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(54) Title: CLOSURE MEMBER CUSHION AND METHOD OF INSTALLATION

(57) Abstract: A cushion (1) for a vehicle closure member is provided. The cushion (1) includes an anchoring means (5) located on a first wall portion (25) positioned at a first end of the cushion (1), and configured to enable affixing of the cushion (1) at an installation point, and an impact absorbing means (10) attached to the anchoring means (5), wherein the impact absorbing means (10) including a transverse wall portion (15) opposite to the first wall portion (25), and a first hole (22) formed in the transverse wall portion (15) enabling penetration of a mounting pin (65) through the transverse wall (15), thereby enabling the mounting pin (65) to act on the anchoring means (5) via the first wall portion (25).

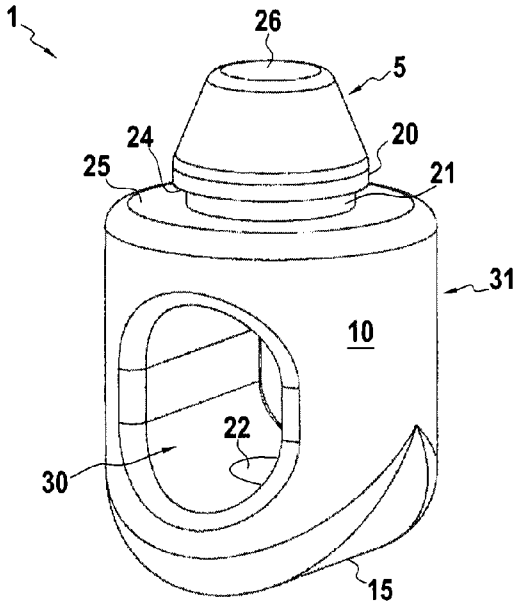

FIG.1

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CLOSURE MEMBER CUSHION AND METHOD OF INSTALLATION

Field of the Disclosure

[0001] The present disclosure relates to closure members of vehicles, and more particularly to a cushion for controlling a maximum open position and bounce, and a method of installing the cushion.

Background of the Disclosure

[0002] In the field of vehicle manufacturing and marketing, it is generally desirable to produce and market vehicles being perceived as high quality and good value. A consumer takes into account numerous elements, both consciously and sub-consciously, when making a determination as to whether a particular vehicle meets such expectations.

[0003] One of these elements relates to opening functionality of closure members, e.g., a trunk lid. Such closure members tend to open quickly based on springs associated with the hinges designed to lift and maintain the closure member in an open position. The conversion of potential energy to kinetic energy, i.e. movement of the closure member, and the need to stop movement of the closure member (i.e., dissipate kinetic energy), generally results in bouncing and/or fluttering at a fully open position of the closure member, thus resulting in the perception of poor quality to the consumer.

[0004] On some vehicles, a fluid damper has been used to disperse energy associated with the motion of the closure member. However, such dampers having a size reasonable for installation on a vehicle do not absorb sufficient energy to eliminate bounce. Further, where the size of such dampers is increased, the cost becomes prohibitive for full scale manufacturing. Additionally, such dampers are prone to wear and fluid leaks, thereby necessitating replacement.

[0005] US 2,810,153 discloses a hinge and counterbalance combination for an automobile door.

[0006] US 2,812,538 discloses a hinge check and hold open for an automobile.

[0007] WO 2004/038148 discloses an inlet brake for a rear opening hood of a motor vehicle. The inlet brake includes a substantially U-shaped receiving element, which, by means of a clamping effect and is to prevent the hood from

springing back. The receiving element is provided with conical, lateral brake cheeks so that a narrowing, clamping receiving element is formed.

[0008] US 2006/279105 discloses a gooseneck hinge assembly for a closure of a vehicle includes a body side strap connected to a vehicle body of the vehicle and a closure side strap having a gooseneck shape adapted to be connected to a closure for closing an opening in the vehicle body. The gooseneck hinge assembly includes a wedge bumper interconnecting the body side strap and the closure side strap to allow the deck lid to free rise to a fully open position and to dampen an impact of the closure side strap.

[0009] It is accordingly a primary object of the disclosure to provide systems and methods for improving the perceived quality of a vehicle closure member.

SUMMARY OF THE DISCLOSURE

[0010] According to embodiments of the present invention a cushion is provided. Such a cushion may be provided, for example, at one or more points on a vehicle so as to regulate an open or closed position of a vehicle closure member (e.g., a door, a trunk lid, an engine compartment cover, etc.) and to dissipate kinetic energy associated with the opening of the closure member.

[0011] The cushion includes an anchoring means located on a first wall portion positioned at a first end of the cushion, and configured to enable affixing of the cushion at an installation point, and an impact absorbing means attached to the anchoring means, wherein the impact absorbing means includes a transverse wall portion opposite to the first wall portion, and a first hole formed in the transverse wall portion enabling penetration of a mounting pin through the transverse wall, thereby enabling the mounting pin to act on the anchoring means via the first wall portion..

