacturable is provided. On account of the prelatching potential, only very low fitting forces are required if the default breaking point has previously been breached, the expanding rivet nevertheless being suppliable (with or without a previously breached default breaking point) to the fitting site in one complete functional group. The closure plug system is preferably used for closing an opening in a vehicle part, preferably in a vehicle body, prior to completion of the vehicle in the course of vehicle assembly, post cathodic or anodic dip coating. Alternatively, the closure plug system is usable as fastening system which is easy to fit and manufacture and is shippable in an advantageous manner, or is used therefor.

The opening preferably has a diameter $d \leq 19$ mm, preferably $d \leq 15$ mm, particularly preferably $d \leq 10$ mm. This closure plug system offers the greatest advantages thereof in particular at such small openings, since lower fitting forces are required in comparison with integral closure plugs.

The expanding rivet is preferably made from plastics, preferably by means of injection molding, and preferably from polyamide. The expanding effect is preferably slighter in the prelatched position than in the terminal position, particularly preferably no expanding effect being provided by the pin part in the prelatched position. The expanding part preferably has a shank, preferably a hollow shank, which preferably has an internal diameter which is the same as or smaller than the external diameter of the pin part, for

example at least at the distal end. Preferably, the expanding part at the proximal end has a flange which preferably has a larger external diameter than the external diameter of the shank of the expanding part. Preferably, (in relation to the internal and/or external diameter) the shank is partially tapered in a conical manner preferably in the direction of the distal end of the expanding part.

The expanding part in the opening is preferably expanded in that regions of the expanding part are subject to an enlargement in terms of the external diameter of said regions in that the pin part pushes the latter in a radially outward manner.

Integrally manufactured is preferably understood to mean that the expanding part and the pin part are or have been collectively manufactured as one piece, respectively. The expanding part and the pin part are preferably integrally manufactured by means of a casting method, preferably by means of an injection-molding method, that is to say preferably by means of a common tool. The original position is preferably that relative position of the expanding part and the pin part that is present immediately post manufacturing, for example injection molding. The terminal position is preferably a position in which the expanding rivet is considered to be fitted, as the expansion attained is sufficient; that is to say that said terminal position need not necessarily be a terminal-stop position, the latter, on account of the haptic feedback during fitting, however usually being an advantageous terminal position.

The pin part preferably has a shank. At that end that faces away from the expanding part the pin part preferably has a cover part which radially protrudes beyond the shank and which preferably forms an end-side termination of the pin part.

A latching mechanism is preferably understood to mean a mechanism which enables a latching position in which the expanding part and the pin part are mutually held in particular in a form-fitting manner (and not merely by way of a press fit), wherein the latching position is attainable by means of overcoming a temporary and flexible maximum material deformation, that is to say that the material deformation in the latching position is smaller than when the pin part is moved into the latching position.

In one further preferred embodiment of the invention, the expanding part and the pin part in the original position by way of the default breaking point are interconnected in such a manner that said parts are substantially coaxial with one another.

On account thereof and when the remaining construction is designed in a corresponding manner, the expanding rivet may be fixed in the opening by axial displacement alone. The expanding part and the pin part are preferably rotation-symmetrical, axial referring to this rotation-symmetrical axis.

In one further preferred embodiment of the invention, the prelatched position, proceeding from the original position, is attainable by displacing the pin part in a substantially axial manner along one direction in relation to the expanding part, and the terminal position, proceeding from the prelatched position, is attainable by axially displacing the pin part farther along the same direction in relation to the expanding part.

In a corresponding method according to the invention, the pin part, proceeding from the original position, is correspondingly displaced along one direction to the prelatched position and then, proceeding from the prelatched position, by axially displacing the pin part farther along the same direction in relation to the expanding part to the terminal position. On account thereof, an intuitive application of the system is provided. Preferably, this direction is also the same direction in which the expanding rivet is introduced into the opening.

In one further preferred embodiment of the invention, the closure plug system has a sealing bush which is push-fittable or push-fitted onto the expanding rivet, in particular onto the expanding part.

In a corresponding method according to the invention, a sealing bush is push-fitted onto the expanding rivet, in particular onto the expanding part; this may be performed post prelatching or prior to prelatching and preferably prior to the expanding rivet being introduced into the opening, for example prior to or post shipping from the manufacturing site to the fitting site. Alternatively, the bush may also be moved to the fitting site, and the bush is initially incorporated in the opening and the closure plug is thereafter pushed into the bush which is located in the opening.

