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- (54) **Title:** A VEHICLE TURNING SIGNAL DEVICE AND A VEHICLE COMPRISING SUCH A DEVICE

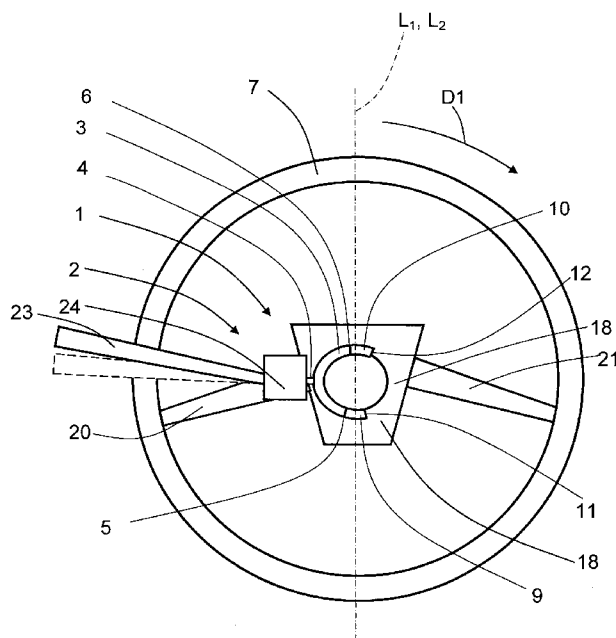


FIG. 2

(57) **Abstract:** The present invention relates to a vehicle turning signal device (1) comprising a turning signal lever (2) and a main cam (3). The turning signal lever (2) comprises a reset lever (4) for resetting an actuated turning signal. The main cam (3) has a first end (5) and a second end (6) and is fixedly arranged to a steering wheel rim (7). The reset lever (4) is arranged to be in sliding contact with the main cam (3) between the first end (5) and the second end (6). The turning signal device (1) further comprises a first sliding cam (9) and a second sliding cam (10) which have corresponding first and second open ends (11, 12) and constitute corresponding extensions of the main cam at the respective ends (5, 6). The reset lever (4) is arranged to be in sliding contact with the sliding cams (9, 10) as it passes the first end (5) or second end (6). The open ends (11, 12) are arranged to be moved from extended rest positions towards the first end (5) or second end (6) when being engaged by the reset lever (4), and then to slide back.

TITLE

5 A vehicle turning signal device and a vehicle comprising such a device

TECHNICAL FIELD

10 The present invention relates to a vehicle turning signal device comprising a turning signal lever and a main cam. The turning signal lever in turn comprises a reset lever arranged for resetting an actuated turning signal. The main cam has a first end and a second end and is fixedly arranged to a steering wheel rim for being turned together with the steering wheel rim around a common steering axis. The reset lever is arranged to be in sliding contact with the main cam between the first end and the second end as it moves between them.

15 The present invention also relates to a vehicle comprising a turning signal device, the turning signal device comprising a turning signal lever and a main cam. The turning signal lever in turn comprises a reset lever arranged for resetting an actuated turning signal. The main cam has a first end and a second end and is fixedly arranged to a steering wheel rim for being turned together with the steering wheel rim around a common steering axis. The reset lever is arranged to be in sliding contact with the main cam between the first end and the second end as it moves between them.

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30 BACKGROUND
In vehicles, turning signals are used for indicating for the surroundings how the driver of the vehicle intends to turn. A turning signal is normally actuated by pressing a lever, where the lever often is located in the vicinity of the steering wheel. If the lever is located on the left-hand side of the steering wheel, it is pressed down for indicating a left turn, and pressed up for indicating a right turn.

After the turning signal has been actuated, it is normally automatically disengaged when the steering wheel first has been turned to a certain extent in the direction of the intended turn, and then secondly been turned back towards straight driving.

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For certain road turns, said certain extent is too small, resulting in the turning signal being disengaged before the turn is completed, for example due to the need for some additional maneuvering during the turn. There is thus a need for creating a hysteresis between that the automatic return function is turned on and that the turning signal is turned off.

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In other words, when a turning signal has been actuated, it is preferably disengaged when the steering wheel first has been turned to a first extent in the direction of the intended turn, and then turned back to a second extent towards straight driving, where there is a hysteresis between the first extent and the second extent.

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This is described in US 4888456, where a cancelling device for a turning signal is shown. Here, a cam guide member is rotated by the steering wheel. A cam body has inwardly elastically deformable portions and an increased cancel reverse cancelling angle.

