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(54) **A FASTENER**

(57) The present invention provides for a fastening clip (100) for attachment to a threaded elongate fastener (300), comprising a base plate (102), having a proximal face and a distal face, comprising a central through hole (104) defining a centre axis (108) and forming a frusto-conical sleeve extending away from said proximal face along said centre axis (108) and which is configured to guidingly receive the threaded elongate fastener (300); at least two diametrically opposing resilient retention arms (106a, 106b), each one extending from a peripheral edge of said base plate (102) radially outward and invertingly folding back towards said centre axis (108), so as to provide two cooperating end portions (110a, 110b) operable to resiliently move substantially parallel to said centre axis (108) between a first position, where said end portions (110a, 110b) are operably disengaged from the threaded elongate fastener (300), and a second position, where the end portions (110a, 110b) are retainingly and biasingly engaged with the threaded elongate fastener (300) when inserted through said central through hole (104), and wherein each one of said two cooperating end portions (110a, 110b) further comprises at least one recessed portion (122a, 122b) adapted to receivingly and attachingly engage with a corresponding installation tool (200).

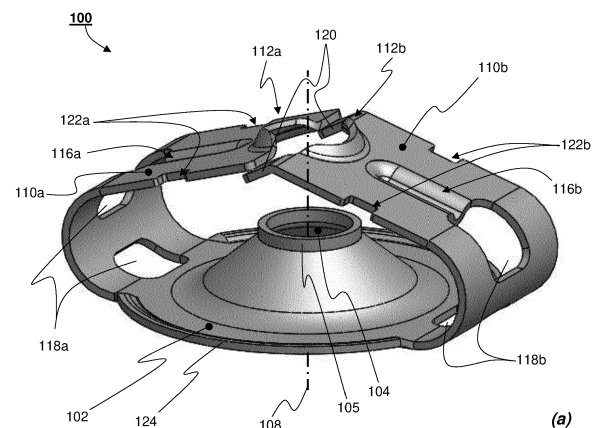


FIG. 3

Description

Technical Field of Invention

[0001] The present invention relates to a fastener for vehicle parts. In particular, the invention relates to a fastener securing a heat shield to a threaded bolt of a vehicle body that is suitable for assembly, as well as, disassembly, and even more particularly, a fastener securing a heat shield to a threaded bolt of a vehicle body that is suitable for high-speed automatic assembly.

Introduction

[0002] Many variations of clips and nut, or other fasteners, are widely used in the automobile industry to fasten specific parts, panels or other accessories in a vehicle. Attachment clips may be used to attach car components, such as a heat shield plate for insulating heat of a muffler underside the vehicle, that are apt to be affected by heat. Figures 1 and 2 show examples of two different clips 10, 20 commonly used to attach a heat shield plate to a suitable bolt projecting through the heat shield plate to mountably engage with the clip 10, 20. Here, when fitting the clip 10, 20, the installer simply pushes the slanted teeth or claws 12, 22 over the shank of the bolt or screw so as to funnel the clip into a centralised position and aligning the bolt or screw with the clip 10, 20. Subsequently, the claws or teeth 12, 22 are pushed over the thread ridges of the shank until the clip is attached to the heat shield panel. In this engaged position, the claws or teeth 12, 22 axially urge the clip 10, 12 toward the heat shield panel by the elastic forces of the biased claws or teeth 12, 22. Additional retention members 14 further engage with the threaded shank portion to lock the clip into position, though, the leading edge of the retention members 14 tangentially engages with the thread portion of the shank only providing a single point of contact between the retention members 14 and the threaded shank of the bolt or screw making it a relatively unstable and insecure connection.

[0003] The example clip of Figure 2 simply relies on the relatively insubstantial claws or teeth 22 to lock the clip 20 into position and bias the clip 20 onto the heat shield panel potentially accepting the loosening or even loss of the clip 20 because of the relatively weak connection.

[0004] Thus, currently available fastening clips, such as the clips 10, 20 illustrated in Figure 1 and 2, tend to fail when used for high-speed automated assembly, because such clips are difficult to consistently centre and securely lock on a respective bolt or screw at really fast mounting speed (e.g. due to inaccuracies of the automated system and or installation tool when moved at high speed) causing potential misalignment and even incomplete connections.

[0005] Therefore, it is an object of the present invention to provide an improved fastening clip, suitable for auto-

mated assembly (especially at high-speed settings), that allows for a more reliable central alignment with the bolt or screw during installation and provides a stronger but demountable connection.

Summary of the Invention

[0006] According to a first embodiment of the invention there is provided a fastening clip for attachment to a threaded elongate fastener, comprising:

a base plate, having a proximal face and a distal face, comprising a central through hole defining a centre axis and forming a frustoconical sleeve extending away from said proximal face along said centre axis and which is configured to guidingly receive the threaded elongate fastener;

at least two diametrically opposing resilient retention arms, each one extending from a peripheral edge of said base plate radially outward and invertingly folding back towards said centre axis, so as to provide two cooperating end portions operable to resiliently move substantially parallel to said centre axis between a first position, where said end portions are disengaged from the threaded elongate fastener, and a second position, where the end portions are retainingly and biasingly engaged with the threaded elongate fastener when inserted through said central through hole, and

wherein each one of said two cooperating end portions further comprises at least one recessed portion adapted to receivingly and attachingly engage with a corresponding installation tool.

[0007] This provides the advantage of a fastener suitable for automated installation (e.g. push-in action) that may also be removed without damaging the fastener or attachment bolt. In particular, the unique design of the fastener of the present invention ensures that the part (e.g. heat shield) is not dented or otherwise damaged during installation or disassembly. The resilient retention arms and cooperating end portions provide for a strong connection with the stud or attachment bolt (or screw), while maintaining pressure on the part via the biased retention arms, therefore, mitigating the potentially damaging effect of vibrations.

[0008] In addition, the frustoconical aperture of the base plate allows for easy and accurate positioning of the fastener on the stud or bolt, especially when mounted automatically in a high-speed action. Apertures have been provided to the retention arms to allow for a temporary attachment to the installation tool (i.e. when moved into position by the tool) via a friction fit between the resilient retention arms and the installation tool which is achieved by the resilient deformability of the retention arms.

[0009] Advantageously, each one of said end portions of said resilient retention arms may comprise an engagement member at a distal end adapted to matingly engage with a corresponding thread section of the threaded elongate fastener. Preferably, said engagement member may be formed by an extruded lip formed in line with the orientation of the corresponding thread of the threaded elongate fastener.

[0010] This provides the advantage of a considerably improved contact area between the threaded bolt or screw and the retention arm provided by an engagement member that is matingly shaped to a respective thread of the bolt or screw, therefore, providing a stronger and more secure mount.

[0011] Advantageously, one of said two cooperating end portions may comprise at least one ramp member extending from said distal end in a direction nonparallel to a central longitudinal axis of said end portion of said retention arms, so as to slidingly engage with said distal end of the other one of said two cooperating end portions during movement between said first position and said second position.

[0012] This provides the advantage of preventing entanglement between the cooperating retention arms during assembly, especially during high-speed assembly utilising an automated installation system. In particular, the one or two (arranged in parallel, depending on the design of the end portion) ramp member(s) are arranged so as to abuttingly engage with an underside of the end portion of the other retention arm, when in the first position, and slidingly engage with (i.e. slidingly move the end portion of the other retention arm up and over) the other end portion, when moving between the first position and the second position.

[0013] Advantageously, each one of said retention arms may comprise at least one reinforcing rib member at least partially extending along said central longitudinal axis of respective said end portions.

[0014] This provides an improved stiffness at the end portion of the retention arm, so as to optimise the movement of the engagement members of the end portions along the threaded bolt or screw and strengthen the locking engagement between the engagement members of the end portions and the threaded bolt or screw.

[0015] Preferably, said reinforcing rib member may be provided by a stiffening emboss.

[0016] Advantageously, each one of said at least one recessed portion may be provided on a lateral edge of a respective one of said two cooperating end portions. Preferably, said recessed portion may be adapted to form an interference fit with a corresponding portion of the installation tool.

[0017] Advantageously, a proximal rim of said frusto-conical sleeve may be configured to abuttingly engage with said two cooperating end portions when in said second position.

