(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 545 797 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
16.01.2013 Bulletin 2013/03

(51) Int Cl.:
A44B 11/25 *(2006.01)*

(21) Application number: **12174966.7**

(22) Date of filing: **04.07.2012**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **13.07.2011 GB 201112019**

(71) Applicant: **Nissan Motor Manufacturing (UK) Ltd.**
Cranfield
Bedfordshire MK43 0DB (GB)

(72) Inventor: **Mitchell, Simon**
Cranfield, Bedfordshire MK430DB (GB)

(54) Seatbelt buckle assembly

(57) Seatbelt buckle assembly 307 comprises a cover (350, Fig. 4) or bristles 370 arranged to keep foreign objects out of the buckle interior; particularly where a latch (not shown) engages with and retains the seatbelt tongue (200, Fig. 1). The flap or bristles may rotate outwardly (Fig. 9) to expel foreign objects; and may be actuated by a press button (360, Fig. 4) or press panel 380 in the buckle assembly. The flap may be opened automatically by a sensor (420, Fig. 7) signal as webbing is paid out from a retractor reel (400, Fig. 7). The flap or bristles is/are mounted adjacent to an outer tongue insertion area (320, Fig. 3), which is adjacent to a tongue release button 310. Advantage: prior art buckles allow foreign objects to fall into a tapered passage (330, Fig. 3) leading to an inner tongue insertion area (340, Fig. 3).

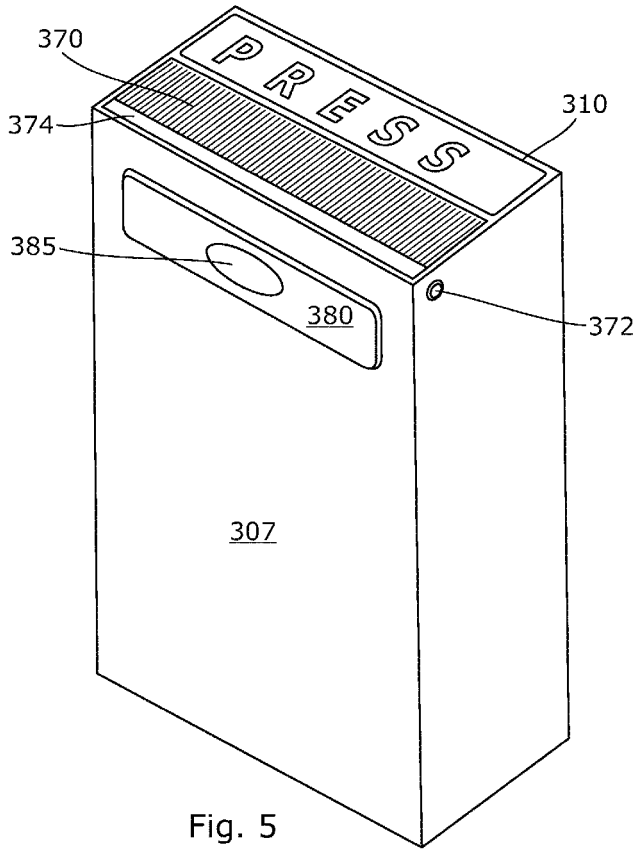

Fig. 5

EP 2 545 797 A1

Description

Field of the invention.

[0001] The invention is concerned with seatbelt assemblies for a seatbelt type restraint device for a passenger or commercial vehicle. Aspects of the invention relate to a seatbelt assembly, to a vehicle seatbelt system, and to a vehicle.

Background of the invention.

[0002] Most modern vehicles, such as passenger cars, intended for use on public roads are fitted with seatbelts, arranged to restrain a seated occupant during sudden changes in vehicle movement such as heavy braking; or in the event of a vehicle collision. These devices are intended to manage the movement of the occupant within the vehicle during such an event, mitigating the risk of occupant injury.

[0003] Typically, a seatbelt system comprises a length of webbing, a tongue secured to the webbing and a buckle arranged for releasable engagement with the tongue. The two ends of the length of webbing are secured to the vehicle or to the vehicle seat, with one end rigidly secured via a mounting bracket to the vehicle body or seat and the other end commonly secured to the vehicle or seat via a spring-biased spool known as a retractor. Where the retractor is mounted to the body, it is usually mounted at or near the foot of the vehicle B-pillar, and the belt webbing passes over a D-shaped metal loop (commonly known as a D-loop) at the top of the B-pillar. The seatbelt buckle is typically located adjacent to the pelvis of the seated occupant, on the opposite side of the occupant to the retractor and the mounting bracket; and is mounted to the vehicle floor or seat by an anchor.

[0004] In use, the seated occupant pulls the tongue fixed to the webbing across their body, causing the retractor to pay out a portion of webbing stored thereon, sufficient to allow the occupant to insert the tongue into the buckle and to engage it therewith. The result of this action causes a portion of the seatbelt webbing to lie across the lap of the occupant, and another portion of the webbing to lie diagonally across their chest. The mounting bracket, retractor and buckle provide three points of anchorage for the occupant to the vehicle and, with the webbing secured across their body, will restrain the occupant within the vehicle until the tongue is disengaged or unlatched from the buckle.

[0005] The integrity of the seatbelt system in use depends on the tongue being latched securely within the buckle. As the buckle is necessarily located adjacent to the junction between the backrest and the cushion of the seat, it is unfortunately in a position where it may collect foreign objects such as shirt buttons, loose threads from clothing, small coins, and dust particles. Although seat belt buckles are often designed with internal pathways allowing such debris to fall out of the bottom of the buckle, the tongue may be prevented from engaging with the buckle until the debris has found its way out. This situation can be irritating for the vehicle user, especially if they are prevented from using their vehicle in a safe condition. It may often be feasible for a technician to clear the blockage in a matter of moments; but this is scant consolation to the vehicle user, who has to wait for a technician to arrive and to clear a blockage in the buckle before they can start their previously planned journey.

[0006] Clearly, in the matter of seatbelt buckle blockage, prevention is better than cure. If it is possible to prevent entry of debris into the buckle, this could potentially avoid considerable inconvenience for the vehicle user.

[0007] Previous mechanisms intended to deter entry of debris into seatbelt buckles comprise doors or a slider which close the slot where the tongue enters the buckle. However, this slot is usually inset into the buckle. Hence, any debris sitting on the door or slider may not be easily cleared before inserting the tongue into the buckle. Unfortunately in this context, the inset of the tongue insertion slot into the buckle is an essential feature for user convenience. As users often do not look at the buckle when they are fastening the seat belt, it is helpful to the user to have a tapered entry to the buckle, so that the seatbelt tongue does not have to be precisely aligned with the slot before insertion. It has been known in the prior art to provide a slider with an open tapered passage on one side. This passage opens a route for foreign objects to enter the buckle, and thus defeats the object of providing a slider.

[0008] It is against this background that the present invention has been conceived. It is an aim of the present invention to collect any debris which may aggregate in the area of the seatbelt tongue entry into the buckle. A further aim of the invention is to provide a means whereby such debris may be removed from the buckle before the tongue is inserted into the buckle. This approach greatly reduces inconvenience caused by difficulties in fastening seatbelt tongues to buckles, with a minimal increase in complexity of the buckle assembly. Other aims and advantages of the invention will become apparent from the following description, claims and drawings.