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It is however desirable to provide a vehicle turning signal device with a hysteresis according to the above where the design is kept uncomplicated with few parts.

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SUMMARY

It is an object of the present invention to provide a vehicle turning signal device with a hysteresis according to the above where the design is kept uncomplicated with few parts.

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This object is achieved by means of a vehicle turning signal device comprising a turning signal lever and a main cam. The turning signal lever in turn comprises

a reset lever arranged for resetting an actuated turning signal. The main cam has a first end and a second end and is fixedly arranged to a steering wheel rim for being turned together with the steering wheel rim around a common steering axis. The reset lever is arranged to be in sliding contact with the main cam between the first end and the second end as it moves between them. The turning signal device further comprises a first sliding cam and a second sliding cam. The first sliding cam constitutes an extension of the main cam at the first end and has a first open end. The second sliding cam constitutes an extension of the main cam at the second end and has a second open end. The reset lever is arranged to be in sliding contact with the first sliding cam as it passes the first end and to be in sliding contact with the second sliding cam as it passes the second end. The open end of each sliding cam is arranged to be moved from an extended corresponding rest position towards the corresponding first end or second end, respectively, when being engaged by the reset lever, and to slide back to said rest position when the reset lever is disengaged.

This object is also achieved by means of a vehicle comprising a turning signal device, the turning signal device comprising a turning signal lever and a main cam. The turning signal lever in turn comprises a reset lever arranged for resetting an actuated turning signal. The main cam has a first end and a second end and is fixedly arranged to a steering wheel rim for being turned together with the steering wheel rim around a common steering axis. The reset lever is arranged to be in sliding contact with the main cam between the first end and the second end as it moves between them. The turning signal device further comprises a first sliding cam and a second sliding cam. The first sliding cam constitutes an extension of the main cam at the first end and has a first open end. The second sliding cam constitutes an extension of the main cam at the second end and has a second open end. The reset lever is arranged to be in sliding contact with the first sliding cam as it passes the first end and to be in sliding contact with the second sliding cam as it passes the second end. The open end of each sliding cam is arranged to be moved from an extended corresponding rest position towards the corresponding first end or second end,

respectively, when being engaged by the reset lever, and to slide back to said rest position when the reset lever is disengaged.

According to an example, when the steering wheel rim is turned in a first direction in a condition of an actuated first turn signal, the reset lever is arranged to slide on the main cam towards the first end and then continue to slide on the first sliding cam until it passes the first open end. There, the reset lever is arranged to contact the first open end when the steering wheel rim is turned in a second direction, opposite the first direction, such that the first open end is pushed towards the main cam as the steering wheel rim is continuously turned in the second direction. The reset lever is arranged to reset the actuated first turning signal when passing the first open end towards the main cam.

According to another example, the sliding cams are biased by corresponding spring means. The force of the respective spring means is adapted to fall below the force necessary to actuate the reset lever.

According to another example, the sliding cams are arranged to slide on a side of the main cam, alternatively to slide inside or outside the main cam.

Other examples are evident from the dependent claims

A main advantage of the present invention is that it provides a vehicle turning signal device with a hysteresis where the design is kept uncomplicated with few parts. The presence of a hysteresis results in a reduced risk for an unwanted turning signal reset during an uncompleted road turn.

BREIF DESCRIPTION OF THE DRAWINGS

The present invention will now be described more in detail with reference to the appended drawings, where

Figure 1 schematically shows a steering wheel assembly;

Figure 2 schematically shows a part of the steering wheel assembly from the underside in a first position;

Figure 3 schematically shows a part of the steering wheel assembly from the underside in a second position;

Figure 4 schematically shows a part of the steering wheel assembly from the underside in a third position;

Figure 5 schematically shows a part of the steering wheel assembly from the underside in a fourth position;

Figure 6 schematically shows a top view of a first detailed example of a cam arrangement according to the present invention;

Figure 7 shows a schematic side view of the object of Figure 6;

Figure 8 schematically shows a top view of a second detailed example of a cam arrangement according to the present invention;

Figure 9 schematically shows a top view of a third detailed example of a cam arrangement according to the present invention; and

Figure 10 schematically shows a vehicle comprising a steering wheel assembly according to the above.