[0012] By providing such a cushion, particularly in an automotive application, kinetic energy of a closing member (e.g., a truck lid) may be absorbed by the cushion and energy converted, e.g., into heat, potential energy, etc., so as to reduce or even eliminate bounce resulting from impact with the cushion. In this way, the apparent quality of the vehicle may be more highly regarded by a consumer. In addition, because of its compact design, such a cushion may maintain a similar size to previously existing cushions, and no redesign need be performed to utilize the cushion. Moreover, substantial cost

savings may be achieved by eliminating the need for fluid dampers, and long term reliability also, thereby improved.

[0013] The impact absorbing means may further include resistance reducing means, for example, a hollow space, configured to reduce the resistance of the impact absorbing means and the anchoring means may include a protrusion extending longitudinally from the first end of the cushion.

[0014] The anchoring means may include a grommet, preferably a flared grommet.

[0015] The cushion can comprise a synthetic rubber, preferably ethylene propylene diene monomer (EPDM), and the synthetic rubber can have a hardness of between 30 SHA and 80 SHA, better between 35 SHA and 60 SHA, for example 50 SHA.

[0016] According to embodiments of the present specification, the impact absorbing means can be configured to be compressed between 16 percent and 75 percent, better between 24 percent and 60 percent, for example, 56 percent, for example, when subjected to a compressive force of 65 Newtons (N). The impact absorbing means can be configured to absorb greater than 0.40 Joules, better greater than 0.50 Joules, even better between 0.60 and 2.0 Joules, for example 0.64 Joules.

[0017] An outer diameter of the cushion may range between 80 to 95 percent of a height of the impact absorbing means, and may be for example, 22 mm.

[0018] The cushion may further include a mounting pin guiding portion positioned at the first wall portion within the resistance reducing portion. Such a guiding portion may be configured as a blind hole formed within the first wall portion.

[0019] The resistance reducing portion may include a hollow space, the hollow space being transverse to the longitudinal axis of the cushion and located within the impact absorbing means.

[0020] The anchoring means and the impact absorbing means can be unitarily formed, for example by a molding or an extrusion process.

[0021] According to some embodiments of the present disclosure, a vehicle including the cushion according to any of the previously described configurations may be provided and the cushion may be configured to limit a maximum open position of a vehicle closure member, for example, a trunk lid.

[0022] According to further embodiments of the present disclosure, a cushion is provided. The cushion may include an anchoring portion located at a first end of the cushion, the anchoring portion being configured for affixing the cushion at an installation point, and an impact absorbing portion located opposite the anchoring portion and comprising a resiliently deformable body The resiliently deformable body may include a first hole configured to enable penetration of a mounting pin through the resiliently deformable body, and a blind hole longitudinally aligned with the through hole and configured to receive the mounting pin. The blind hole bottom may be operatively connected to the anchoring portion so as to enable force exerted on the blind hole bottom to be transferred to the anchoring portion.

[0023] The cushion may further include a hollow space, the hollow space being transverse to the longitudinal axis of the cushion and being configured to reduce the resistance of the impact absorbing means.

[0024] The anchoring portion may comprise a protrusion extending longitudinally from the first end of the cushion, the protrusion possibly being of the grommet type, and which may be flared.

[0025] The cushion can comprise a synthetic rubber, for example, an ethylene propylene diene monomer (EPDM). The synthetic rubber has a hardness of between 30 SHA and 80 SHA, for example, between 35 SHA and 60 SHA.

[0026] The impact absorbing portion may be configured to be compressed between 16 percent and 75 percent when subjected to a compressive force of 65 Newtons (N). Further, the impact absorbing portion may be configured to absorb greater than 0.63 Joules, better between 0.50 Joules and 2.0 Joules, for example 0.64 Joules.

[0027] An outer diameter of the cushion may range between 80 to 95 percent of a height of the impact absorbing portion and the anchoring portion and the impact absorbing portions can be unitarily formed.

[0028] According to yet further embodiments of the present disclosure, a vehicle including the cushion as described above is provided. The cushion may be configured to limit a maximum open position of a vehicle closure member, for example, a trunk lid.

[0029] According to still further embodiments of the present disclosure, a method for mounting the cushion described above is provided. The method

may include inserting a mounting pin through the first hole until the mounting pin is seated within the blind hole, positioning the cushion at the installation point, and exerting a force on the bottom of the blind hole via the mounting pin such that the anchoring portion is forced into the installation point.

[0030] It is intended that combinations of the above-described elements and those within the specification may be made, except where otherwise contradictory.

[0031] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the disclosure, as claimed.

[0032] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the disclosure and together with the description, serve to explain the principles thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033] Fig. 1 is a perspective representation of an exemplary cushion according to embodiments of the present disclosure;

[0034] Figs. 2A and 2B are plan views of the exemplary cushion shown at Fig. 1;

[0035] Figs. 3A and 3B are schematic representations of the exemplary cushion of Fig. 1 showing an at-rest position and a compressed position respectfully;

[0036] Fig. 4 shows an exemplary mechanical assembly for mounting cushions according to embodiments of the present disclosure;

[0037] Fig. 5 is a flowchart depicting an exemplary method for mounting the cushion according to embodiments of the present disclosure; and

[0038] Fig. 6 is a graph demonstrating the force to compression distance ratios of an exemplary cushion according to embodiments of the present disclosure.