Particularly good sealing in particular in relation to dirt, corrosion, or noise is achieved by way of the sealing bush. The sealing bush preferably covers at least that region of the expanding rivet which in the fitted state is directly adjacent to the opening. The sealing bush preferably has an internal diameter which is the same as or larger than the external diameter of the expanding part; preferably, the internal diameter of the sealing bush is substantially adapted to the external diameter of the expanding part. The sealing bush is preferably cup-shaped, that is to say cylindrical (possibly having conical regions), wherein one end side is open (notwithstanding a collar, see hereunder), and the other end side is preferably closed. The expanding part and the sealing bush are introduced, preferably pre-fitted, through the open end side. The sealing bush is made from a thermoplastic material (TPE), for example, or from a hot-melt material, for example an ethylene vinyl acetate (EVA) based hot-melt adhesive material such as is employed, for example, in paint drainage closure plugs. In the variant using TPE means a rubber-like bush which is merely widened by the expanding rivet and in relation to the sheet-metal panel edge seals in a form-fitting manner, for example, is obtained.

The object according to the invention, of providing an improved closure plug, in particular a hot-melt plug, is also achieved by the provision of a sealing bush according to the invention, having a closure plug. That is to say that the closure plug need not necessarily be an expanding rivet and need not necessarily be an integrally manufactured expanding rivet and also need not necessarily have a latching mechanism for prelatching, but here may be a known closure plug and/or fastener. The provision of a sealing bush alone results in simple manufacturability and at the same time a very good sealing effect, preferably when the material of the bush is TPE or particularly preferably a hot-melt material, since the bush advantageously seals on both sides of the vehicle sheet metal panel. The combination having an expanding rivet, preferably an integrally manufactured expanding rivet with a default breaking point and/or a latching mechanism for prelatching here offers further and even more advantageous embodiments. The object according to the invention is likewise achieved by a corresponding method for closing an opening of a vehicle part by means of a closure plug system, wherein this method comprises the incorporation of the sealing bush into the opening or push-fitting the sealing bush onto the closure plug, and thereafter incorporating

the closure plug (with or without a sealing bush, as the case may be) into the opening (with or without a sealing bush, as the case may be).

In one further preferred embodiment of the invention, the expanding part has a shank, and the sealing bush at least partially surrounds the shank.

On account thereof, advantageous sealing on the bush face of the opening (internal face) is achieved. The preferred properties of the shank of the expanding part, which have been mentioned above, are in turn possible here.

In one further preferred embodiment of the invention, the expanding part has a flange, and the sealing bush at least partially surrounds the flange.

On account thereof, advantageous sealing around the opening is achieved on a surface of the vehicle part. The preferred properties of the flange of the expanding part, which have been mentioned above, are in turn possible here. The sealing bush preferably has a radially inwardly drawn region (collar), which covers in a radially outward region of the flange that side of the flange that faces away from the shank of the expanding part, on account of which the sealing bush prior to fitting is better retained on the expanding part.

In one further preferred embodiment of the invention, the sealing bush is composed of a hot-melt material.

In a corresponding method according to the invention, the vehicle part post fitting of the closure plug system is moved into an oven having a temperature which is sufficient for the hot-melt material to melt. On account thereof, particularly good sealing of the opening is achieved.

In one further preferred embodiment of the invention, the default breaking point is formed by individual webs.

On account thereof, a defined and low default breaking force is achieved. Preferably, 2, 3, 4 or more webs are present. The webs are preferably distributed along the circumference so as to be mutually spaced apart in a uniform angular manner, preferably in precisely one axial plane. Preferably, one or a plurality of the webs connect that end of the pin part that is to be

first introduced into the expanding part (distal end) to the internal face of a central opening of the expanding part, preferably on the flange of the expanding part.

In one further preferred embodiment of the invention, the expanding part has at least two expanding segments which in those regions in which an expanding effect is provided are mutually separated by expansion grooves, the webs, or at least part of the webs being disposed such that after breaching of the default breaking point these webs, or that part of the webs or stub or burr of the respective web that still remains after breaching of the default breaking point, engage or engages, respectively, in one or a plurality of the expansion grooves when the pin part is located in the terminal position or is displaced in this direction.

In a corresponding method according to the invention, the webs, part of the webs, or corresponding stubs or burrs are displaced in a corresponding manner into the expansion grooves. On account thereof, a negative effect caused by the webs or by the burr, respectively, may be advantageously avoided. Preferably, the webs or at least part of the webs have the same mutual angular spacing as the corresponding expansion grooves; particularly preferably, these webs or at least part of these webs in the original position are disposed on the same angular positions as the corresponding grooves, that is to say that the former are only axially displaced.