[0018] Advantageously, said proximal face may comprise a protruding rim extending at least partially along a

peripheral edge of said base plate.

[0019] Advantageously, each one of said at least two diametrically opposing resilient retention arms may comprise at least one aperture adapted to receive a corresponding tool for dismounting said fastening clip from the threaded elongate fastener. The aperture(s) provide the advantage of a suitable point of contact for disassembling the fastening clip from the threaded bolt or screw, e.g. by either prying the retention arms out of engagement with the threaded bolt or screw, or by providing a turning handle to unscrew the fastening clip of the threaded bolt or screw, utilising, for example, a screw driver or similar hand tool.

[0020] Alternatively, or additionally, said at least two diametrically opposing resilient retention arms may be adapted to operably engage with a socket tool during disassembly of said fastening element from the shaft member of the vehicle part.

[0021] Advantageously, said at least two diametrically opposing resilient retention arms may be integral to said base plate. Preferably, said base plate and said at least two diametrically opposing resilient retention arms may be formed from a single piece of material.

[0022] Advantageously, said single piece of material is a resilient material.

Brief Description of the Drawings

[0023] Embodiment(s) of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 (Prior Art) illustrates a perspective view of an example embodiment of a fastening clip known in the art;

Figure 2 (Prior Art) illustrates a perspective view of another example embodiment of a fastening clip known in the art;

Figure 3 illustrates a fastening clip in accordance with an example embodiment of the present invention (a) in perspective view, (b) in a side view and (c) in a front view;

Figure 4 illustrates the fastening clip of Figure 3 removably attached to a suitable installation tool (shown in a transparent form) (a) in a perspective view, (b) in a top view (from the proximal side), (c) a first- and (d) a second close-up perspective view of the friction fit between the installation tool and the retention arm;

Figure 5 illustrates the installation process utilising an installation tool with the fastening clip of the present invention temporarily attached (a) moving the fastening clip over the threaded bolt or screw and the retention arms in a first position, (b) pushing a

plunger of the installation tool down to move the retention arms from the first position towards the second position locking the end portion into engagement with the thread of the bolt or screw, as well as, detaching the retention arms from the installation tool, and (c) removing the installation tool from the fastening clip;

Figure 6 illustrates another perspective view of (a) the installation tool moving the attached fastening clip over the bolt or screw and (b) a perspective bottom view of the installation tool alone;

Figure 7 illustrates an alternative embodiment of the fastening clip without a ramp member (a) in a perspective (b) in a side view, (c) in a front view and (d) in a top view, and

Figure 8 illustrates the fastening clip of Figure 7, a corresponding installation tool with removed plunger and an example bolt or screw plate.

Figure 9 illustrates a perspective view of another alternative example embodiment of a fastening clip of the present invention;

Figure 10 illustrates a bottom view of the alternative example embodiment shown in Figure 9;

Figure 11 illustrates a perspective top view of the fastening clip of Figure 9 during disassembly utilising a standard socket tool (i.e. hexagonal socket);

Figure 12 illustrates a bottom view of the fastening clip and standard socket tool of Figure 11 during disassembly;

Figure 13 illustrates a perspective top view of a close-up portion of the fastening clip and standard socket tool of Figure 11 during disassembly showing the disassembly arms operably engaged with the standard socket tool, and

Figure 14 illustrates a cross-sectional side view of the fastening clip of Figure 9 when in use (i.e. securing a heat shield to a vehicle structure) and before disassembly using the standard socket tool.

Description

[0024] The described example embodiment relates to a fastening clip suitable for securing paraphernalia and accessories, and especially heat shield panels. The embodiment(s) of the invention is(are) normally applied in vehicles. Although the invention is described with respect to vehicles, the invention is not restricted to vehicles altogether, but may also be used in other structures requiring attachment of accessories or peripheral components

to a structure.

[0025] Certain terminology is used in the following description for convenience only and is not limiting. The words 'right', 'left', 'lower', 'upper', 'front', 'rear', 'upward', 'down' and 'downward', 'top' and 'bottom' designate directions in the drawings to which reference is made and are with respect to the described component when assembled and mounted. The words 'inner', 'inwardly' and 'outer', 'outwardly' refer to directions toward and away from, respectively, a designated centreline or a geometric centre of an element being described (e.g. central axis), the particular meaning being readily apparent from the context of the description.

[0026] Further, relative positional terms, such as, 'distal', 'proximal', 'lateral' and 'medial' are understood in their normal meaning and in relation to a specific element being described. In particular, these terms designate directions in relation to the tool or user end, e.g. proximal is in a direction towards the installation tool or user, wherein distal refers to the direction away from the installation tool or user.

[0027] Further, as used herein, the terms 'connected', 'attached', 'coupled', 'mounted' are intended to include direct connections between two members without any other members interposed therebetween, as well as, indirect connections between members in which one or more other members are interposed therebetween. The terminology includes the words specifically mentioned above, derivatives thereof, and words of similar import.

[0028] Further, unless otherwise specified, the use of ordinal adjectives, such as, 'first', 'second', 'third' etc. merely indicate that different instances of like objects are being referred to and are not intended to imply that the objects so described must be in a given sequence, either temporally, spatially, in ranking or in any other manner.

[0029] Referring now to Figure 3, a preferred embodiment of the fastening clip 100 of the present invention is manufactured from a single sheet material, such as, for example, a sheet metal and in particular a spring steel that is formed using, *inter alia*, a punch and stamping press. The sheet metal may be heat treated after the punching and/or stamping process so as to form at least resilient retention arms 106a, 106b. However, it is understood by the person skilled in the art that any other suitable material or manufacturing process may be used, such as, for example, a resilient polymer or polymer compound using suitable polymer manufacturing processes (thermoforming, injection moulding, extrusion), but also 3D printing manufacturing processes.

[0030] The fastening clip 100 comprises a substantially circular base plate 102 having a frustoconical aperture 104 projecting towards an upper or proximal end (i.e. into the direction of the installation tool 200 or user). Two diametrically opposing retention arms 106a, 106b extend from a peripheral edge of the base plate 102 first radially and proximally outward to then invertingly fold back towards a centre axis 108 of the aperture 104 such that the distal end portions 110a, 110b are positioned proxi-

mally spaced apart (i.e. on top of) from the frustoconical aperture 104. In this position, the resilient retention arms 106a, 106b are in an unbiased first position with the space between the end portions 110a, 110b defining the axial freedom of movement of the retention arms 106a, 106b between respective first (unlocked) position and second (locked) position. The frustoconical aperture 104 may be provided with a rim 105 adapted to abuttingly engage with any one of the end portions 110a, 110b when in the second position.

[0031] Each one of the end portions 110a, 110b is provided with an engagement member 112a, 112b on its distal end (i.e. the distal edge of the retention arms 106a, 106b) comprising of an extruded lip portion 114a, 114b forming a clamping collar adapted to matingly interlock with a corresponding thread section of the connecting stud, bolt or screw 300, i.e. at least an upper edge of the extruded lip portion 114a, 114b or clamping collar is inclined in line with the thread angle of the threaded stud, bolt or screw 300 so as to match the corresponding thread space. Furthermore, the lip portion 114a, 114b is extruded into a frustoconically shaped collar with the narrower edge at the proximal side (i.e. top) of the end portion 110a, 110b, therefore allowing the engagement member 112a to slidably move over a corresponding thread of the stud, bolt or screw 300 when moving from the first position towards the second position, but block or jam with the thread of the stud, bolt or screw 300 when moved from the second position towards the first position.

[0032] Each one of the resilient retention arms 106a, 106b may further comprise a reinforcing rib 116a, 116b configured to structurally stiffen at least a portion of the retention arms 106a, 106b. The reinforcing rib 116a, 116b may be provided along a longitudinal central axis of the end portion 110a, 110b, so as to stiffen that portion of the retention arm 106a, 106b (i.e. only allowing resilient flexure at the bent portion of the retention arms 106a, 106b). Preferably, the reinforcing rib 116a, 116b is provided by stamping a central portion of the end portion 110a, 110b so that the material is protruding on its distal side. However, the stiffening and reinforcement of at least a portion of the retention arms 106a, 106b may be provided by any other suitable structure.