Summary of the invention.

[0009] According to an aspect of the present invention, there is provided a seatbelt assembly comprising a length of webbing, a tongue and a buckle; said tongue comprising a webbing loop portion comprising a webbing slot, and a buckle insertion portion; said buckle comprising: a tongue release button having an accessible operating face and a concealed body; an outer tongue insertion area adjacent to said release button operating face, said outer area having a width and/or height substantially greater than the corresponding dimensions of the buckle insertion portion of the tongue; an inner tongue insertion area inset from said outer tongue insertion area, said

inner area having width and height similar to the corresponding dimensions of the buckle insertion portion of the tongue; a tapered passage between said outer and inner tongue insertion areas; and a barrier arranged to deter ingress of foreign objects into said buckle, said barrier being mounted to said buckle adjacent to said outer tongue insertion area; **characterized in that** the barrier substantially covers the outer tongue insertion area.

[0010] Advantageously, the present invention provides a barrier to ingress of foreign objects at the outer end of the tapered passage in the top of the buckle. This barrier collects foreign objects before they enter the main body of the buckle, and facilitates easier removal of foreign objects before buckling up the seatbelt.

[0011] In an example, the tapered passage in the buckle comprises four faces tapering inwards at substantially equal angles from the outer tongue insertion area to the inner tongue insertion area.

[0012] In an example, the tongue webbing loop portion webbing slot has a width greater than the width of the seatbelt webbing, and the buckle insertion portion of the tongue is narrower than the tongue webbing loop portion webbing slot.

[0013] In a further example, the barrier comprises a flap.

[0014] In an alternative example, the barrier comprises at least one set of bristles.

[0015] In an example, the barrier is arranged to deter ingress of foreign objects into a latching area inside said buckle, the latching area containing a latch arranged to retain said tongue when it is inserted into said buckle.

[0016] In an example, said barrier is rotatable outwardly of said buckle.

[0017] In an example, said barrier is hinged to said buckle.

[0018] In a further example, two barriers comprising intersecting bristles are simultaneously rotatable outwardly of said buckle.

[0019] Advantageously, this feature allows a user to eject foreign objects from the area of the seatbelt buckle before fastening the seatbelt.

[0020] In a further example, the rotation of said at least one barrier is actuated by at least one press button incorporated into said buckle.

[0021] In an alternative example, the rotation of said at least one barrier is actuated by at least one press panel incorporated into said buckle.

[0022] In a further alternative example, the seatbelt assembly also comprises a seatbelt retraction reel comprising a webbing withdrawal sensor, and the buckle comprises a driver for the barrier; and the rotation of the barrier is triggered by a webbing withdrawal signal from said webbing withdrawal sensor.

[0023] According to another aspect of the present invention for which protection is sought, there is provided a vehicle seatbelt system comprising a seatbelt assembly according to any of the preceding paragraphs.

[0024] According to a yet further aspect of the present invention for which protection is sought, there is provided a vehicle comprising a vehicle seatbelt system according to the preceding paragraph.

[0025] Within the scope of this application it is envisaged that the various aspects, embodiments, examples, features and alternatives set out in the preceding paragraphs, in the claims and/or in the following description and drawings may be taken independently or in any combination thereof, except where there is an incompatibility of features.

[0026] While the examples given for suitable applications for the present invention relate to seatbelt buckle assemblies for road vehicles, it will be appreciated by one skilled in the art that there are potentially other uses for the present invention in both vehicle and non-vehicle applications; for example, in seatbelts for use in aircraft.

Brief Description of the Drawings

[0027] The present invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 shows a schematic perspective view of the webbing, tongue, and buckle of a known seatbelt assembly;

Figure 2 shows a perspective view of the known seatbelt tongue of Figure 1;

Figure 3 shows a perspective view of a known seatbelt buckle assembly;

Figure 4 shows a perspective view of a first embodiment of a seatbelt buckle assembly according to the invention;

Figure 5 shows a perspective view of a second embodiment of a seatbelt buckle assembly according to the invention;

Figure 5a is a fragmentary view showing an alternative arrangement of bristles to that shown in Figure 5;

Figure 6 shows a partial cross-sectional view of the seatbelt buckle of Figure 4 along line VI-VI of Figure 4;

Figure 7 shows a simplified view of a seatbelt retractor reel according to a third embodiment of the invention; and

Figures 8 and 9 are partial cross-sectional views of a seatbelt buckle according to a third embodiment of the invention, these views being similar to that of Figure 6.

[0028] In the Figures described below, like parts are

denoted by like reference numerals for ease of understanding.

[0029] **Figure 1** shows parts of a known seatbelt assembly 500, comprising a length of webbing 100, a tongue 200, and a buckle 300. The seat belt assembly shown is suitable for a right-hand front vehicle seat, and is seen from a viewpoint approximately corresponding to a left-hand windscreen pillar of a vehicle to which said seatbelt assembly is fitted. The seatbelt assembly is shown as if a user (not shown) were about to buckle up, by inserting tongue 200 into buckle 300. The upper end 100U of webbing length 100 would in practice run through an upper mounting (not shown) to a retractor reel, while lower end 100L would run across a user's lap and around the vehicle seat to a floor mounting or anchor (not shown). Similarly, buckle 300 is conventionally mounted to the vehicle by a short length of webbing or cable (not shown). However, these terminations do not form part of the invention as claimed, and will therefore not be described further.

[0030] **Figure 2** shows a known seatbelt tongue 200. This tongue comprises a webbing loop portion 220 enclosing a webbing slot 240, and a buckle insertion portion 260 comprising a hole 280, the purpose of which will be explained later. This Figure is also used to define the three orthogonal dimensional axes of the parts of the seatbelt tongue and buckle - length L, width W, and height H. It can be seen from this Figure that the width W260 of buckle insertion portion 260 is conventionally less than the width W240 of the webbing slot 240.

[0031] **Figure 3** shows a known seatbelt buckle 300. A tongue release button 310 has an accessible operating face 314 and a concealed body 318 (schematically shown in dashed outline). When tongue 200 is inserted into buckle 300, it first passes through an outer tongue insertion area 320 adjacent to button 310, then down through a tapered passage or throat 330 to an inner tongue insertion area 340, which is smaller (narrower and lower, with reference to the axes shown in Figure 2) than outer area 320. Tapered passage 330 allows tongue 200 to "self centre" as it is pushed into buckle 300, which helps the user to align tongue and buckle quickly and easily. (The hidden details of passage 330 and area 340 are shown in chain-dotted line to distinguish them from concealed button body 318) Typically, the tapered passage comprises four faces 330A, 330B, 330C, 330D, which are equally angled inwards from the outer tongue insertion area 320 to the smaller inner tongue insertion area 340.

[0032] When tongue 200 has passed through area 340, it passes into the inner workings (not shown) of buckle 300. Hole 280 (Figure 2) engages with a latch (not shown) to secure the tongue 200 within buckle 300. Some prior art buckles have a door or slider closing inner tongue insertion area 340. This will keep foreign objects out of the inner workings of buckle 300 until tongue 200 is inserted into the buckle; but unfortunately, when the door or slider is opened, the foreign objects may fall into the buckle.