Expansion grooves are preferably grooves which are enlarged when expanding of the expanding part is performed. One or a plurality of the expansion grooves are preferably grooves which at least in portions run in an axial manner.

In one further preferred embodiment of the invention, the latching mechanism has two latching components, namely a first latching groove and a first latching rib, wherein the one latching component is disposed on the expanding part, and the other latching component is disposed on the pin part.

On account thereof, the latching mechanism is implemented in a simple manner. Preferably, the first latching groove is disposed on the pin part and the first latching rib is disposed on the expanding part. The first latching

groove is preferably an encircling groove at the distal end of the pin part. Preferably, the webs are still disposed between the distal end and the latching groove. The first latching rib is preferably configured on the internal sleeve face of the central opening of the expanding part, preferably of the flange of the expanding part. A latching rib is preferably continuous or is preferably composed of individual rib parts or burls which are preferably distributed on the circumference so as to be mutually spaced apart in a uniform angular manner. The same applies in a corresponding and analogous manner to a latching groove.

In one further preferred embodiment of the invention, in the terminal position the other latching component on the pin part forms a latching connection to the end region of the expanding part.

In a corresponding method according to the invention, a corresponding latching connection is formed by displacing the pin part to the terminal position. On account thereof, the other latching component, that is to say preferably the latching groove at the distal end of the pin part, is utilizable in a two-fold manner (prelatching, terminal latching). The end region of the expanding part preferably has the expanding segments which at the end side are preferably not connected, the distal end of the pin part thus being able to be pushed through while the expanding segments are being expanded. The expanding segments preferably have a radially inwardly protruding region which then latches into the latching groove (or else optionally latches behind a latching rib) at the distal end of the pin part. Here, the combination having a hot-melt sealing bush which then additionally also at least partially covers, or in the molten state wets the distal end of the pin part, respectively, is particularly preferred, on account of which even better retention of the closure plug system is provided.

In one further preferred embodiment of the invention, the pin part has a third latching component, for example a second latching rib or a second latching groove, that is axially spaced apart from the other latching component and is of the same type as the other latching component.

On account thereof, the one latching component, that is to say preferably the latching rib on the internal sleeve face of the central opening of the expanding part, is utilizable in a two-fold manner (prelatching, terminal latching). The third latching component is preferably a second latching

groove which is disposed on the pin part. Preferably, the second latching groove is disposed on that end region of the pin part that faces away from the expanding part, preferably directly in the transition region between the shank and the cover part, if and when a cover part is present.

In one further preferred embodiment of the invention, in the terminal position the third latching component forms a latching connection to the one latching component on the expanding part.

In a corresponding method according to the invention, a corresponding latching connection is formed by displacing the pin part to the terminal position. On account thereof, alternatively or additionally to the above-mentioned terminal-position latching, latching is achieved in the terminal position. That is to say that preferably the second latching groove on the pin part in the terminal position forms a latching connection to the first latching rib on the expanding part.

In one further preferred embodiment of the invention, one or a plurality of the latching components have one or a plurality of chamfers or curvatures by means of which moving the pin part to the prelatched position is more smooth than retrieving the pin part from the prelatched position.

In a corresponding method according to the invention, less force is spent on moving the pin part to the prelatched position than on retrieving the pin part from the prelatched position, retrieving of the pin part having possibly been performed in a purely unintentional manner. On account thereof, the prelatched position may be more reliably maintained during shipping, and should the prelatched position nevertheless be released at any time, the latter may be re-established again in a simple manner.

Exemplary design embodiments of the present invention will now be described by means of the following drawings in which:

Figs. 1a,b,c,d,e,f show various views of a closure plug system according to the invention;

Fig. 2 shows a hot-melt plug system composed of a closure plug system and a sealing bush;

Fig. 3 shows the expanding rivet of fig. 2 in an advanced pushed state and being joined to the sealing bush 20;

Fig. 4 shows the hot-melt plug system in the fitted state;

Figs. 5a,b show various views of the sealing bush;

Fig. 6 shows another view of the expanding rivet in the advanced pushed state, assembled with the sealing bush;

Figs. 7a,b,c,d show various views of the situation shown in fig. 4;

Figs. 8a and b show the fitted system after the oven, in the adhesively bonded state.