[0033] Apertures 118a, 118b may further be provided on each of the retention arms 106a, 106b so as to allow as suitable engagement with at least a hand tool for dismounting the fastening clip 100 from the stud, bolt or screw 300. Any suitable number of apertures 118a, 118b may be used.

[0034] In a preferred embodiment of the fastening clip 100 of the present invention, one of the end portions 110a, 110b may comprise at least one ramp member 120 extending from the distal edge of the retention arm 106a, 106b so as to abuttingly engage with an underside of the other retention arm 106a, 106b, when in the first unbiased position. In this particular embodiment, the at least one ramp member 120 is nonparallel with respect to the longitudinal axis of the end portion 110a, 110b such that the

distal edge of the other retention arm 106a, 106b slides up and over when the cooperating retention arms 106a, 106b are moved between the first position and the second position (without jamming). It is understood by the person skilled in the art that the at least one ramp member 120 may be at any angle (including an extension parallel to the longitudinal axis of the end portion 110a, 110b) suitable to prevent jamming of the cooperating retention arms 106a, 106b during use.

[0035] Each one of the retention arms 106a, 106b further comprises at least one recess portion 122a, 122b adapted to attachingly engage with a corresponding installation tool 200. The recess portion(s) 122a, 122b may be provided on a lateral edge of the end portion 110a, 110b and may be in the form of a simple cut-out or a stepped end section.

[0036] The proximal face of the base plate 102 may further comprise a protruding rim 124 along at least a portion of its peripheral edge configured to retainingly position and to centre a corresponding installation tool when attachingly coupled to the fastening clip 100.

[0037] Referring now to Figures 4 to 6, the function of the fastening clip 100 is described when used with a suitable installation tool 200. Here, the installation tool 200 is suitable for high-speed automatic assembly, such as, for example, a system using assembly line robots. However, the basic operation of the fastening clip 100 is the same when assembled manually (e.g. using fingers or any other suitable tool).

[0038] Figures 4 (a)-(d) shows an illustration of the fastening clip 100 when attached to a suitable installation tool 200, i.e. before the fastening clip 100 is mounted to the stud, bolt or screw 300. Here, the installation tool 200 comprises suitable recesses 202 forming a chamfered edge (or bevel) 204 configured to engage with a respective edge portion of the recess portion 122a, 122b of the retention arm 106a, 106b. When the installation tool 200 is pushed onto the proximal portion of the fastening clip 100, the resilient retention arms 106a, 106b flex just enough for the edge portion of the recess portion(s) 122a, 122b and the chamfered edge(s) 204 to form a friction or interference fit that is strong enough to attach the fastening clip 100 to the installation tool 200. In this configuration, the installation tool 100 can move with the attached fastening clip 100 to the respective stud, bolt or screw 300.

[0039] Figure 5 (a) shows the fastening clip 100 when moved into a mounting position on the vehicle part (e.g. heat shield panel 400), where the stud, bolt or screw 300 is guided by and pushed through the frustoconical aperture 104 and the engagement members 112a, 112b abuttingly engage with an end portion of the stud, bolt or screw 300. Once the installation tool 200 has moved the fastening clip 100 onto the stud, bolt or screw 300 a plunger 206 axially pushes the retention arms 106a, 106b from the first unbiased position towards the second biased position by sliding the engagement members 112a, 112b over the thread of the stud, bolt or screw 300. Due to the

frustoconical design of the two cooperating engagement members (i.e. the formed clamping claw) 112a, 112b and the bias provided by the resilient retention arms 106a, 106b, the inclined edge of the lip portion 114a, 114b will matingly latch into corresponding thread sections of the stud, bolt or screw 300, when moved towards the second position (see Figure 5 (b)) and released by the plunger 206 (see Figure 5 (c)), locking the fastening clip 100 onto the stud, bolt or screw 300. The bias provided by the locked retention arms 106a, 106b maintains a consistent axial pressure of the fastening clip 100 onto the heat shield panel 400 mitigating any adverse effects caused by vibrations or any other external forces.

[0040] Figure 6 (a) illustrates the assembly setup between the installation tool 200, the fastening clip 100 and the heat shield panel 400, and Figure (b) provides a more detailed view of the installation tool 200, the recesses 202, chamfered edges 204 and plunger 206.

[0041] In order to disassemble or remove the fastening clip 100 from the stud, bolt or screw 300 of the heat shield 400, a user may simply pry the retention arms 106a, 106b away from the threaded stud, bolt or screw 300 using, for example, a screw driver or any other tool that fits into the apertures 118a, 118b, so that the biased retention arms 106a, 106b snap back into a respective unbiased position. Alternatively, another suitable tool may be used to push through both apertures 118a and 118b so as to provide a rotary handle (or rotary lever) in order to unscrew the fastening clip 100 from the threaded stud, bolt or screw 300. This allows the removal of the fastening clip 100 without causing damage to the stud, bolt or screw, heat shield panel or the fastening clip 100 itself, therefore, providing for a fastening clip 100 that can be re-used.

[0042] Referring now to Figures 7 (a), (b) and (c), an alternative embodiment of the fastening clip 500 is shown comprising all the features of the first embodiment of the fastening clip 100 but without the ramp member(s) 120.

[0043] Figure 8 illustrates an embodiment of the fastening clip 500, a panel portion 400 having a threaded bolt 300 and an installation tool 200 with a removed plunger 206 made from a polymer.

[0044] Referring now to Figures 9 to 14 another, alternative embodiment of the fastening clip 600 of the invention comprises a substantially circular frustoconical clamping disk, having an annular plate member 602 with a plurality of radially outwardly extending circumferentially segmented resilient fold members 604 folded axially downward from a peripheral edge of the annular plate member 602, and a central aperture 606, having a plurality of circumferentially segmented conically upwardly extending teeth 608 adapted to couplingly engage with a shaft member 300 (stud, bolt or screw) of the vehicle part during use. The alternative embodiment of the fastening clip 600 is characterised by at least three resilient circumferentially equidistantly spaced apart disassembly members 610 protruding axially upwards from the peripheral edge of the annular plate member 602, which

are adapted to operably engage with a socket tool 700 during disassembly of the fastening element 600 from the shaft member 300 of the vehicle part.

[0045] The at least three circumferentially equidistantly spaced apart disassembly members provide the advantage that the fastening clip 600 can be easily removed from its locking engagement with the shaft member 300 (e.g. threaded stud, bolt or screw) of the vehicle part or structure, by simply operably engaging with a suitable socket tool 700, i.e. a hexagonal socket tool, where the disassembly members 610 are pressed into the hexagonal space of the socket tool 700 so as to form a resilient friction fit and allowing a torque force provided via the socket tool 700 to be imparted to the fastening clip 600 to then be unscrewed from the threaded bolt 300 during disassembly (manually or automatically). Thus, the alternative fastening clip 600 allows repeated use, as well as, a minimised risk of damaging the fastener and/or threaded bolt 300 during disassembly.

[0046] During use, the fastening clip 600 can be easily mounted according to known assembly procedures, e.g. with an automated push-in movement via a suitable tool or manually. In order to remove (disassemble) the fastening clip 600 from the locking engagement with the threaded bolt 300, a suitable standard socket tool 700 is pushed into engagement with the at least three disassembly members 610, such that a torque force provided to the socket tool 700 can be applied to the fastening clip 600 and unscrew it from the threaded bolt or shaft 300.

[0047] As shown particularly in Figure 12, as well as, in a close-up view of the disassembly members 610 in Figures 13, the disassembly members are "lodged" into the hexagonal socket 700, so that lateral edges of each one of the disassembly members 610 is abuttingly engaged with an inner surface of the hexagonal socket tool 700 (i.e. fit across the corners), allowing torque to be imparted from the tool 700 onto the disassembly members 610 and fastening clip 600.

[0048] Figure 14 illustrates a cross-section of the fastening clip 600 mounted to the heat shield panel 400 and attached to the socket tool 700 via the disassembly members 610.

[0049] It will be appreciated by persons skilled in the art that the above embodiments have been described by way of example only and not in any limiting sense, and that various alterations and modifications are possible without departing from the scope of the invention as defined in the appended claims.