DESCRIPTION OF THE EMBODIMENTS

[0039] Reference will now be made in detail to the present exemplary embodiments of the disclosure, examples of which are illustrated in the

accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[0040] Fig. 1 is a perspective representation of an exemplary cushion 1 according to embodiments of the present disclosure. Cushion 1 may include an anchoring portion 5 and impact absorbing portion 10, among others.

[0041] Anchoring portion 5 and impact absorbing portion 10 may be made from any suitable material, for example rubber, synthetic rubber, e.g., ethylene propylene diene monomer (EPDM), particularly a closed cell foam rubber. According to some embodiments, anchoring portion 5 and impact absorbing portion 10 may be unilaterally formed, such as by an extrusion process, a molding process (e.g., injection molding), or any suitable process or combination of processes.

[0042] The material (e.g., a synthetic rubber) forming cushion 1 may have a hardness of between 30 SHA and 80 SHA, possibly between 35 SHA and 60 SHA, for example 50 SHA, depending on the desired energy absorbing characteristics of the cushion 1. For example, EPDM 7051 and EPDM 7038. One of skill in the art will understand upon a review of the present disclosure that by varying the hardness of the material used to form cushion 1, differing levels of resistance may be achieved.

[0043] According to some embodiments, it may be desirable for the cushion to absorb greater than 0.50 Joules, for example, between 0.63 Joules and 4.0 Joules, and in one particular example, 0.64 Joules.

[0044] Anchoring portion 5 may be formed as a protrusion extending longitudinally from a first end of cushion 1. Anchoring portion 5 may include a head 20 and a neck 21, among others. According to some embodiments, anchoring portion 5 may be configured to behave as a grommet type anchor, that is to say, generally flared and/or collared so as to enable inserting into and affixing to a panel or other suitable surface, for example a thin surface of between 1 and 20 mm associated with a vehicle. One of ordinary skill in the art will recognize that anchoring portion 5 may be implemented with other fastening type connections. For example, anchoring portion 5 may be implemented with an interference press-fit type connection.

[0045] Neck 21 of anchoring portion may be configured to span the distance corresponding to a thickness of a material to which cushion 1 is to be affixed. For example, where cushion 1 is to be installed on a thin plate having a

thickness of 15 mm, neck 21 may have a height equal to 15 mm, or even slightly less (e.g., 14mm) to, for example, facilitate a firm connection and to minimize undesirable noise generation (e.g., squeaking).

[0046] Head 20 may be configured to aid in alignment and insertion of anchoring portion 5 into a hole in a mounting surface. For example, by providing a tapered head 20, i.e., having a collar 24 wider than a tip 26 resulting in a conical or frustro-conical shape, head 20 may be a aligned with a hole and more easily inserted through the hole in the mounting surface. One of skill in the art will recognize that other shaped heads 20 may also be implemented, for example, cylindrical, cubic, pyramidal, etc., without departing from the scope of the present disclosure.

[0047] Impact absorbing portion 10 may be configured to absorb impact energy associated with motion of a closure member, e.g., a vehicle trunk lid. In other words, impact absorbing portion 10 may be configured to convert kinetic energy of a closure member into other forms of energy, e.g., heat, potential energy, etc.

[0048] Impact absorbing portion may include a body 31, an installation point interface 25 (e.g., a wall portion), a through hole 22, a blind hole 18, a closure member interface 15 (e.g., a transverse wall portion), and a resistance reducing portion 30, among others.

[0049] Body 31 of impact absorbing portion 10 may be formed unitarily with anchoring portion 5 so as to result in a single piece construction of cushion 1 (e.g., by molding, extrusion, etc.) Alternatively body 31 may be subsequently affixed with anchoring portion 5, for example, where anchoring portion 5 and body 31 include interlocking portions (not shown) configured to enable an operative connection between the two section.

[0050] Body 31 may be of any desirable shape, for example, cylindrical, spherical, cubical, trapezoidal, etc., and may have any desirable surface features.

[0051] Body 31 may have a height H configured so as to enable adequate closure member energy absorption, compression distance, and so as to regulate a fully open position of a vehicle closure member. In addition, other factors may be considered, such as retrofitting previous vehicle designs without modification of such vehicles. According to some examples, a diameter of a

cylindrical body 31 may range between 80 and 100 percent of height H, better, between 90 and 95 percent of height H, for example, 92 percent.

[0052] Figure 6 is a graph demonstrating the force to compression distance ratios based on temperatures of 80 degrees C, room temperature (i.e., ~20 degrees C), and -30 degrees C, for an exemplary cushion according to embodiments of the present disclosure. As indicated, as temperature decreases, greater force is used for compressing cushion 1 the same distance. One of skill in the art will understand that such a chart may be useful in determining a desirable height H of body 31. For example according to some embodiments, height H may be between 20 and 30 mm.