Figs. 1a,b,c,d,e,f show various views of a closure plug system according to the invention. Said closure plug system has an expanding rivet 10 for closing an opening 110 in a vehicle part 100, presently a panel in a vehicle body. The expanding rivet 10 is composed of an expanding part 11 and a pin part 12, wherein the pin part 12 in the fitted state of the expanding rivet 10 in the opening 110, that is to say in the fitted state, is introduced into the expanding part 11 up to a terminal position and expands the latter in the opening 110. The expanding part 11 and the pin part 12 are integrally manufactured and in an original position are initially interconnected by a default breaking point 13. The default breaking point 13 has to be breached in order for the pin part 12 to be introduced up to the terminal position in the expanding part 11. The expanding rivet 10 has a latching mechanism 30 by way of which the expanding part 11 and the pin part 12 in relation to one another are prelatchable in a prelatched position which differs from the terminal position if and when the default breaking point 13 has been breached.

In order for the opening 110 to be closed, the default breaking point 13 is breached and the expanding rivet 10 is thereafter introduced into the opening 110, and the pin part 12 is pushed into the expanding part 11 up to a terminal position. The pin part 12 thus expands the expanding part 11 in the opening 110. The expanding part 11 and the pin part 12 before the

expanding rivet 10 is introduced into the opening 110, and once the default breaking point 13 has been breached, in a prelatched position which differs from the terminal position are prelatched to one another by means of a latching mechanism 30.

Figs. 1a to 1f furthermore show the following preferred features. The expanding part 11 and the pin part 12 in the original position by way of the default breaking point 13 are connected with one another in such a manner that said parts are substantially coaxial with one another. The prelatched position, proceeding from the original position, is attainable by displacing the pin part 12 in a substantially axial manner along one direction in relation to the expanding part 11. The terminal position, proceeding from the prelatched position, is attainable by axially displacing the pin part 12 farther along the same direction in relation to the expanding part 11. The default breaking point 13 is formed by individual webs 13.1, 13.2, 13.3. The expanding part 11 has at least two expanding segments 14.1, 14.2, 14.3, 14.4. The latter in those regions in which an expanding effect is provided are mutually separated by expansion grooves 15.1, 15.2, 15.3, 15.4. The webs 13.1, 13.2, 13.3 are disposed such that after breaching of the default breaking point 13, these webs 13.1, 13.2, 13.3 or a corresponding stub or burr of the respective web 13.1, 13.2, 13.3 that still remains after breaching of the default breaking point 13, engage or engages, respectively, in one or a plurality of the expansion grooves 15.1, 15.2, 15.3, 15.4 when the pin part 12 is located in the terminal position or is displaced in this direction. The latching mechanism 30 has two latching components, namely a first latching groove 31 and a first latching rib 32. The one latching component, presently the latching rib(s) 32 on the internal wall of the shank 11.1 of the expanding part 11, is disposed on the expanding part 11, and the other latching component, presently the latching groove 31 on the external wall of the shank of the pin part 12, is disposed on the pin part 12. In the terminal position the latching groove 31 on the pin part 12 forms a latching connection to the end region of the expanding part. The pin part 12 has a third latching component, presently a second latching groove 33, that is axially spaced apart from the other latching component. In the terminal position the third latching component forms a latching connection to the latching rib(s) 32 on the expanding part 11. The latching groove 31 has a chamfer 31.1 by means of which moving the pin part 12 to the prelatched position is more smooth than retrieving the pin part 12 from the prelatched

position. Moreover, the expanding part 11 has a shank 11.1 and a flange 11.2.

Figs. 2 to 8b show a hot-melt plug system 1 composed of a closure plug system 1, which is based on figs. 1a to f, and of a sealing bush 20, only the sealing bush 20 being shown in figs. 5a and 5b. The expanding rivet 10 and the hot-melt bush 20 are shown in the state after respective manufacturing thereof.

The sealing bush 20 is push-fittable onto the expanding rivet 10, in particular onto the expanding part 11, such that the expanding part 11 at least partially and presently even completely surrounds the shank 11.1 of the expanding part. Moreover, the sealing bush 20 is adapted for at least partially surrounding the flange 11.2, presently in particular the radial external sides of the flange 11.2, and beyond the external sides furthermore for covering in a radially inward manner part of the end side of the flange 11.2 which faces away from the shank 11.1. The sealing bush 20 is composed of a hot-melt material.

A plug system which particularly preferably constitutes an assembled solution having a rivet and a bush which is made from hot-melt material has been proposed herein. The bush leads to complete (overall) protection of the sheet metal panel against corrosion. Only slight insertion forces are required. Two different components enable a simple design of the casting tool. The hot-melt plug system enables high process stability, two parts having a robust fitting process. The rivet may be made from one or two parts, preferably from one part.