[0033] **Figure 4** shows a first embodiment 305 of a buckle according to the invention. This is similar in general layout to buckle 300, but has a cover 350 over outer tongue insertion area 320 and adjacent to tongue release button 310, the operation of which is not affected. Cover 350 is shown with a hinge comprising ridge moulding 354 and pivot pins 352 engaging projections 356 from the body of buckle 305. Numeral 360 represents a press button, the purpose of which will be explained later.

[0034] **Figure 5** shows a second embodiment 307 of a buckle according to the invention. This is similar to buckle 305 of Figure 4, but instead of cover or flap 350, a foreign object guard is provided by a set of bristles 370. Numeral 372 represents a pivot pin, while 374 represents a spine member on which bristles 370 are mounted. Numeral 380 represents a press panel, similar to press button 360 in Figure 4, the purpose of which will be explained below.

[0035] **Figure 5a** shows an alternative arrangement of bristles 370D. A first set of bristles 370L is mounted on spine member 374, while a second, opposing and overlapping set of bristles 370R is mounted on a further spine member 374R opposite member 374. This arrangement is more complex than the Figure 5 arrangement, but is more effective in exclusion of debris.

[0036] If a user wants to fasten a seat belt, but notices one or more foreign object(s) retained on the cover, flap, or bristles, the user can manually clear said foreign matter from the buckle before inserting the seatbelt tongue. However, this process may be tedious, and relies on the user looking before buckling up. Hence, Figure 6 shows a further development 308 of the first embodiment 305 of the buckle according to the invention. This further development is intended to allow quick, easy, and efficient clearance of foreign objects; and could also be applied to the bristles 370 of the Figure 5 embodiment. Press button 360 is seen in Figure 6 to be part of a larger moulding 361, comprising a lower mounting 362, a leg 364, a lever 366, and an over-centre latch 368. Lower mounting 362 is shown as a vertical pin, but other mounting techniques may be preferred to facilitate moulding of the buckle housing. Leg 364 is arranged to be flexible, so that when press button 360 is operated, the majority of moulding 361 moves towards tongue release button 310. (In this Figure, to avoid confusion due to the multiplicity of sectioned parts, a space 316 for insertion of release button 310 is shown instead of the actual button). As moulding 361 moves, lever 366 presses against a projection 358 which depends from cover or flap 350. This in turn causes cover or flap 350 to hinge upwards around pin 352.

[0037] This mechanism is preferably designed to flick cover or flap 350 upwards rapidly from a substantially horizontal orientation to a substantially vertical orientation (see Figure 9 below). This ensures not only a rapid and effective clearance of foreign objects lying on the cover or flap, but also ensures that said cover or flap

does not obstruct the passage of tongue 200 into buckle 308. As many users grasp the seatbelt buckle with one hand while they insert the tongue into the buckle with the other hand, they may find it simple to operate press button 360 (Figure 4) or press panel 380 (Figure 5) with a thumb, while their fingers grasp the other side of the buckle. A thumb grip (385, Fig. 5) is located centrally on press panel 380, to make it easy to find panel 380 without looking. Numeral 368 represents an over-centre catch, which gives tactile feedback to the user that the cover has flipped up, without the user having to look. Numeral 335 represents an upstanding section of the buckle body adjacent to leg 364. Should leg 364 not provide sufficient spring force to return press button 360 to its inoperative location as shown, a coil spring (not shown) could be assembled into the buckle assembly between leg 364 and upstanding section 335.

[0038] The "flip up" mechanism of Figure 6 may also be applied to the bristles 370 of Figure 5. A similar arrangement, with two opposed buttons or a mechanical crosslinkage, could "flip up" the bristles 370L, 370R of Figure 5a.

[0039] Figures 7 to 9 show a third embodiment of the invention. This is distinguished from the first and second embodiments in that the cover or flap over the outer tongue insertion area is raised automatically when the vehicle occupant prepares to put their seatbelt on. Conversely, the cover can also be lowered automatically when the seatbelt is taken off.

[0040] **Figure 7** shows the core elements of a seatbelt retractor reel 400 included in this embodiment. Webbing 100 is wound around a shaft 410, the outer diameter of the wound webbing being represented by dashed line 100E. A sensor 420 is shown in figurative form. This sensor is arranged to detect spooling out of the seatbelt; which is something that a vehicle occupant normally initiates only when they intend to put the seatbelt on.

[0041] Sensor 420 may measure one or more of the following: the rotational speed of shaft 410; a number of rotations of shaft 410; the diameter 100E of the spooled-up webbing; or a change in said diameter. For measurement of diameter, an optical or ultrasonic sensor would be suitable.

[0042] **Figure 8** shows a seatbelt buckle, generally indicated at 390. Cover or flap 392 comprises a counterweight 393, and a cover driver comprising a miniature stepper motor or rotational solenoid 394, which is anchored to buckle body 395, and comprises a drive arm 396 embedded in flap 392. When a signal is received from sensor 420 (Fig. 7, above), indicating that a user is about to fasten the seatbelt, motor 394 drives cover 392 through an anticlockwise (as shown) quarter turn from the closed position of Figure 8 to the open position of Figure 9, allowing tongue 200 to be latched into buckle 390 in direction TI. (It will be noted that space 316 in Figure 6 has been omitted from Figures 8 and 9, for clarity)

[0043] Conversely, when tongue 200 is unlatched from buckle 390, an electrical signal will be received from a seatbelt warning light circuit (not shown), indicating that the buckle has been released; or from sensor 420, indicating that webbing 100 is now spooling back onto reel 400. Either of these signals is suitable for instructing driver 394 to drive arm 396 to return cover 392 to the closed position of Figure 8. Counterweight 393 assists the cover in returning to this default position. It will be noted from Figures 8 and 9 that cover 392 has a small lip at its right hand side (as shown). This lip is large enough to retain debris on the cover, but not sufficiently large to encourage use of the cover as a storage area.

[0044] Other advantages will be apparent to one skilled in the art, and the present examples and embodiments are to be considered illustrative and not restrictive. The invention is not to be limited to the details given herein, but may be modified within the scope and equivalence of the appended claims.

Claims

1. A seatbelt assembly (500) comprising a length of webbing (100), a tongue (200) and a buckle (305, 307, 308, 390);

said tongue (200) comprising:

a webbing loop portion (220) comprising a webbing slot (240);
and a buckle insertion portion (260);

said buckle (305, 307, 308, 390) comprising:

a tongue release button (310) having an accessible operating face (314) and a concealed body (318);
an outer tongue insertion area (320) adjacent to said release button operating face, said outer area having a width and/or a height substantially greater than the corresponding dimensions of the buckle insertion portion (260) of the tongue (200);
an inner tongue insertion area (340) inset from said outer tongue insertion area (320), said inner area having width and height similar to the corresponding dimensions of the buckle insertion portion (260) of the tongue (200);
a tapered passage (330) between said outer (320) and inner (340) tongue insertion areas; and
a barrier (350, 370, 370D, 392) arranged to deter ingress of foreign objects into said buckle, said barrier being mounted to said buckle (305, 307, 308, 390) adjacent to said outer tongue insertion area (320); **characterized in that**:

the barrier (350, 370, 370D, 392) substantially covers the outer tongue insertion area (320).