[0053] Installation point interface 25 of impact absorbing portion 10 may be configured to be in contact with one or more portions of an installation point 61 following insertion of anchoring portion 5 into, for example, a hole formed in a surface of a sheet. Therefore, installation point interface 25 may comprise a wall portion forming a "shoulder" in relation to neck 21 of anchoring portion 5, and may be suitably configured to take into account contours and other features (e.g., raised fasteners) of the sheet at the installation point 61. Installation point interface 25 may also be treated (e.g., coated) with any desirable material where additional sound dampening or other desired effects are deemed desirable.

[0054] Closure member interface 15 may be configured to interface with portions of, for example, closure members of the vehicle and/or hinge portions 60 thereof, e.g., as shown at Figures 3A and 3B. Therefore, closure member interface 15 may comprise a transverse wall portion, i.e., a wall perpendicular to the longitudinal axis L of cushion 1. For example, according to some embodiments, closure member interface 15 may include one or more portions (e.g., grooved wall portion, flat wall portion, etc.) configured to contact and/or receive a hinge member 60 of a vehicle closure member during movement (e.g. opening) of the vehicle closure member. Similarly to installation point interface 25, closure member interface 15 may be configured and/or treated so as to provide desirable effects such as sound dampening and/or squeak reduction, for example.

[0055] Figures 3A and 3B are schematic representations of cushion 1 showing an at-rest position prior to impact of hinge portion 60 on closure member interface 15, and a compressed position following energy absorption

and compression of cushion 1 as a result of impact by hinge portion 60 on closure member interface 15 during closure of the closure member.

[0056] According to some embodiments, a compression distance of impact absorbing portion 10 may be between 16 percent and 75 percent, better between 24 percent and 60 percent, for example, 56 percent of the height H of impact absorbing portion 10.

[0057] Returning to Figures 2A and 2B, resistance reducing portion 30 may be configured to reduce the resistance associated with impact absorbing portion 10. For example, depending upon the amount of resistance desired and the energy absorbing characteristics of cushion 1, resistance reducing portion 30 may be implemented to further tune the resulting energy absorption and dynamic characteristics of cushion 1.

[0058] According to some embodiments, resistance reducing portion 30 may be created by an absence of material within body 31. For example, resistance reducing portion 30 may be a through hole formed perpendicularly to the longitudinal axis L of cushion 1, resulting, for example, from steps taken during a molding process of cushion 1 (e.g., a mold having a desirably sized insert), an extrusion process, and/or following formation of cushion 1 (e.g., drilling, machining, etc.) Such a through hole may be of any desirable shape, for example circular, semicircular, elliptical, rectangular, etc. For example, a projection of a void associated with resistance reducing portion 30 may be substantially rectangular with rounded corners.

[0059] In such embodiments, implementation of such a hole may lead to the creation of flexible members positioned on either side of resistance reducing portion 30, these flexible members, for example, comprising the material from which cushion 1 is fabricated, and/or additional materials. Thickness of such flexible members may be varied based on a size associated with both body 31 and resistance reducing portion 30. For example, a thickness ratio of a flexible member to the body (i.e., thickness of a single flexible member to width (or diameter) of body 31) may range between 10 to 60 percent, better, between 20 and 40 percent, for example 26 percent.

[0060] Alternatively, other methods for reducing resistance of impact absorbing portion 10 may be implemented, such as, for example, cutting away various amounts of material from body 31, drilling a plurality of interspersed holes through body 31, etc. One of skill in the art will understand that various

methods for reducing resistance of impact absorbing portion 10 may be implemented without departing from the scope of the present disclosure.

[0061] According to some embodiments, where resistance reducing portion 30 is formed by a hole perpendicular to the longitudinal axis L cushion 1, the hole may have a height H_1 of, for example between 40 and 70 percent of height H of body 31. H_1 may vary based on the desired resistance reduction to be achieved in impact absorbing portion 10, among others.

[0062] In addition, resistance reducing portion 30 may be modified by introducing different materials in select portions of the hole forming resistance reducing portion 30, in order to achieve the desired resistance. In such an example, a portion of material may be removed may be replaced by a material having a hardness greater than or less than the removed material in order to manipulate the resistance.

[0063] Returning to figures 2A and 2B, impact absorbing portion 10 may include a through hole 22 and a mounting pin guiding portion 18 (e.g., a blind hole), each extending along longitudinal axis L of cushion 1. Through hole 22 may be configured to enable a mounting pin 65 (shown at Figure 4) to penetrate through a transverse wall forming closure member interface 15, and through body 31 passing in a direction from closure member interface 15 towards anchoring portion 5. Therefore, through hole 22 may open outwards through both closure member interface 15 and resistance reducing portion 30. In addition, through hole 22 may have a diameter substantially matching that of the intended mounting pin 65, or may be configured such that a desired amount of interference is present between an inserted mounting pin 65 and through hole 22.

[0064] Mounting pin guiding portion 18 (e.g., a blind hole) may be configured to receive and guide mounting pin 65. According to embodiments where mounting pin guiding portion 18 is a blind hole, blind hole 18 may be configured to enable mounting pin 65 to act upon anchoring portion 5 by way of at least the bottom of, for example, blind hole 18. Blind hole 18 may be reamed, drilled, milled, and/or formed as a result of processes during fabrication of cushion 1 (e.g., molding, extrusion, etc.) to a specified depth, in other words, without penetrating through the plane associated with installation surface interface 25 or anchoring portion 5.