List of reference signs

1	Closure plug system
10	Expanding rivet
11	Expanding part
11.1	Shank
11.2	Flange
12	Pin part
13	Default breaking point
13.1, 13.2, 13.3	Webs
14.1, 14.2, 14.3, 14.4	Expanding segments
15.1, 15.2, 15.3, 15.4	Expansion grooves
20	Sealing bush
30	Latching mechanism
31	First latching groove
31.1	Chamfer
32	First latching rib
33	Second latching groove
100	Vehicle part
110	Opening

Claims

1. A closure plug system (1) having an expanding rivet (10) for closing an opening (110) in a vehicle part (100), in particular in a panel of a vehicle body, wherein the expanding rivet (10) is composed of an expanding part (11) and a pin part (12), wherein the pin part (12) in the fitted state of the expanding rivet (10) in the opening (110), hereunder referred to as the fitted state, is introduced into the expanding part (11) up to a terminal position and expands the latter in the opening (110), wherein the expanding part (11) and the pin part (12) are integrally manufactured and in an original position are initially interconnected by a default breaking point (13), wherein the default breaking point (13) has to be breached in order for the pin part (12) to be introduced up to the terminal position in the expanding part (11), and wherein the expanding rivet (10) has a latching mechanism (30) by way of which the expanding part (11) and the pin part (12) in relation to one another are prelatchable in a prelatched position which differs from the terminal position if and when the default breaking point (13) has been breached.
2. The closure plug system (1) as claimed in claim 1, wherein the expanding part (11) and the pin part (12) in the original position by way of the default breaking point (13) are interconnected in such a manner that said parts are substantially coaxial with one another.
3. The closure plug system (1) as claimed in claim 2, wherein the prelatched position, proceeding from the original position, is attainable by displacing the pin part (12) in a substantially axial manner along one direction in relation to the expanding part (11), and wherein the terminal position, proceeding from the prelatched position, is attainable by axially displacing the pin part (12) farther along the same direction in relation to the expanding part (11).
4. The closure plug system (1) as claimed in one of the preceding claims, wherein the closure plug system (1) has a sealing bush (20) which is push-fittable or push-fitted onto the expanding rivet (10), in particular onto the expanding part (11).

5. The closure plug system (1) as claimed in claim 4, wherein the expanding part (11) has a shank (11.1), and the sealing bush (20) at least partially surrounds the shank (11.1).
6. The closure plug system (1) as claimed in one of claims 4 to 5, wherein the expanding part (11) has a flange (11.2), and the sealing bush (20) at least partially surrounds the flange (11.2).
7. The closure plug system (1) as claimed in one of claims 4 to 6, wherein the sealing bush (20) is composed of a hot-melt material.
8. The closure plug system (1) as claimed in one of the preceding claims, wherein the default breaking point (13) is formed by individual webs (13.1, 13.2, 13.3).
9. The closure plug system (1) as claimed in one of the preceding claims, wherein the expanding part (11) has at least two expanding segments (14.1, 14.2, 14.3, 14.4) which in those regions in which an expanding effect is provided are mutually separated by expansion grooves (15.1, 15.2, 15.3, 15.4), and wherein the webs (13.1, 13.2, 13.3) or at least part of the webs (13.1, 13.2, 13.3) are disposed such that after breaching of the default breaking point (13) these webs (13.1, 13.2, 13.3), or that part of the webs (13.1, 13.2, 13.3) or stub or burr of the respective web (13.1, 13.2, 13.3) that still remains after breaching of the default breaking point (13), engage or engages, respectively, in one or a plurality of the expansion grooves (15.1, 15.2, 15.3, 15.4) when the pin part (12) is located in the terminal position or is displaced in this direction.
10. The closure plug system (1) as claimed in one of the preceding claims, wherein the latching mechanism (30) has two latching components, namely a first latching groove (31) and a first latching rib (32), wherein the one latching component is disposed on the expanding part (11), and the other latching component is disposed on the pin part (12).
11. The closure plug system (1) as claimed in claim 10, wherein in the terminal position the other latching component on the pin part (12) forms a latching connection to the end region of the expanding part.