2. A seatbelt assembly (500) according to claim 1, wherein the tapered passage (330) comprises four faces (330A, 330B, 330C, 330D) tapering inwards at substantially equal angles from the outer tongue insertion area (320) to the inner tongue insertion area (340).

3. A seatbelt assembly (500) according to claim 1 or claim 2, wherein the webbing loop portion webbing slot (240) of the tongue (200) has a width (W240) greater than the width of the seatbelt webbing (100), and the buckle insertion portion (260) of the tongue is narrower than the webbing loop portion webbing slot (240) of the tongue.

4. A seatbelt assembly (500) according to any preceding claim, wherein the barrier comprises a flap (350).

5. A seatbelt assembly (500) according to any one of claims 1 to 3, wherein the barrier comprises at least one set of bristles (370).

6. A seatbelt assembly (500) according to any preceding claim, wherein the barrier (350, 370, 370D, 392) is arranged to deter ingress of foreign objects into a latching area inside said buckle (305, 307, 308, 390), the latching area containing a latch arranged to retain said tongue (200) when it is inserted into said buckle.

7. A seatbelt assembly (500) according to any preceding claim, wherein said barrier (350, 370, 392) is rotatable outwardly of said buckle (305, 307, 390).

8. A seatbelt assembly (500) according to any preceding claim, wherein said barrier (350, 370, 392) is hinged to said buckle (305, 307, 390).

9. A seatbelt assembly (500) according to claim 7 or claim 8 when dependent on claim 5, wherein the barrier (370D) comprises two intersecting sets of bristles (370L, 370R), which are simultaneously rotatable outwardly of said buckle (307).

10. A seatbelt assembly (500) according to any one of claims 7 to 9, wherein the rotation of said barrier (350, 370, 370D) is actuated by at least one press button (360) incorporated into said buckle (305, 307, 308).

11. A seatbelt assembly (500) according to any one of claims 7 to 9, wherein the rotation of said barrier (350, 370, 370D) is actuated by at least one press panel (380) incorporated into said buckle (305, 307, 308).

12. A seatbelt assembly (500) according to any previous claim, also comprising a seatbelt retraction reel (400) comprising a webbing withdrawal sensor (420), wherein the buckle (390) comprises a driver (394) for the barrier (392), and the rotation of said barrier (392) is triggered by a webbing withdrawal signal from said webbing withdrawal sensor (420).