[0065] A center of blind hole 18 may be substantially longitudinally aligned with a center of through hole 22 such that upon insertion of mounting pin 65, mounting pin 65 may traverse through hole 22, resistance reducing portion 30, to be received by blind hole 18. Additionally, blind hole 18 may be positioned such that the bottom of blind hole 18 corresponds substantially with anchoring portion 5. In other words, at least a portion of the bottom of blind hole 18 may be opposite to anchoring portion 5. For example, the centers of anchoring portion 5, blind hole 18, through hole 22, and mounting pin 65 may all be aligned along longitudinal axis L, as exemplified at Figure 4.

[0066] With mounting pin 65 received by blind hole 18, a top portion of mounting pin 65 may then interface with the bottom of blind hole 18 such that mounting pin 65 may act on anchoring portion 5 via the bottom of blind hole 18 thereby enabling a force exerted by mounting pin 65 to press cushion 1 into an installed position at installation point 61. By enabling such force to be transmitted from mounting pin 65 to anchoring portion 65, problems associated with mounting cushion 1 in view of the compressibility of impact absorbing portion 10 can be overcome.

[0067] Figure 5 is a flowchart 500 depicting an exemplary method for mounting cushion 1 according to embodiments of the present disclosure. A cushion 1 may be positioned on mounting pin 65 such that mounting pin 65 traverses through hole 22 and is received by blind hole 18 (step 505). Mounting pin 65 may then be seated in blind hole 18 such that a top portion of mounting pin 65 is in contact with the bottom of blind hole 18 (step 510).

[0068] Anchoring portion 5 of cushion 1 may be positioned at installation point 61 (step 515) of a sheet configured to receive anchoring portion 5, e.g., having a hole of diameter corresponding to neck 21, formed (e.g., drilled) through the sheet at installation point 61. A force may then be applied to anchoring portion 5 via mounting pin 65 acting on the bottom of blind hole 18 (step 520) so as to press anchoring portion 5 into the hole at installation point 61, such that installation point interface 25 contacts at least a portion of the sheet. Such a force may be applied to mounting pin 65 via, for example, a lever or rotating device 70, among others.

[0069] By providing such systems and methods, cushion 1 may enable a desired amount of kinetic energy of a closure member to be converted to other forms of energy (e.g., heat, potential energy, etc.), to regulate the fully open

position of the closure member, and to reduce or eliminate bounce of the closure member at the full open position. In addition, by eliminating hydraulic dampers from the closure system, cost may be reduced, long term reliability increased, and space restrictions minimized.

[0070] Moreover, by utilizing the disclosed mounting methods, the otherwise compressible cushion 1 may be more easily mounted to an installation point 61 using mounting pin 65.

[0071] Throughout the description, including the claims, the term "comprising a" should be understood as being synonymous with "comprising at least one" unless otherwise stated. In addition, any range set forth in the description, including the claims should be understood as including its end value(s) unless otherwise stated. Specific values for described elements should be understood to be within accepted manufacturing or industry tolerances known to one of skill in the art, and any use of the terms "substantially" and/or "approximately" and/or “generally” should be understood to mean falling within such accepted tolerances.

[0072] Where any standards of national, international, or other standards body are referenced (e.g., ISO, etc.), such references are intended to refer to the standard as defined by the national or international standards body as of the priority date of the present specification. Any subsequent substantive changes to such standards are not intended to modify the scope and/or definitions of the present disclosure and/or claims.

[0073] It is intended that the specification and examples be considered as exemplary only, with a true scope of the disclosure being indicated by the following claims.

CLAIMS

1. A cushion, comprising:

an anchoring means located on a first wall portion positioned at a first end of the cushion, and configured to enable affixing of the cushion at an installation point;

an impact absorbing means attached to the anchoring means,

wherein the impact absorbing means comprises

a transverse wall portion opposite to the first wall portion; and

a first hole formed in the transverse wall portion enabling penetration of a mounting pin through the transverse wall, thereby enabling the mounting pin to act on the anchoring means via the first wall portion.

2. The cushion according to claim 1, wherein the impact absorbing means comprises resistance reducing means configured to reduce the resistance of the impact absorbing means.

3. The cushion according to any of the preceding claims, wherein the anchoring means comprises a protrusion extending longitudinally at the first end of the cushion.

4. The cushion according to any of the preceding claims, wherein the anchoring means comprises a grommet, preferably a flared grommet.

5. The cushion according to any of the preceding claims, wherein the cushion comprises a synthetic rubber, preferably ethylene propylene diene monomer (EPDM).

6. The cushion according to claim 5, wherein the synthetic rubber has a hardness of between 30 SHA and 80 SHA, better between 35 SHA and 60 SHA, for example 50 SHA.

7. The cushion according to any of the preceding claims, wherein the impact absorbing means is configured to be compressed between 16 percent

and 75 percent, better between 24 percent and 60 percent, for example, 56 percent.

8. The cushion according to any of the preceding claims, wherein the impact absorbing means is configured to absorb greater than 0.50 Joules, better between 0.63 Joules and 2.0 Joules, for example 0.64 Joules.