DETAILED DESCRIPTION

With reference to Figure 1, there is a steering wheel assembly 17 comprising a steering wheel rim 7, a steering wheel hub 18 and a steering wheel shaft 19. The steering wheel rim 7 is arranged in a plane and the steering wheel hub 18 is connected to the steering wheel rim 7 such that the steering wheel 7 rim and the steering wheel hub 18 share a common steering axis 8 running along the steering wheel shaft 19. A movement of the steering wheel rim 7 around the

steering wheel axis 8 is thus transferred to the steering wheel hub 18. The steering wheel assembly further comprises a turning signal device 1 (not shown in Figure 1) which will be described further below.

5 With reference also to Figure 2, schematically showing a part of the steering wheel assembly 17 from the underside, the steering wheel hub 18 is attached to the steering wheel rim 7 by means of a first spoke 20 and a second spoke 21. The turning signal device 1 comprises a turning signal lever 2, attached to a fixed housing 22, and a main cam 3 having a first end 5 and a second end 6,
10 the main cam 3 being placed in association with the hub 18 (see Figure 1).

The turning signal lever comprises a turning signal actuator rod 23, a reset lever 4 and a reset assembly 24. The turning signal actuator rod 23 and the reset lever 4 meet in the reset assembly 24, where turning signal reset occurs when
15 the reset lever is allowed to first protrude from the reset assembly 24 and then is pushed back into the reset assembly 24, which is a previously well-known functionality which detailed workings will not be discussed further here.

The main cam 3 turns together with the steering wheel rim 7 around the common steering axis 8 in a fixed manner when a driver is performing a road
20 turn. The reset lever 4 is arranged to be in sliding contact with the main cam 3 between the first end 5 and the second end 6 as it moves between them, such that when released at a certain steering angle α_1 , as shown in Figure 3, it is allowed to protrude from the reset assembly 24, awaiting a turning movement in
25 the opposite direction that pushes reset lever 4 back into the reset assembly 24 as will be described more in detail below.

According to the present invention, the turning signal device 1 further comprises a first sliding cam 9 and a second sliding cam 10. The first sliding cam 9
30 constitutes an extension of the main cam 3 at the first end 5 and has a first open end 11. Likewise, the second sliding cam 10 constitutes an extension of the main cam 3 at the second end 6 and has a second open end 12. The reset lever 4 is arranged to be in sliding contact with the first sliding cam 9 as it

passes the first end 5 and to be in sliding contact with the second sliding cam 10 as it passes the second end 6. The open end 11, 12 of each sliding cam 9, 10 is arranged to be moved from a corresponding rest position towards the corresponding first end 5 or second end 6 when being engaged by the reset lever 4, and to slide back to said rest position when the reset lever 4 is disengaged.

The function of the turning signal device 1 will be described in association with a first example, with reference to Figure 2, Figure 3, Figure 4 and Figure 5. Here, a first symmetry line L_1 passes through the steering wheel rim 7 vertically in a fixed manner. A second symmetry line L_2 also passes through the steering wheel rim 7, co-inciding with the first symmetry line L_1 in Figure 2, but following the steering wheel rim 7 as it is turned. By means of the symmetry lines L_1 , L_2 , an angle α_1 , α_2 , α_3 indicative of the current steering wheel rim deflection may be formed.

When the steering wheel rim 7 is turned in a first direction D1 in a condition of an actuated first turning signal, having been actuated by means of the turning signal actuator rod 23 which has been moved to an actuated position from a neutral position indicated with dashed lines, the reset lever 4 is arranged to slide on the main cam 3 towards the first end 5. The reset lever 4 is then arranged to continue to slide on the first sliding cam 9 until it passes the first open end 11 at a first steering wheel rim deflection angle α_1 . As shown in Figure 3, the reset lever 4 has then protruded from the reset assembly 24. When the steering wheel rim 7 is turned in a second direction D2, opposite the first direction D1, the reset lever 4 is arranged to contact the first open end 11 such that it is pushed towards the main cam 3 as the steering wheel rim 7 is continuously turned in the second direction D2 to a second steering wheel rim deflection angle α_2 as shown in Figure 4. The reset lever 4 is arranged to reset the actuated first turning signal when passing the first open end 11 towards the main cam 3 at a third steering wheel rim deflection angle α_3 as shown in Figure 5, the turning signal actuator rod 23 returning to the neutral position from the actuated position indicated with dashed lines. The resetting takes place since

the protruded reset lever 4 is pushed back into the reset assembly 24 by the first cam 3.