Claims

1. A fastening clip for attachment to a threaded elongate fastener, comprising:

a base plate, having a proximal face and a distal face, comprising a central through hole defining a centre axis and forming a frustoconical sleeve

- extending away from said proximal face along said centre axis and which is configured to guid-
ingly receive the threaded elongate fastener;
at least two diametrically opposing resilient re-
tention arms, each one extending from a periph-
eral edge of said base plate radially outward and
invertingly folding back towards said centre axis,
so as to provide two cooperating end portions
operable to resiliently move substantially paral-
lel to said centre axis between a first position,
where said end portions are operably disen-
gaged from the threaded elongate fastener, and
a second position, where the end portions are
retainingly and biasingly engaged with the
threaded elongate fastener when inserted
through said central through hole, and
wherein each one of said two cooperating end
portions further comprises at least one recessed
portion adapted to receivingly and attachingly
engage with a corresponding installation tool.
2. A fastening clip according to claim 1, wherein each
one of said end portions of said resilient retention
arms comprises an engagement member at a distal
end adapted to matingly engage with a correspond-
ing thread section of the threaded elongate fastener.
3. A fastening clip according to claim 2, wherein said
engagement member is formed by an extruded lip
formed in line with the orientation of the correspond-
ing thread of the threaded elongate fastener.
4. A fastening clip according to any one of the preceding
claims, wherein one of said two cooperating end por-
tions comprises at least one ramp member extending
from said distal end in a direction nonparallel to a
central longitudinal axis of said end portion of said
retention arms so as to slidingly engage with said
distal end of the other one of said two cooperating
end portions during movement between said first po-
sition and said second position.
5. A fastening clip according to claim 4, wherein each
one of said retention arms comprises at least one
reinforcing rib member at least partially extending
along said central longitudinal axis of respective said
end portions.
6. A fastening clip according to claim 5, wherein said
reinforcing rib member is provided by a stiffening em-
boss.
7. A fastening clip according to any one of the preceding
claims, wherein each one of said at least one re-
cessed portion is provided on a lateral edge of a re-
spective one of said two cooperating end portions.
8. A fastening clip according to claim 7, wherein said
recessed portion is adapted to form an interference
fit with a corresponding portion of the installation tool.
9. A fastening clip according to any one of the preceding
claims, wherein a proximal rim of said frustoconical
sleeve is configured to abuttingly engage with said
two cooperating end portions when in said second
position.
10. A fastening clip according to any one of the preceding
claims, wherein said proximal face comprises a pro-
truding rim extending at least partially along a pe-
ripheral edge of said base plate.
11. A fastening member according to any one of the pre-
ceding claims, wherein each one of said at least two
diametrically opposing resilient retention arms com-
prises at least one aperture adapted to receive a
corresponding tool for dismounting said fastening
clip from the threaded elongate fastener.
12. A fastening member according to claim 11, wherein
said at least two diametrically opposing resilient re-
tention arms are adapted to operably engage with a
socket tool during disassembly of said fastening el-
ement from the shaft member of the vehicle part.
13. A fastening clip according to any one of the preceding
claims, wherein said at least two diametrically op-
posing resilient retention arms are integral to said
base plate.
14. A fastening clip according to any one of the preceding
claims, wherein said base plate and said at least two
diametrically opposing resilient retention arms are
formed from a single piece of material.
15. A fastening clip according to claim 14, wherein said
single piece of material is a resilient material.

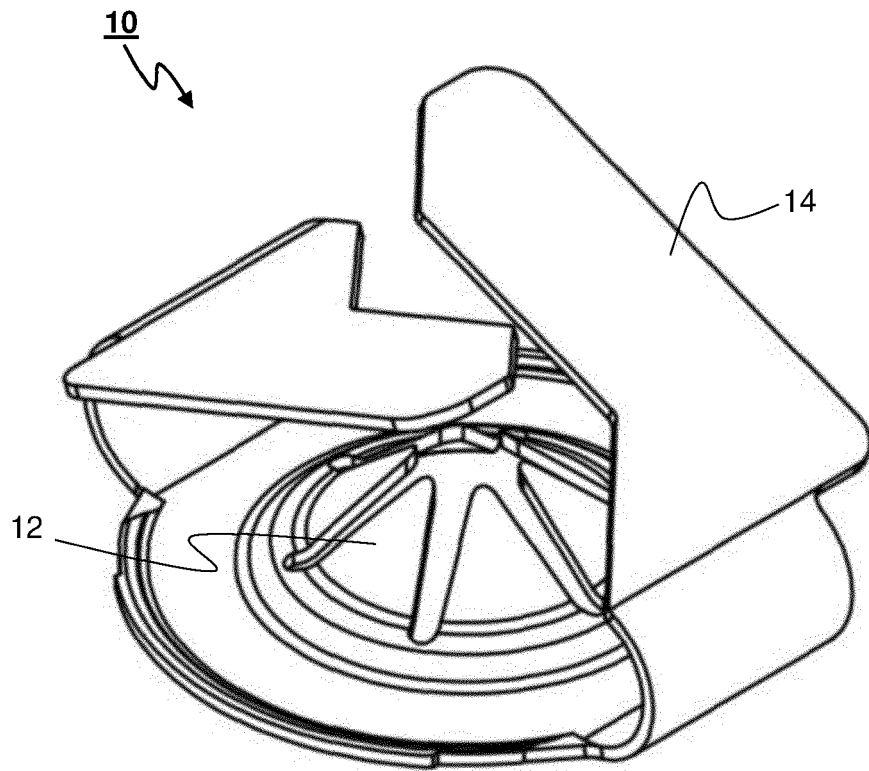


FIG. 1 (Prior Art)

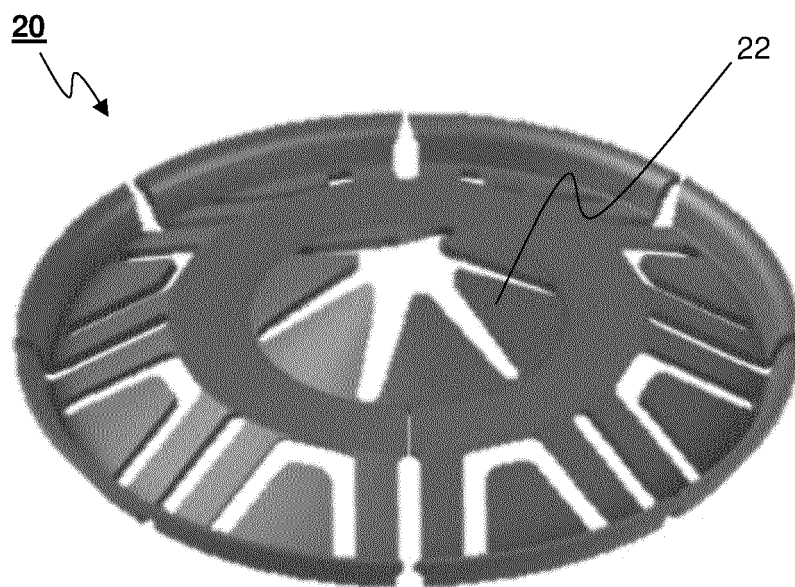


FIG. 2 (Prior Art)