13. A vehicle seatbelt system comprising a seatbelt assembly (500) according to any of claims 1 to 12.

14. A vehicle comprising a vehicle seatbelt system according to claim 13.

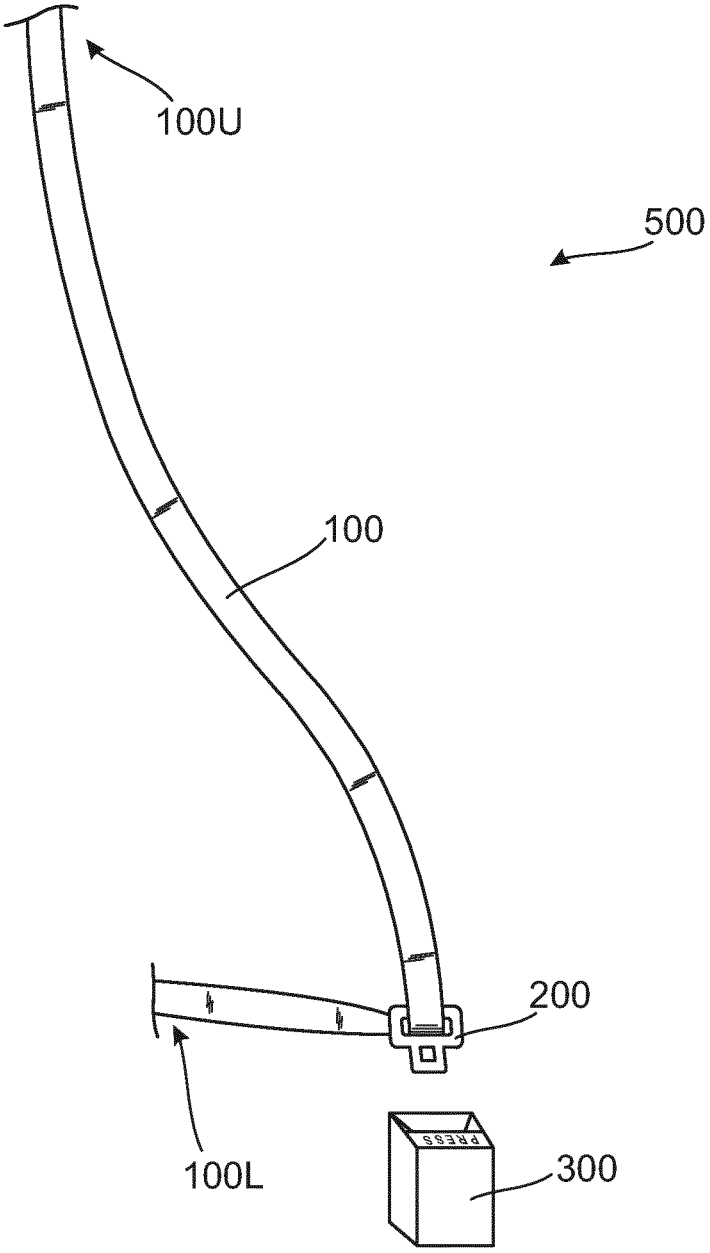