Correspondingly, not shown explicitly in the Figures, when the steering wheel rim 7 is turned in the second direction D2, in a condition of an actuated second turn signal, the reset lever 4 is arranged to slide on the main cam 3 towards the second end 6 and then continue to slide on the second sliding cam 10 until it passes the second open end 12. The reset lever 4 has then protruded from the reset assembly 24. When the steering wheel rim 7 is turned in the first direction D1, opposite the second direction D2, the reset lever 4 is arranged to contact the second open end 12 such that the second open end 12 is pushed towards the main cam 3 as the steering wheel rim 7 is continuously turned in the first direction D1. The reset lever 4 is arranged to reset the actuated second turning signal when passing the second open 12 end towards the main cam 3. The resetting takes place since the protruded reset lever 4 is pushed back into the reset assembly 24 by the first cam 3.

In order to alleviate the above, the first end 5 and the second end 6 of the main cam are preferably wedge-shaped, allowing the reset lever 4 to climb up on the main cam 3, although this is not explicitly shown in the schematic drawings.

Some more detailed examples of the present invention will follow below with reference to Figure 6, Figure 7, Figure 8 and Figure 9. Figure 6 shows a top view of a first detailed example of a cam arrangement according to the present invention, and Figure 7 shows a corresponding side view. Figure 8 shows a top view of a second detailed example of a cam arrangement according to the present invention. Figure 9 shows a top view of a third detailed example of a cam arrangement according to the present invention. In Figure 6, Figure 8 and Figure 10, the main cam is shown transparent for reasons of clarity.

In all examples, the main cam 3a, 3b, 3c is shown positioned on a base plate 25 which is intended to be attached to the wheel the hub 18, the main cam 3a, 3b, 3c as previously having a first end 5a, 5b, 5c and a second end 6a 6b, 6c. The

sliding cams 9a, 10a; 9b, 10b; 9c, 10c have corresponding open ends 11a, 12a; 11b, 12b; 11c, 12c, where the sliding cams 9a, 10a; 9b, 10b; 9c, 10c and the main cam 3a, 3b, 3c are arranged to follow a curved shape around the common steering axis 8.

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The sliding cams 9a, 9b, 9c; 10a, 10b, 10c are biased by corresponding spring means 15a, 15b, 15c; 16a, 16b, 16c, the force of the spring means 15a, 15b, 15c; 16a, 16b, 16c being adapted to fall below the force necessary to actuate the reset lever 4. The spring means rest against a corresponding first stop 13a, 13b, 13c and second stop 14a, 14b, 14c, being positioned between the sliding cams 9a, 9b, 9c; 10a, 10b, 10c and the corresponding stops 13a, 14a; 13b, 14b; 13c, 14c.

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According to the first detailed example, sliding cams 9a, 10a are arranged to slide on a side of the main cam 3a, here the outer side.

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According to the second detailed example, the sliding cams 9b, 10b are arranged to slide inside the main cam 3b, the spring means 15b, 16b and corresponding stops 13b, 14b being positioned inside the main cam 3b

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According to the third detailed example, the sliding cams 9c, 10c are arranged to slide outside the main cam 3c, such that, the sliding cams 9c, 10c at least partly cover the main cam 3c. The spring means 15c, 16c and corresponding stops 13c, 14c are positioned inside the main cam 3c

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With reference to Figure 10, the present invention also relates to a vehicle 26 comprising the steering wheel assembly 17 with the vehicle turning signal device 1, according to the above. The vehicle may be of any type comprising a steering wheel assembly with a turning signal device, such as a car, a truck or a bus.

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The present invention is not limited to the examples above, but may vary within the scope of the appended claims. For example, the exact structure of the cam arrangements may vary, having different sizes and curvatures with respect to

the steering wheel rim. For example, the length of the main cam 3 may be different for different vehicles such that the hysteresis may differ between different arrangements. It could even be possible to have a main cam 3 with adjustable length, e.g. a telescopic arrangement, such that the length of the main cam 3, and thus the amount of hysteresis, may be adjusted to a desired amount of hysteresis individually adapted according to a driver's preferences.

Furthermore, the exact workings of the reset lever 4 and the reset assembly 24 may vary, for example the reset lever 4 is pushed between two pivoting states instead of being pushed in and out. In accordance with the present invention, the reset lever 4 is arranged to slide on the cams and to be affected by the cams such that an actuated turning signal is turned off.