9. The cushion according to any of the preceding claims, wherein an outer diameter of the cushion ranges between 80 to 95 percent of a height of the impact absorbing means.

10. The cushion according to any of claims 2-9, further comprising a mounting pin guiding portion positioned at the first wall portion within the resistance reducing portion.

11. The cushion according to any of the preceding claims, wherein the anchoring means and the impact absorbing means are unitarily formed.

12. A vehicle comprising the cushion according to any of the preceding claims, the cushion being configured to limit a maximum open position of a vehicle closure member, for example, a trunk lid.

13. A cushion, comprising:

an anchoring portion located at a first end of the cushion, the anchoring portion configured for affixing the cushion at an installation point;

an impact absorbing portion located opposite the anchoring portion and comprising a resiliently deformable body,

wherein the resiliently deformable body comprises a first hole configured to enable penetration of a mounting pin through the resiliently deformable body, and a blind hole longitudinally aligned with the through hole and configured to receive the mounting pin, and wherein the blind hole bottom is operatively connected to the anchoring portion so as to enable force exerted on the blind hole bottom to be transferred to the anchoring portion.

14. The cushion according to claim 13, further comprising a hollow space, the hollow space being transverse to the longitudinal axis of the cushion and being configured to reduce the resistance of the impact absorbing means.

15. The cushion according to claim 13, wherein the anchoring portion comprises a protrusion extending longitudinally from the first end of the cushion.

16. The cushion according to claim 13, wherein the anchoring portion comprises a grommet

17. The cushion according to claim 16, wherein the grommet is flared.

18. The cushion according to claim 13, wherein the cushion comprises a synthetic rubber.

19. The cushion according to claim 18, wherein the synthetic rubber is an ethylene propylene diene monomer (EPDM).

20. The cushion according to claim 18, wherein the synthetic rubber has a hardness of between 30 SHA and 80 SHA,

21. The cushion according to claim 20, wherein the synthetic rubber has a hardness between 35 SHA and 60 SHA.

22. The cushion according to claim 13, wherein the impact absorbing portion is configured to be compressed between 16 percent and 75 percent when subjected to a compressive force of 65 Newtons (N).

23. The cushion according to claim 13, wherein the impact absorbing portion is configured to absorb greater than 0.50 Joules.

24. The cushion according to claim 23, wherein the impact absorbing portion is configured to absorb between 0.63 Joules and 2.0 Joules.

25. The cushion according to claim 24, wherein the impact absorbing portion is configured to absorb 0.64 Joules.

26. The cushion according to any of the preceding claims, wherein an outer diameter of the cushion ranges between 80 to 95 percent of a height of the impact absorbing portion.

27. The cushion according to claim 13, wherein the anchoring portion and the impact absorbing portions are unitarily formed.

28. A vehicle comprising the cushion according to claim 13, the cushion being configured to limit a maximum open position of a vehicle closure member.

29. A method for mounting the cushion according to any of claims 1-12,

inserting a mounting pin through the first hole until the mounting pin is in operative contact with the first wall portion;

positioning the cushion at the installation point; and

exerting a force on the mounting pin such that the anchoring portion is forced into the installation point.