Fig. 1
PRIOR ART

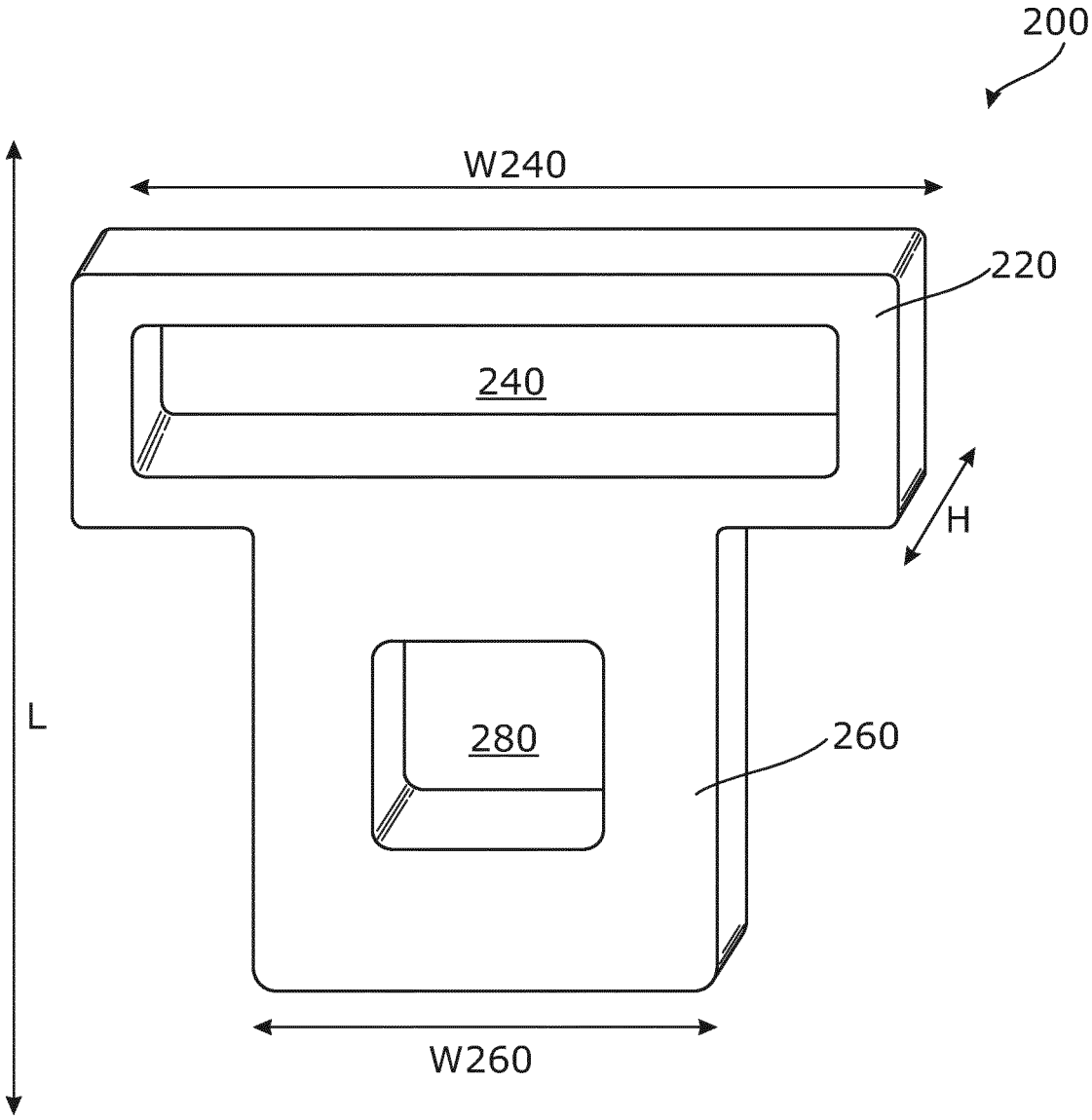

Fig. 2
PRIOR ART

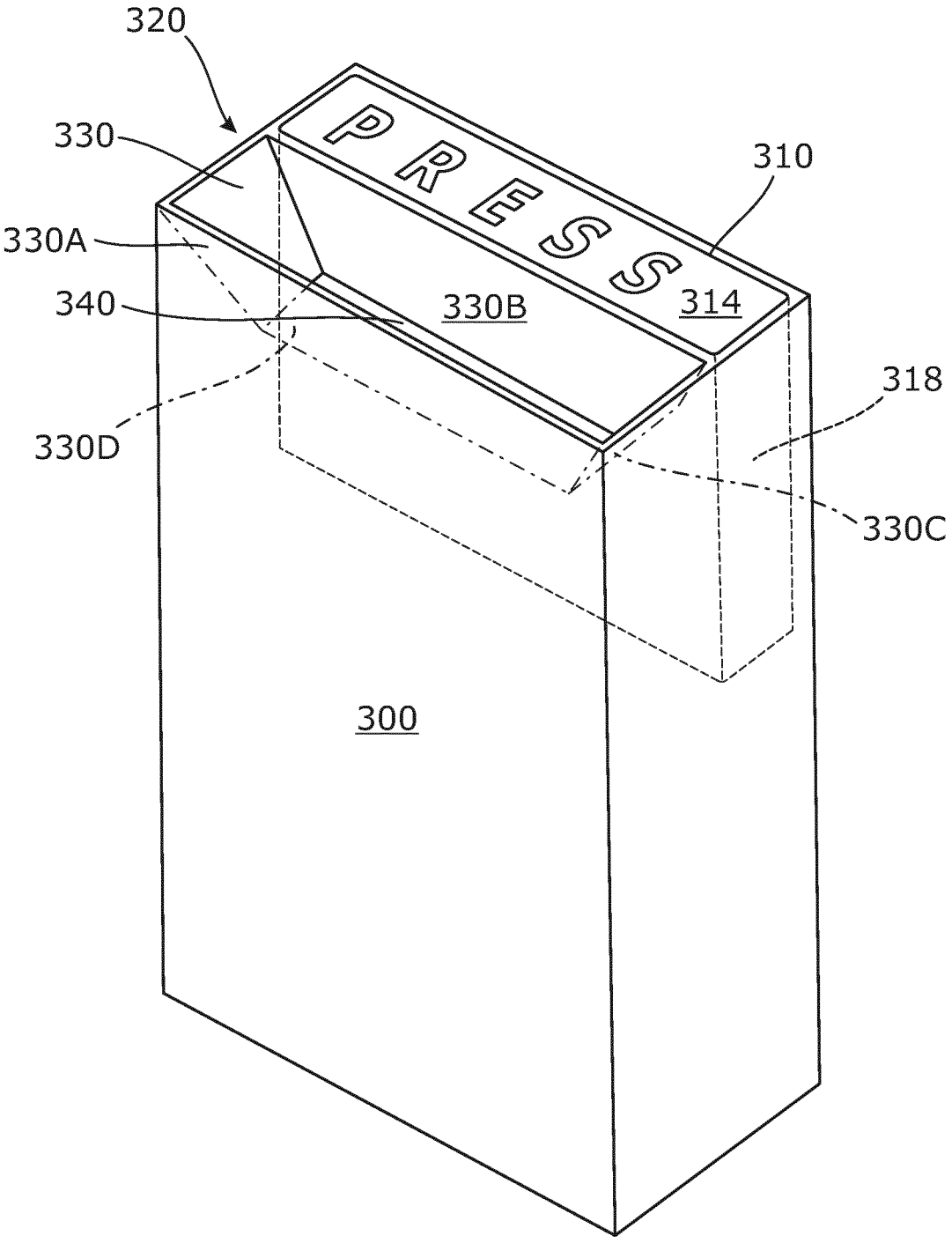

Fig. 3
PRIOR ART

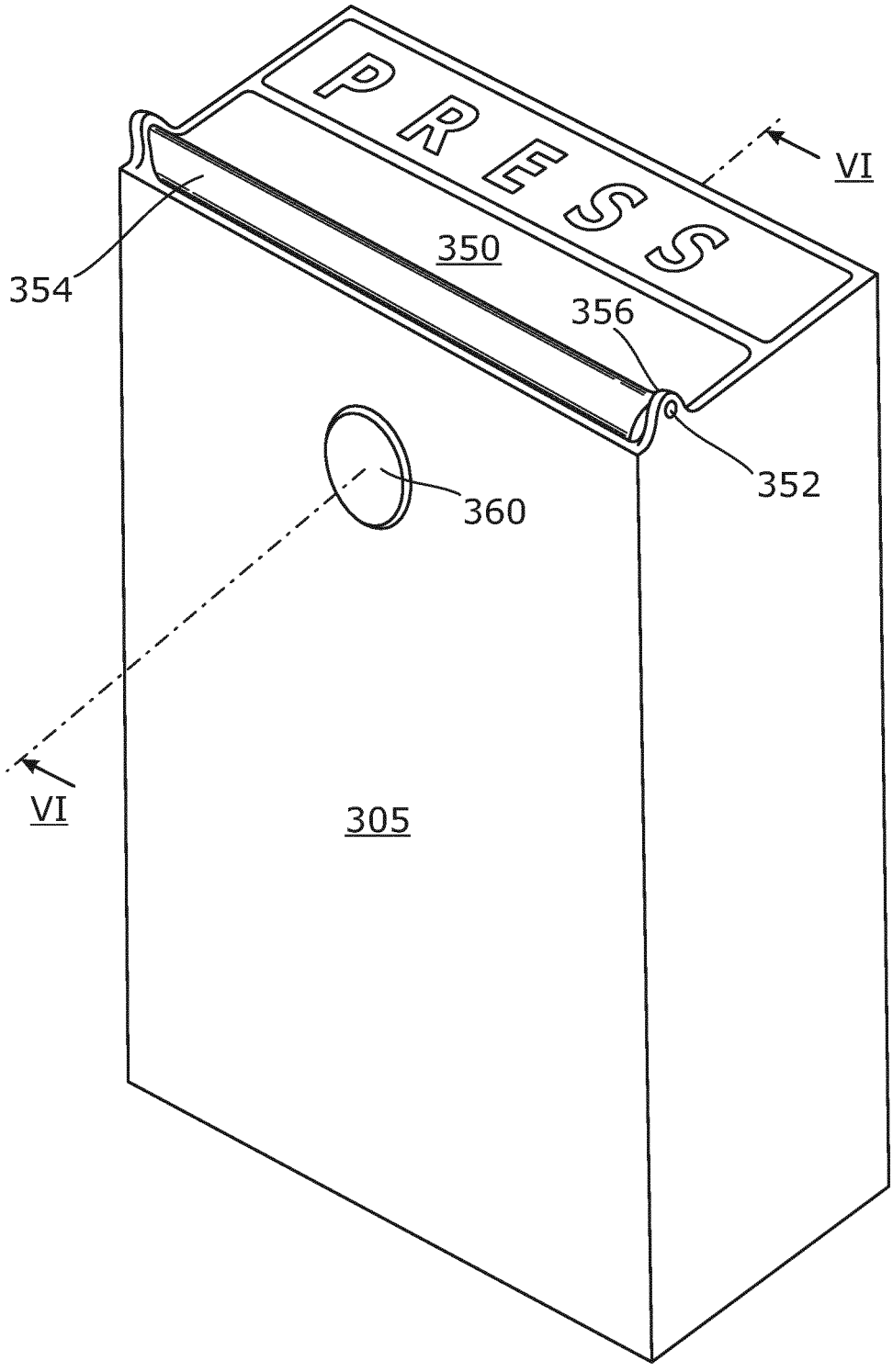

Fig. 4