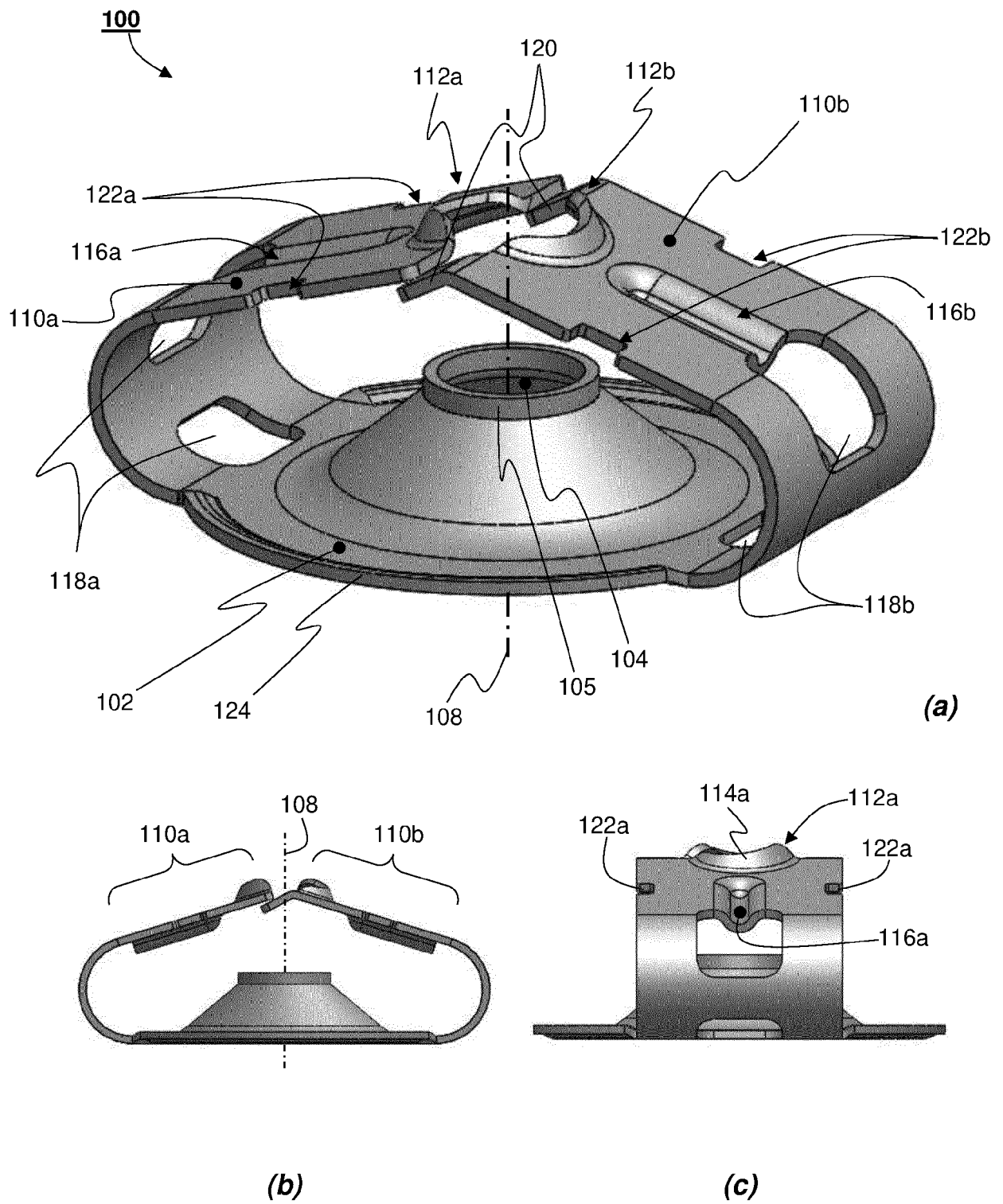


FIG. 3

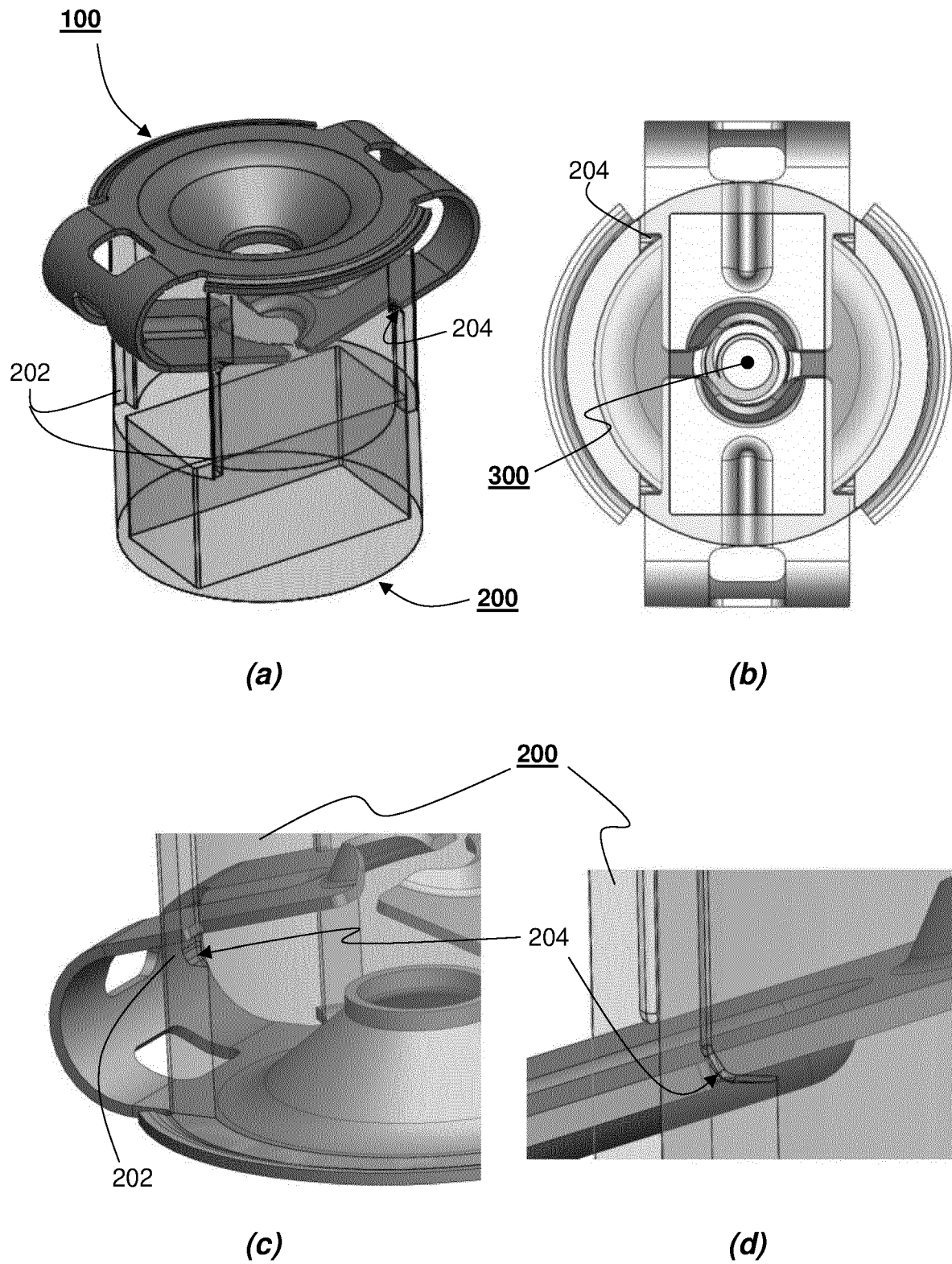


FIG. 4

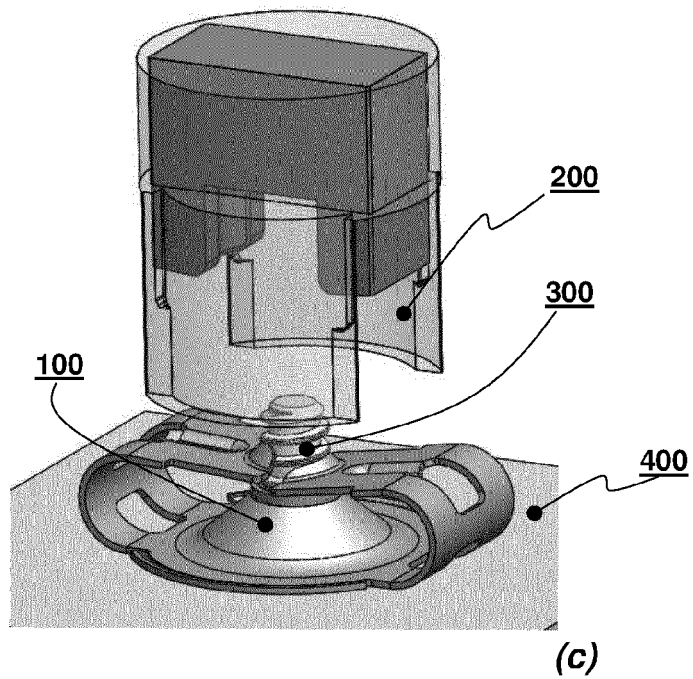