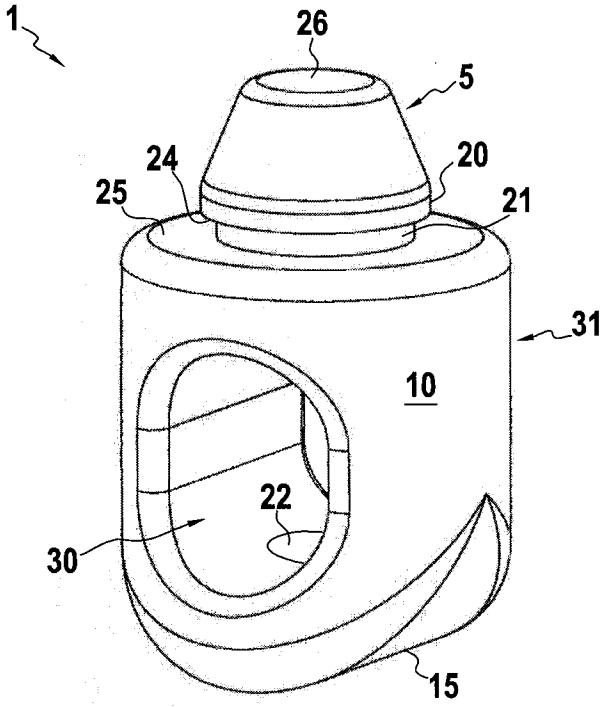

FIG.1

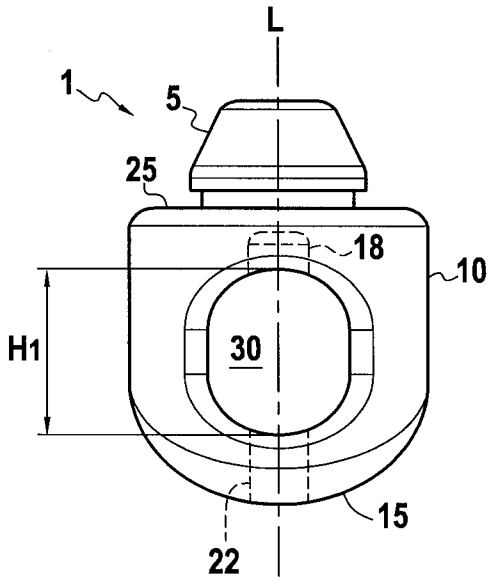

FIG.2A

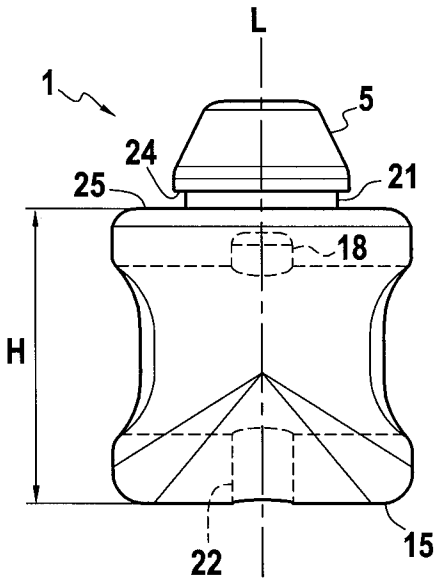

FIG.2B

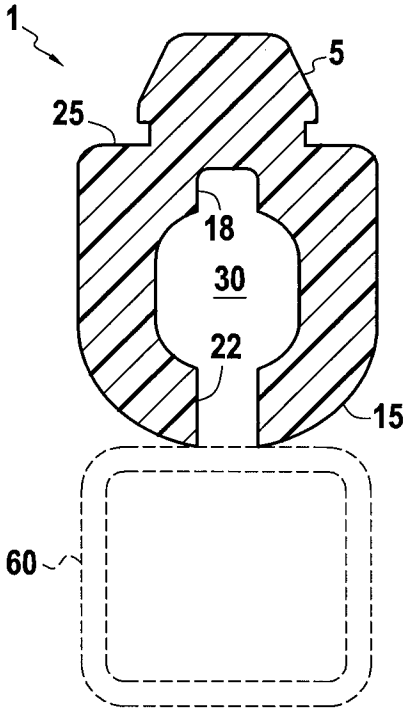

FIG.3A

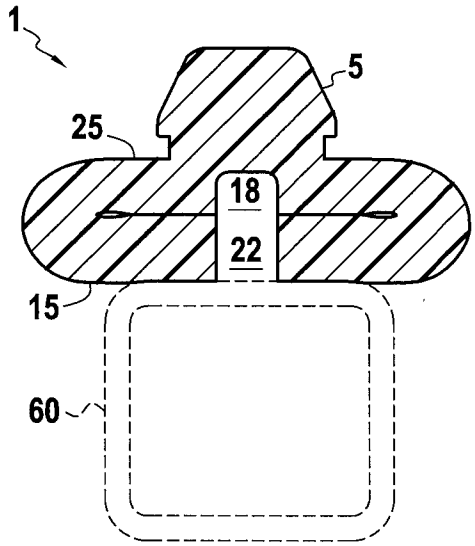

FIG.3B

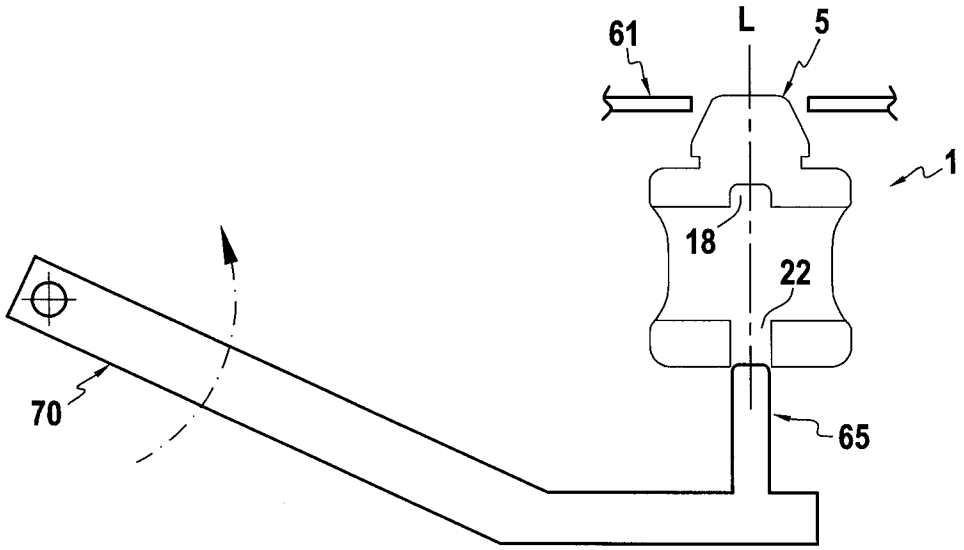

FIG.4

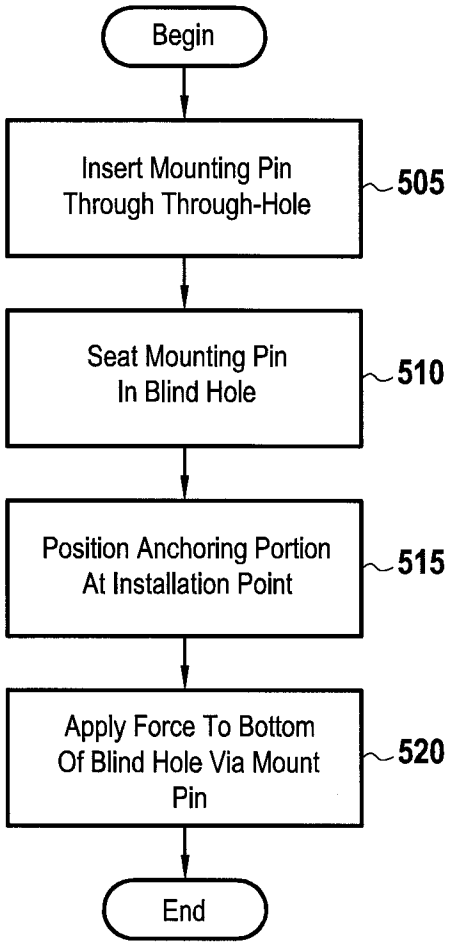
Begin
Insert Mounting Pin Through Through-Hole
505
Seat Mounting Pin In Blind Hole
510
Position Anchoring Portion At Installation Point
515
Apply Force To Bottom Of Blind Hole Via Mount Pin
520
End

FIG.5

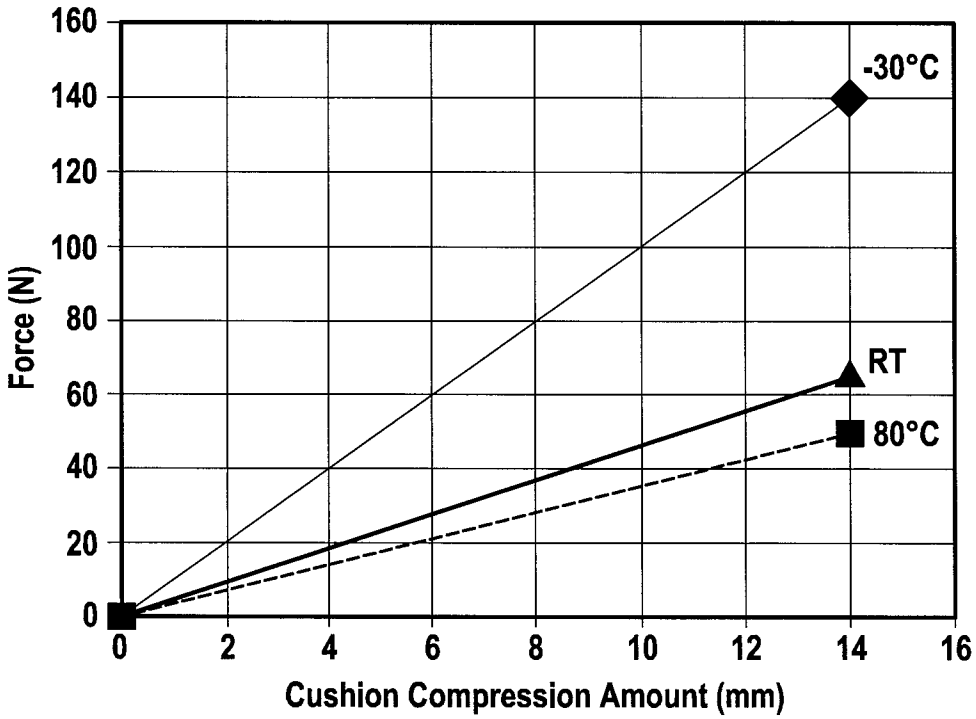
160
140
120
100
80
60
40
20
0
Force (N)
0
2
4
6
8
10
12
14
16
Cushion Compression Amount (mm)
-30°C
RT
80°C

FIG.6

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/051959

A. CLASSIFICATION OF SUBJECT MATTER
INV. E05F5/02
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)
E05F

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	FR 2 992 281 A1 (RENAULT SA [FR]) 27 December 2013 (2013-12-27) page 5, line 7 - line 9 page 6, line 12 - line 19 page 7, line 14 - page 8, line 12 figures 1-3	1-18,20, 22-28
X	US 2014/000066 A1 (DIEP TIEN T [US] ET AL) 2 January 2014 (2014-01-02) paragraph [0021] - paragraph [0024] figures 1-5	1-6, 11-21, 27,28
X	DE 199 17 049 A1 (SCANIA CV AB [SE]) 4 November 1999 (1999-11-04) column 3, line 33 - column 4, line 25 figure 1	1,3-5,11

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"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	Date of mailing of the international search report
7 October 2014	15/10/2014

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Prieto, Daniel

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/051959

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2014/051959

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		DE 102009048322 A1	07-04-2011
		EP 2305438 A1	06-04-2011
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