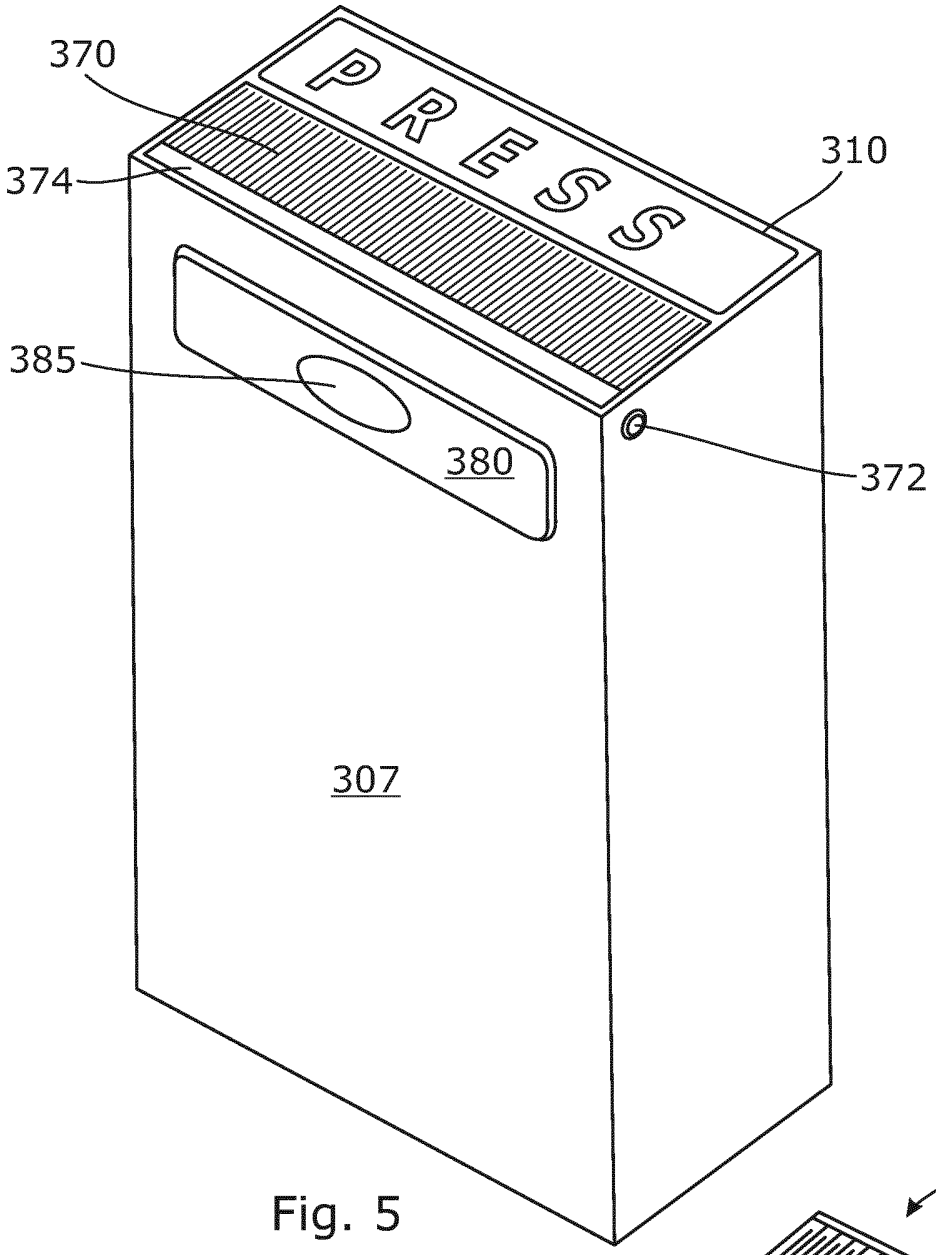

Fig. 5

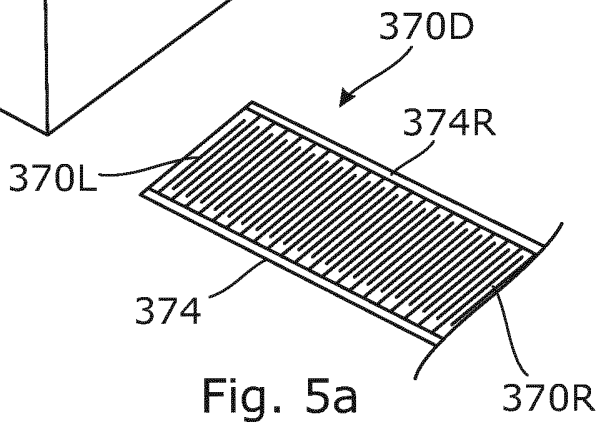

Fig. 5a

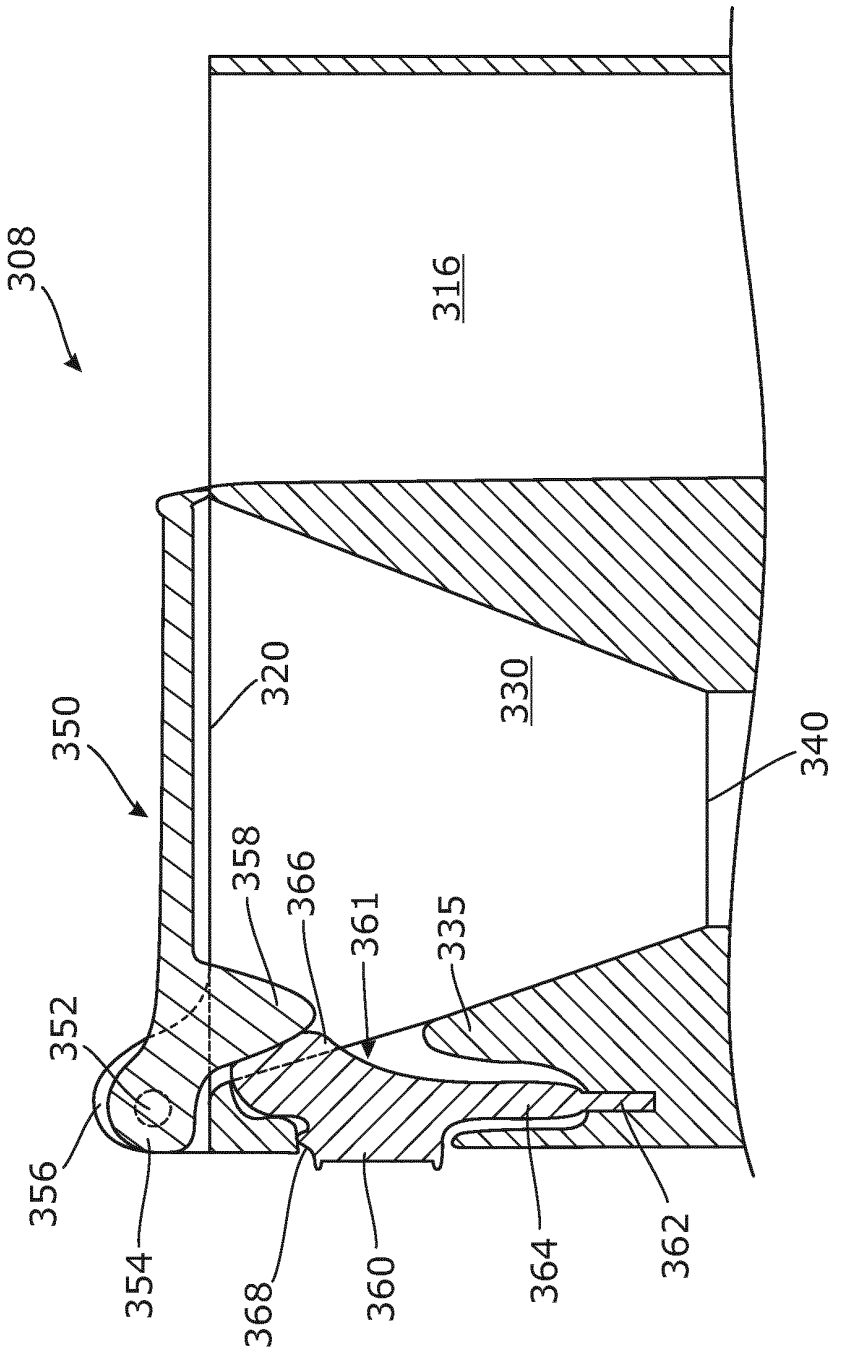
308
316
320
330
340
350
352
356
354
358
366
361
335
368
360
364
362