12. The closure plug system (10) as claimed in claim 10 or 11, wherein the pin part (12) has a third latching component, for example a second latching rib or a second latching groove (33), that is axially spaced apart from the other latching component and is of the same type as the other latching component.
13. The closure plug system (1) as claimed in claim 12, wherein in the terminal position the third latching component forms a latching connection to the one latching component on the expanding part (11).
14. The closure plug system (1) as claimed in one of claims 10 to 13, wherein one or a plurality of the latching components have one or a plurality of chamfers or curvatures by means of which moving the pin part (12) to the prelatched position is more smooth than retrieving the pin part (12) from the prelatched position.
15. A method for closing an opening (110) of a vehicle part (100) by means of a closure plug system (1), wherein
 - a default breaking point (13) between an expanding part (11) and a pin part (12) of an expanding rivet (10) of the closure plug system (1) is breached, and
 - the pin part (12) is pushed into the expanding part (11) up to a terminal position, the pin part (12) thus expanding the expanding part (11) in the opening (110) when the expanding rivet (10) is introduced into the opening (110), andwherein the expanding part (11) and the pin part (12), once the default breaking point (13) has been breached, in a prelatched position which differs from the terminal position are prelatched to one another by means of a latching mechanism (30).

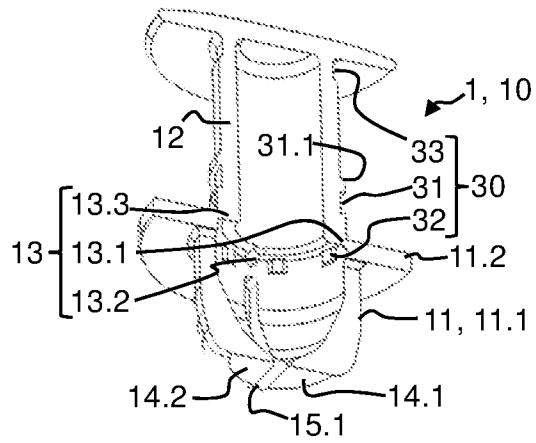


Fig. 1a

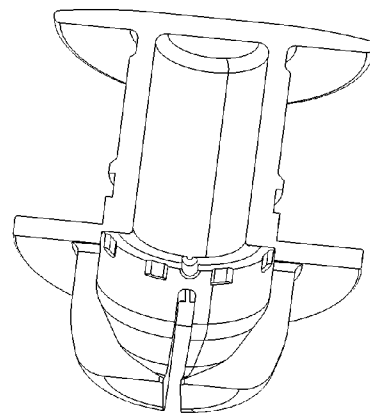


Fig. 1b

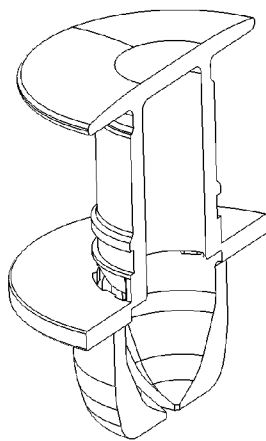


Fig. 1c

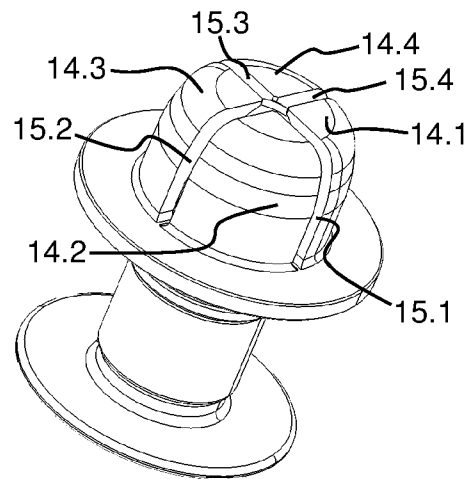


Fig. 1d

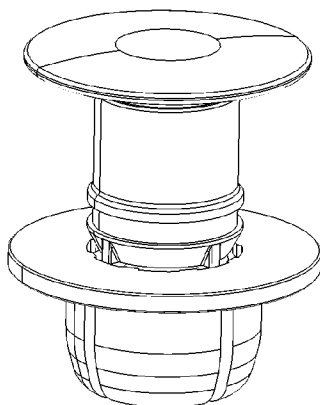


Fig. 1e

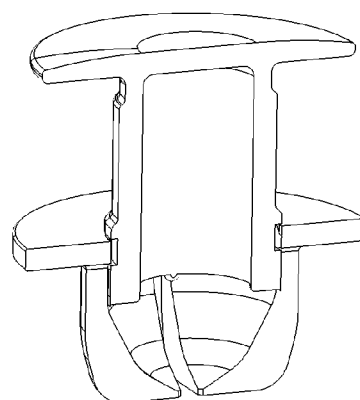


Fig. 1f

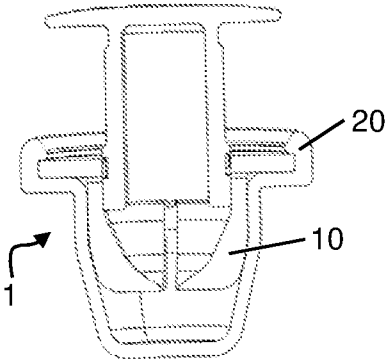
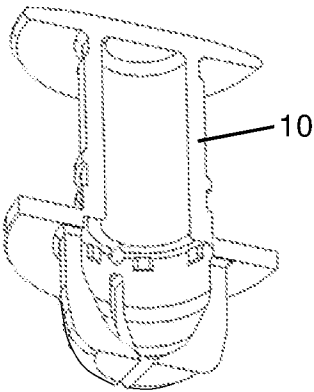