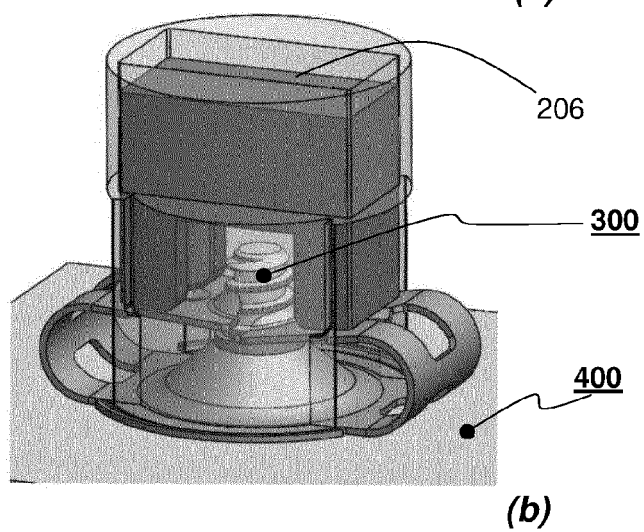
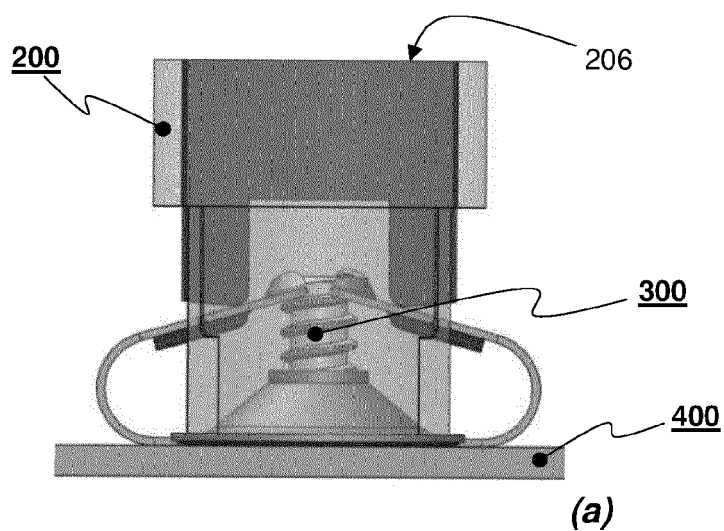


FIG. 5

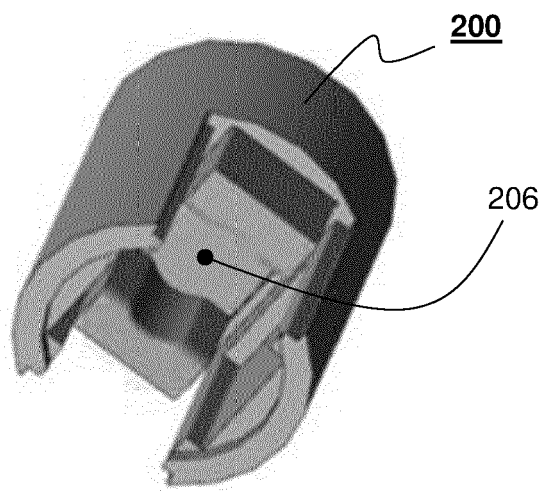
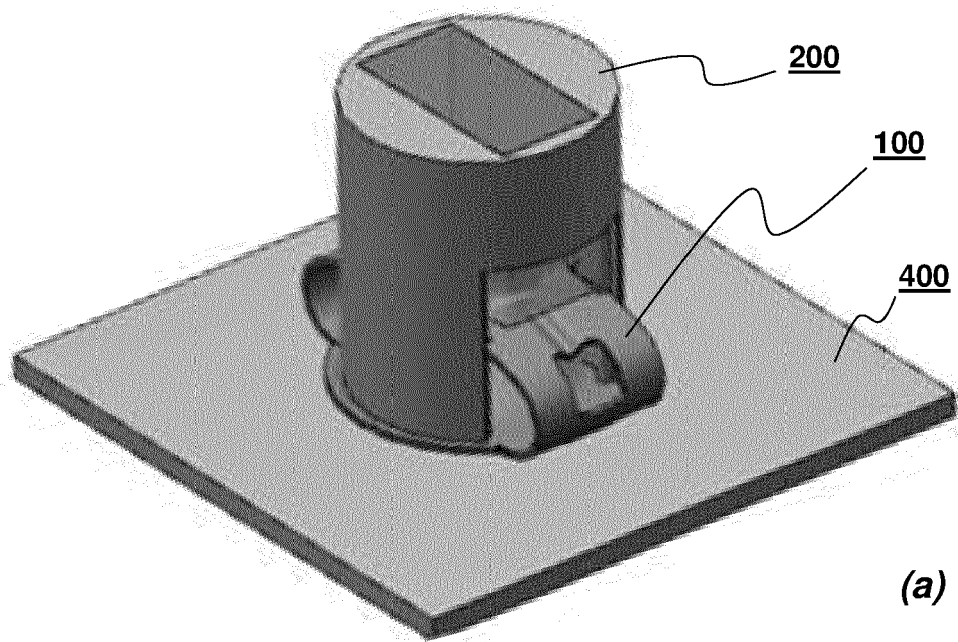