Fig. 6

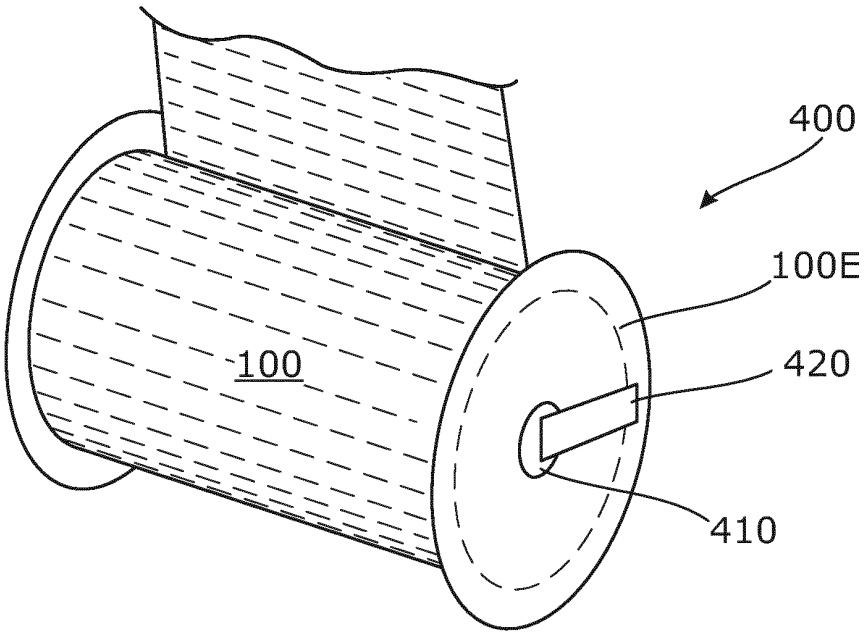

Fig. 7

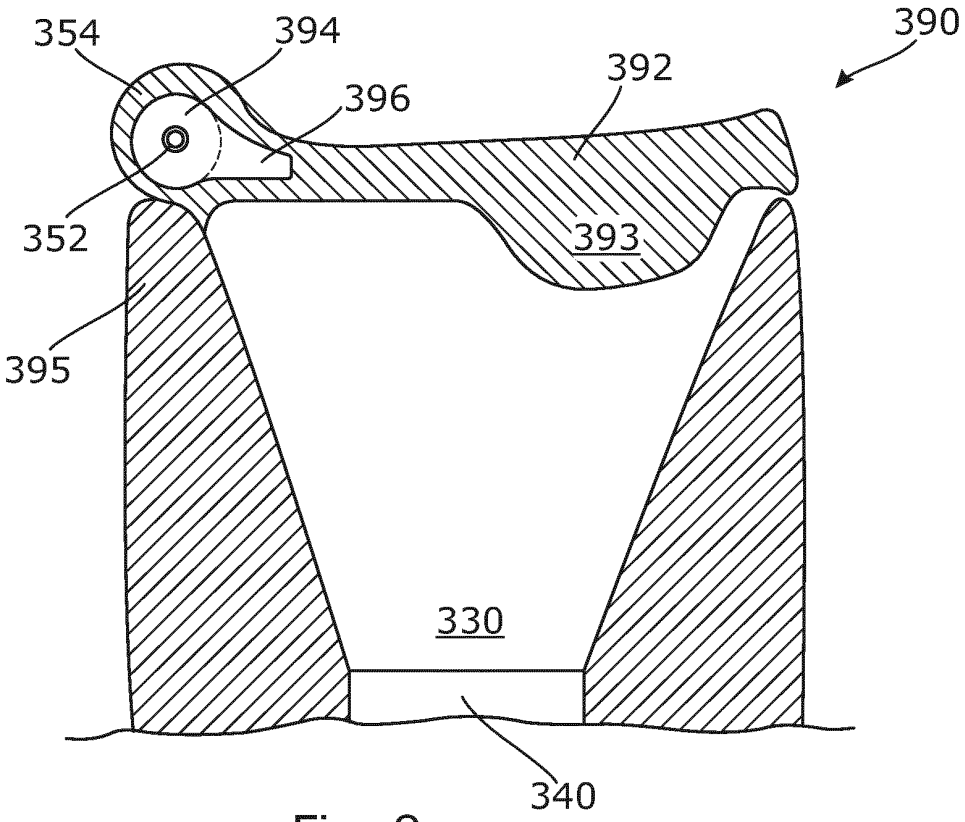

Fig. 8

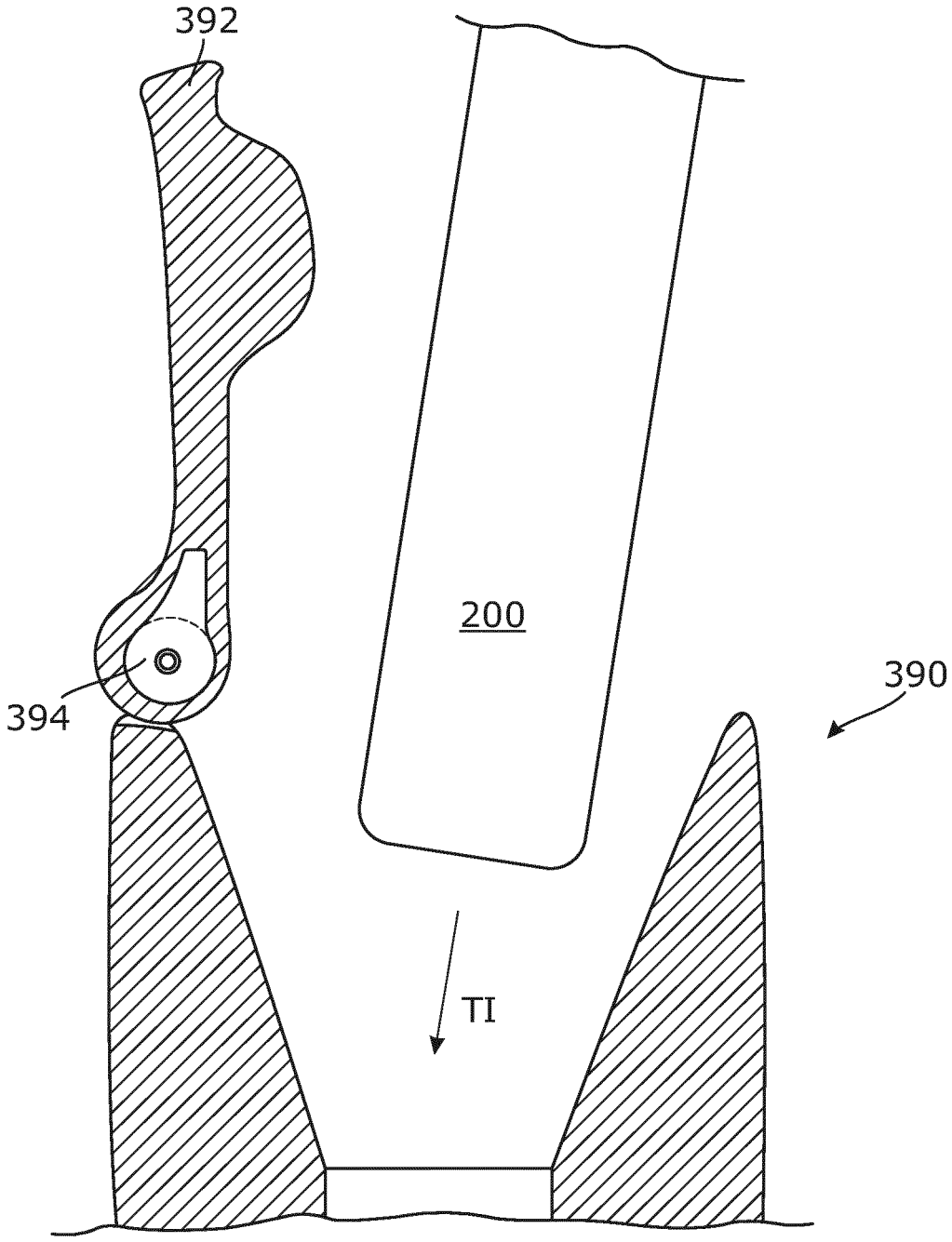

Fig. 9

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 12 17 4966

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 7 647 678 B2 (SMITH) 19 January 2010 (2010-01-19) * column 2 - column 3; figures * -----	1-8, 12-14	INV. A44B11/25
X	US 6 055 708 A (ELLIS ROBERT P [US] ET AL) 2 May 2000 (2000-05-02) * column 2, paragraph 29 - paragraph 36; figures 1-4 * -----	1,13,14	
X	US 4 542 563 A (BEFORT HORST U [CA]) 24 September 1985 (1985-09-24) * column 4, line 9 - line 35; figures 1-3 * -----	1,13,14	
X,P	US 2011/283493 A1 (VIRGEN OCTAVIO MORONES [MX]) 24 November 2011 (2011-11-24) * paragraph [0021]; claim 1; figures 1-5 * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

A44B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	8 November 2012	Fonseca Fernandez, H

CATEGORY OF CITED DOCUMENTS

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

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

1

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 17 4966

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

08-11-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7647678 B2	19-01-2010	NONE	
US 6055708 A	02-05-2000	DE 60026642 T2	30-11-2006
		EP 1075803 A2	14-02-2001
		US 6055708 A	02-05-2000
US 4542563 A	24-09-1985	CA 1211276 A1	16-09-1986
		DE 3404508 A1	23-08-1984
		JP 1620194 C	30-09-1991
		JP 2041961 B	20-09-1990
		JP 59189802 A	27-10-1984
		MX 157150 A	28-10-1988
		US 4542563 A	24-09-1985
US 2011283493 A1	24-11-2011	CN 102247035 A	23-11-2011
		DE 102011101663 A1	09-02-2012
		US 2011283493 A1	24-11-2011

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82