Fig. 3

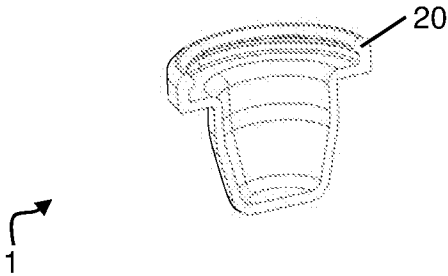


Fig. 2

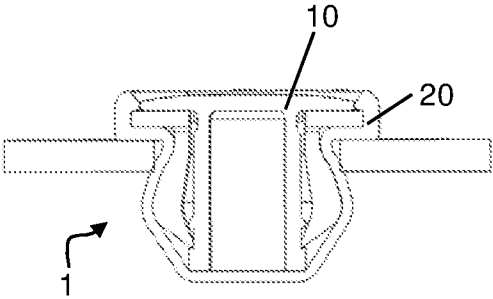


Fig. 4

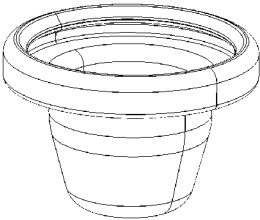


Fig. 5a

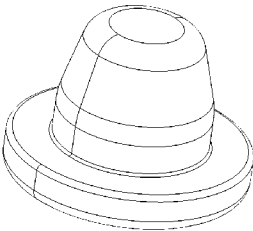


Fig. 5b

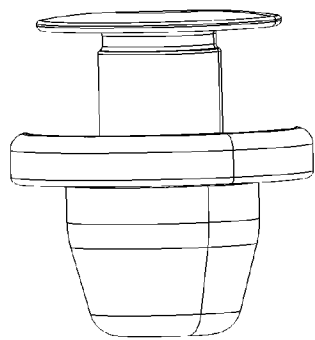


Fig. 6

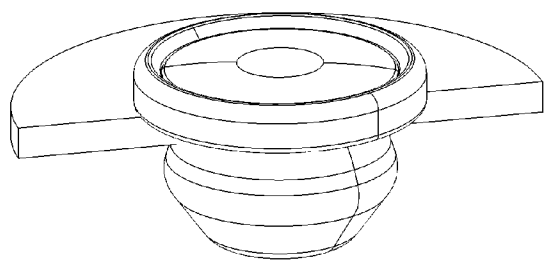


Fig. 7a

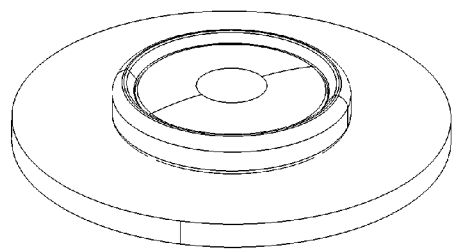


Fig. 7b

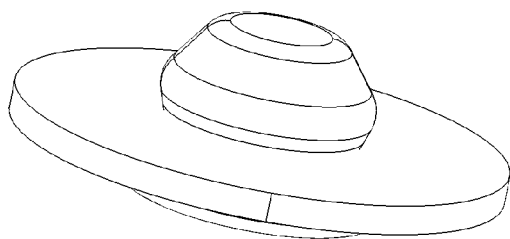


Fig. 7c

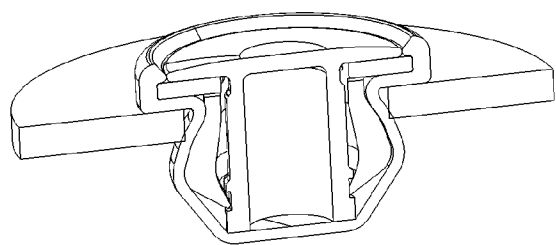


Fig. 7d

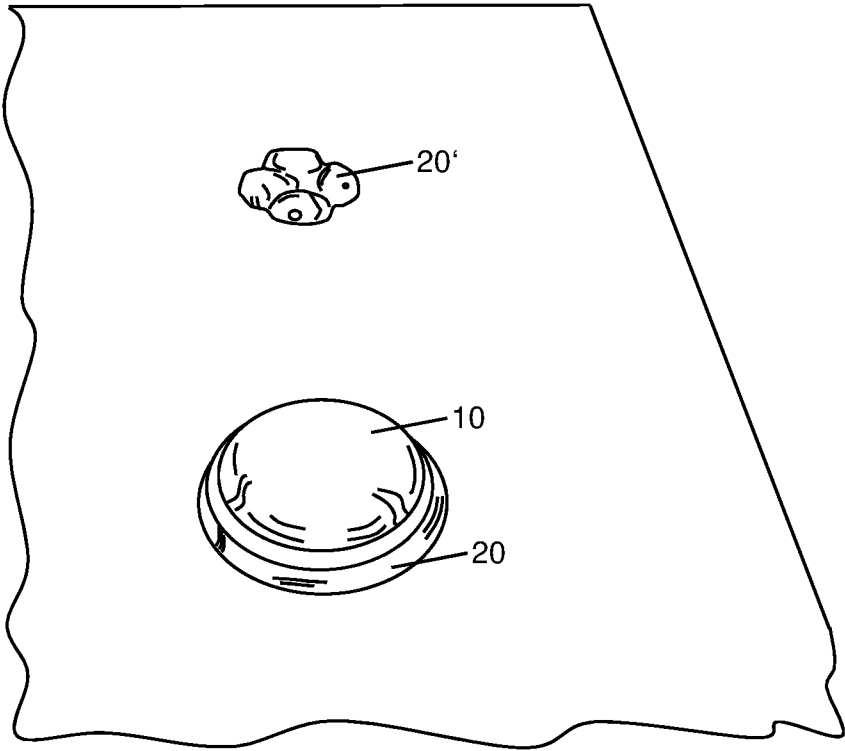


Fig. 8a

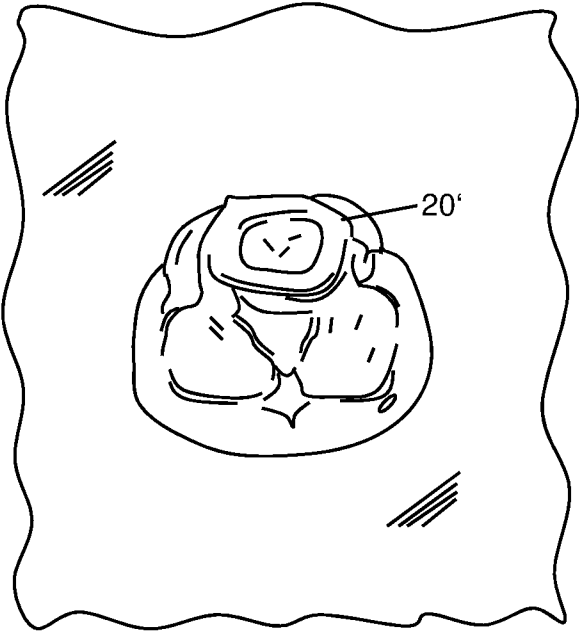


Fig. 8b

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2016/018036

A. CLASSIFICATION OF SUBJECT MATTER
INV. B62D25/24 F16B19/10
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F16B B62D F16J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 4 375 342 A (WOLLAR BURNELL J ET AL) 1 March 1983 (1983-03-01) column 5, line 8 - column 9, line 31 figures	1-4,7-15 5,6
X A	US 4 571 134 A (BEGLINGER GREGORY O [US] ET AL) 18 February 1986 (1986-02-18) column 6, line 27 - column 8, line 41 figures 1-15	1-4,8-15 5-7
A	US 4 405 272 A (WOLLAR BURNELL J [US]) 20 September 1983 (1983-09-20) column 4, line 7 - column 7, line 7 figures ----- -/--	1-3, 8-10,14, 15



Further documents are listed in the continuation of Box C.



See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

18 May 2016

Date of mailing of the international search report

27/05/2016

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Authorized officer

Ionescu, Bogdan

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2016/018036

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1 375 308 A1 (ITW ESPANA SA [ES]) 2 January 2004 (2004-01-02) cited in the application paragraphs [0014] - [0019] figures -----	1,4-8, 10,15

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2016/018036

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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EP 1375308	A1	02-01-2004	DE 60204131 D1 16-06-2005
			DE 60204131 T2 02-02-2006
			EP 1375308 A1 02-01-2004
			ES 2240676 T3 16-10-2005