FIG. 6

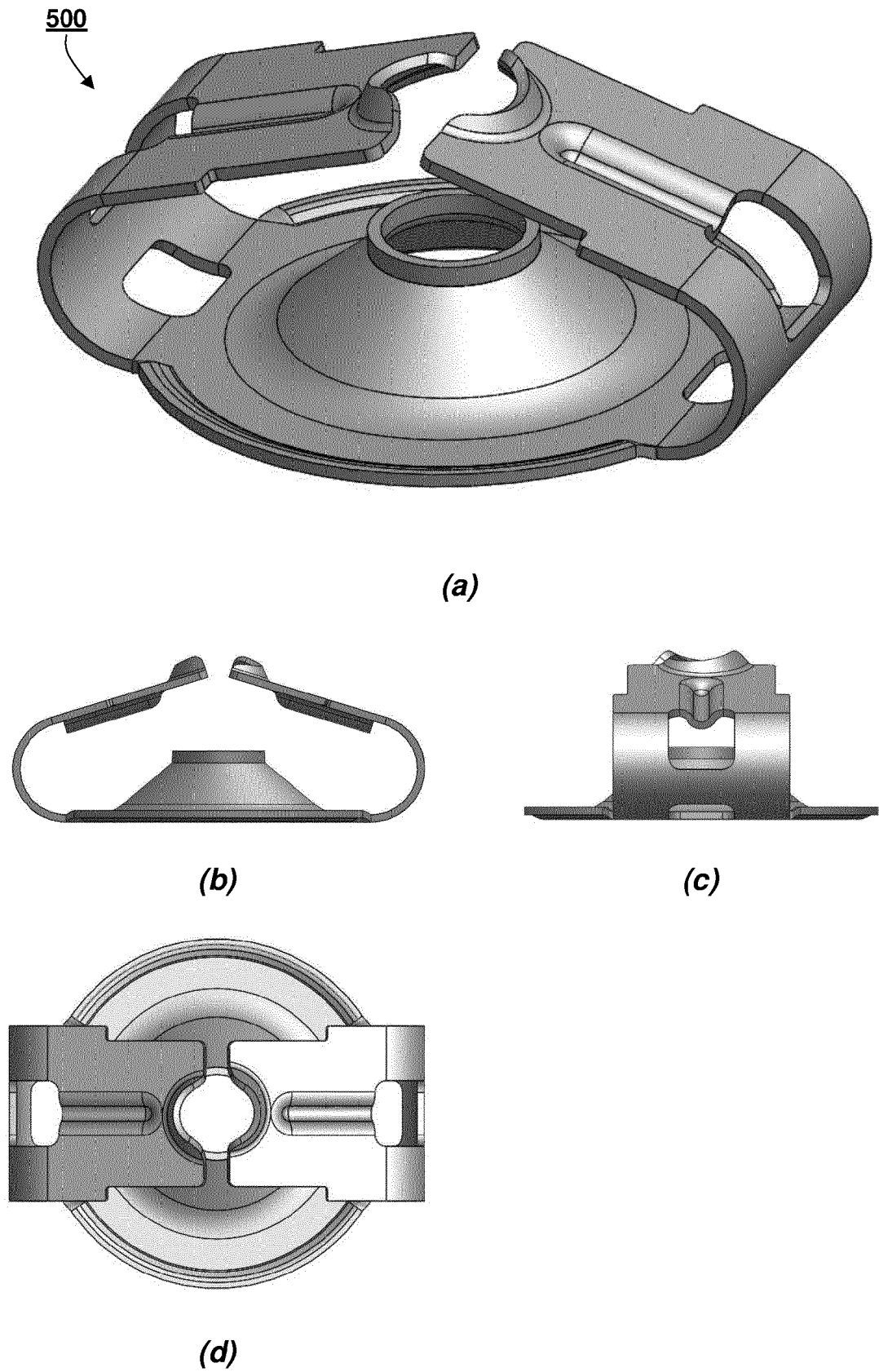


FIG. 7

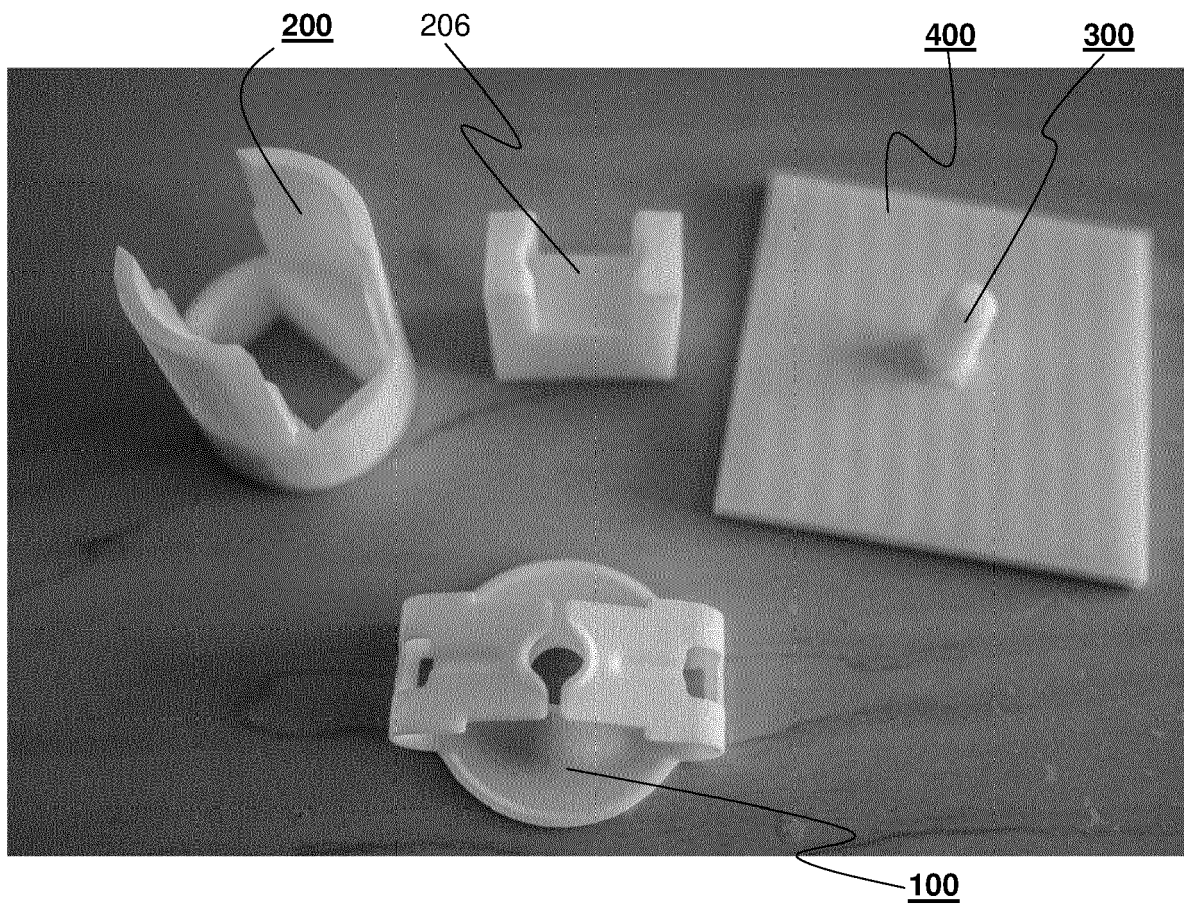


FIG. 8

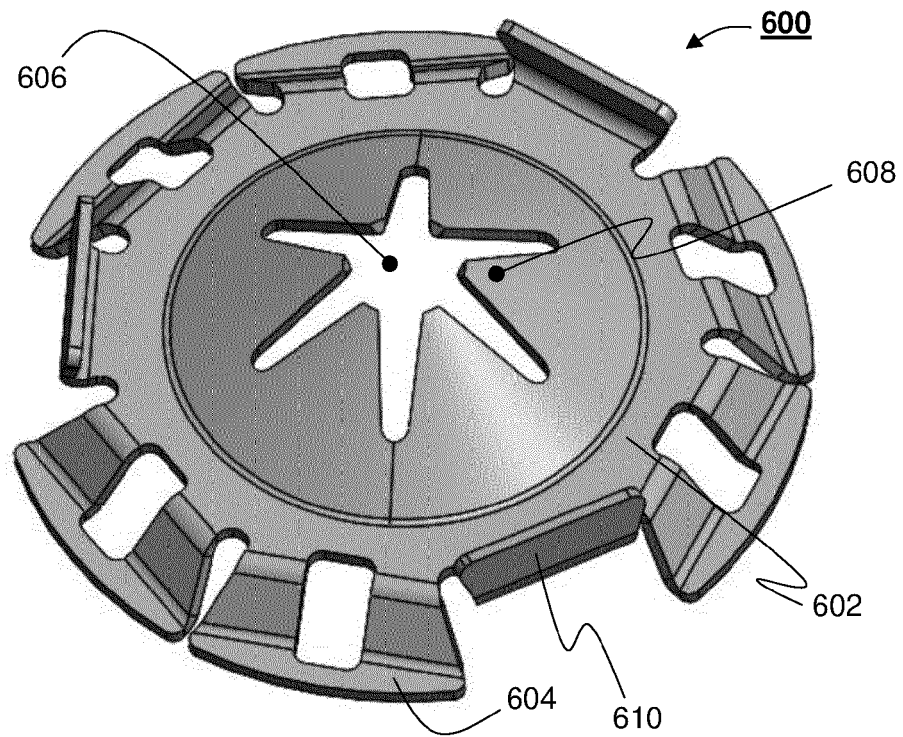


FIG. 9



FIG. 10

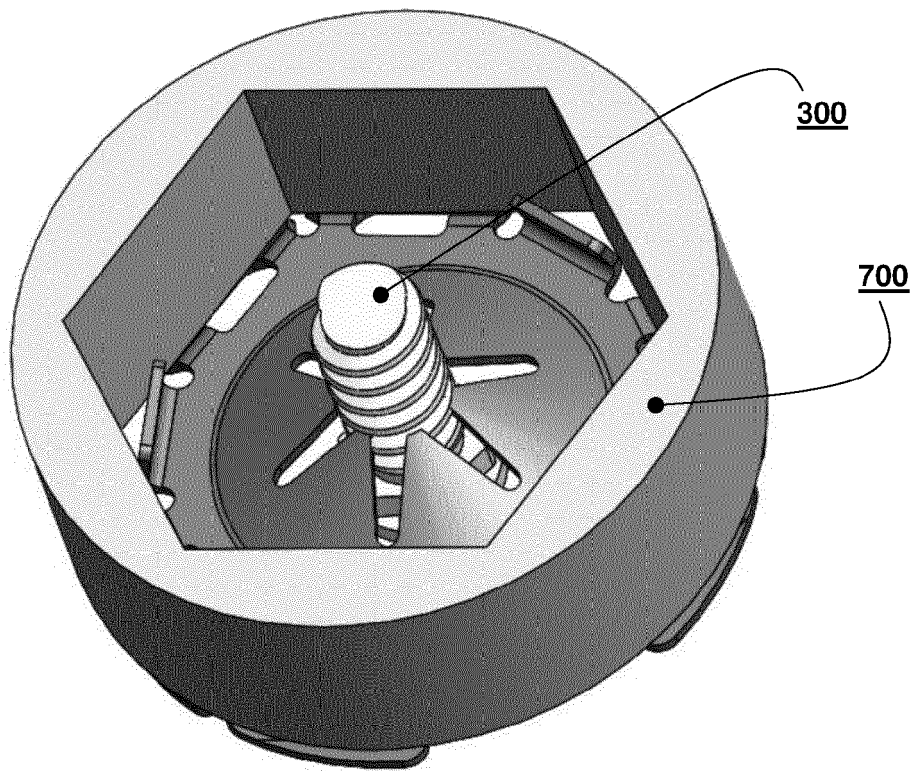


FIG. 11

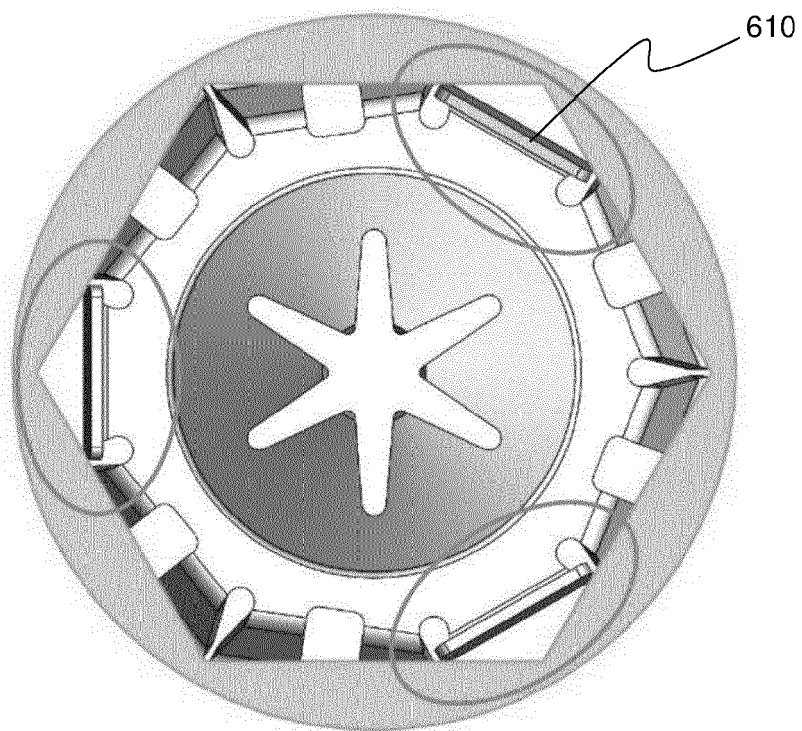


FIG. 12

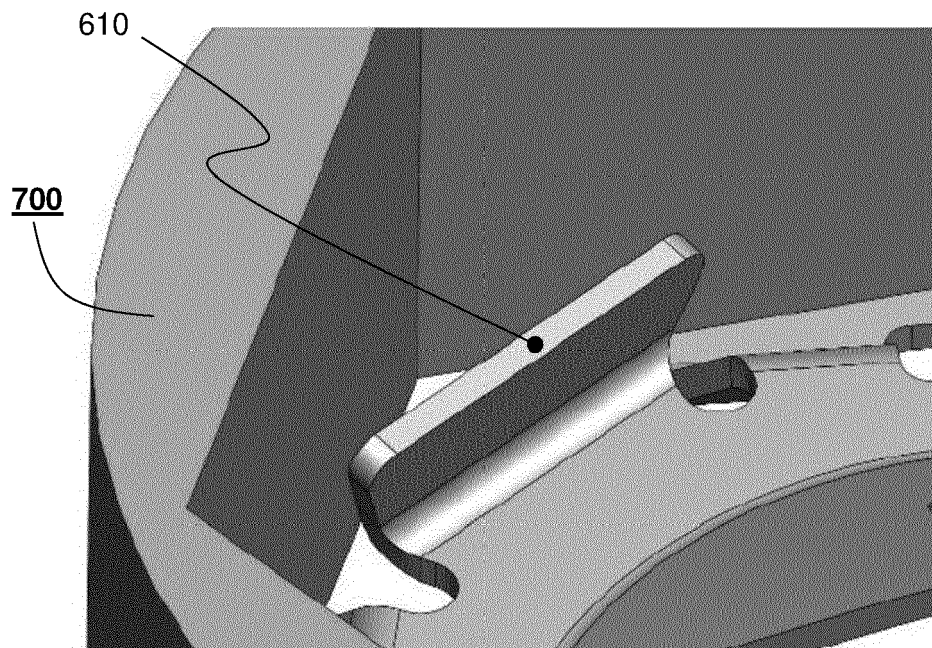


FIG. 13

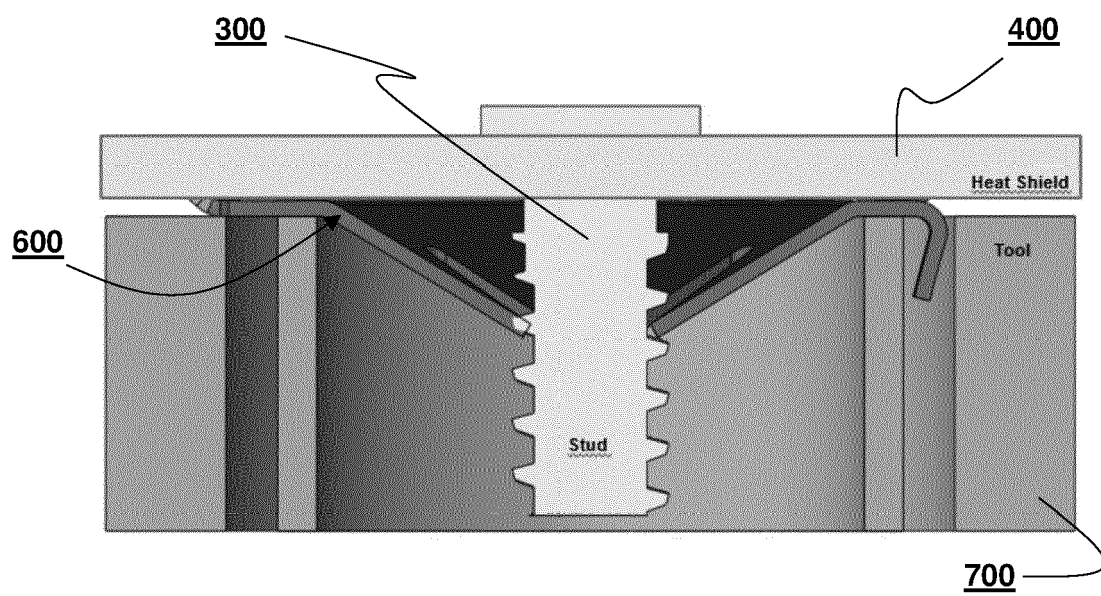


FIG. 14



EUROPEAN SEARCH REPORT

Application Number
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Y	* figures 1-8 *	10-12	F16B37/02
A	* paragraphs [0002], [0029] - [0045] *	4-6	F16B37/08
Y	DE 196 07 000 A1 (HECRALMAT FA [LI]) 28 August 1997 (1997-08-28) * figures 1-4 * * column 3, lines 52-54 * * column 4, lines 25-30 *	10-12	
A	EP 1 182 369 A2 (PIOLAX INC [JP]) 27 February 2002 (2002-02-27) * the whole document *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			F16B B60R B62D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 14 January 2021	Examiner Schandel, Yannick
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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