CLAIMS

- 5 1. A vehicle turning signal device (1) comprising a turning signal lever (2) and a main cam (3), the turning signal lever (2) in turn comprising a reset lever (4) arranged for resetting an actuated turning signal, the main cam (3) having a first end (5) and a second end (6) and being fixedly arranged to a steering wheel rim (7) for being turned together with the steering wheel rim (7) around a
10 common steering axis (8), where the reset lever (4) is arranged to be in sliding contact with the main cam (3) between the first end (5) and the second end (6) as it moves between them, **characterized in** that the turning signal device (1) further comprises a first sliding cam (9) and a second sliding cam (10), the first sliding cam (9) constituting an extension of the main cam (3) at the first end (5) and has a first open end (11), and the second sliding cam (10) constituting an
15 extension of the main cam (3) at the second end (6) and has a second open end (12), the reset lever (4) being arranged to be in sliding contact with the first sliding cam (9) as it passes the first end (5) and to be in sliding contact with the second sliding cam (10) as it passes the second end (6), and where furthermore
20 the open end (11, 12) of each sliding cam (9, 10) is arranged to be moved from an extended corresponding rest position towards the corresponding first end (5) or second end (6), respectively, when being engaged by the reset lever (4), and to slide back to said rest position when the reset lever (4) is disengaged.
- 25 2. A vehicle turning signal device according to claim 1, **characterized in** that when the steering wheel rim (7) is turned in a first direction (D1) in a condition of an actuated first turn signal, the reset lever (4) is arranged to slide on the main cam (3) towards the first end (5) and then continue to slide on the first sliding cam (9) until it passes the first open end (11), where the reset lever
30 (4) is arranged to contact the first open end (11) when the steering wheel rim (7) is turned in a second direction (D2), opposite the first direction (D1), such that the first open end (11) is pushed towards the main cam (3) as the steering wheel rim (7) is continuously turned in the second direction (D2), the reset lever

(4) being arranged to reset the actuated first turning signal when passing the first open end (11) towards the main cam (3).

3. A vehicle turning signal device according to any one of the previous claims, **characterized in** that the sliding cams (9a, 9b, 9c; 10a, 10b, 10c) are biased by corresponding spring means (15a, 15b, 15c; 16a, 16b, 16c), the force of the respective spring means (15, 16) being adapted to fall below the force necessary to actuate the reset lever (15a, 15b, 15c; 16a, 16b, 16c).

4. A vehicle turning signal device according to any one of the previous claims, **characterized in** that the sliding cams (9, 10) and the main cam (3) are arranged to follow a curved shape around the common steering axis (8).

5. A vehicle turning signal device according to any one of the previous claims, **characterized in** that the sliding cams (9a, 10a) are arranged to slide on a side of the main cam (3a).

6. A vehicle turning signal device according to any one of the claims 1-4, **characterized in** that the sliding cams (9b, 10b; 9c, 10c) are arranged to slide inside or outside the main cam (3b, 3c).

7. A vehicle comprising a turning signal device (1), the turning signal device (1) comprising a turning signal lever (2) and a main cam (3), the turning signal lever (2) in turn comprising a reset lever (4) arranged for resetting an actuated turning signal, the main cam (3) having a first end (5) and a second end (6) and being arranged for being turned together with a steering wheel rim (7) around a common steering axis (8) in a fixed manner, where the reset lever (4) is arranged to be in sliding contact with the main cam (3) between the first end (5) and the second end (6) as it moves between them, **characterized in** that the turning signal device (1) further comprises a first sliding cam (9) and a second sliding cam (10), the first sliding cam (9) constituting an extension of the main cam (3) at the first end (5) and having a first open end (11), and the second sliding cam (10) constituting an extension of the main cam (3) at the second

end (6) and having a second open end (12), the reset lever (4) being arranged to be in sliding contact with the first sliding cam (9) as it passes the first end (5) and to be in sliding contact with the second sliding cam (10) as it passes the second end (6), where furthermore the open end (11, 12) of each sliding cam (9, 10) is arranged to be moved from a corresponding rest position towards the corresponding first end (5) or second end (6) when being engaged by the reset lever (4), and to slide back to said rest position when the reset lever (4) is disengaged.

8. A vehicle (26) according to claim 7, **characterized in** that when the steering wheel rim (7) is turned in a first direction (D1) in a condition of an actuated first turn signal, the reset lever (4) is arranged to slide on the main cam (3) towards the first end (5) and then continue to slide on the first sliding cam (9) until it passes the first open end (11), where the reset lever (4) is arranged to contact the first open end (11) when the steering wheel rim (7) is turned in a second direction (D2), opposite the first direction (D1), such that the first open end (11) is pushed towards the main cam (3) as the steering wheel rim (7) is continuously turned in the second direction (D2), the reset lever (4) being arranged to reset the actuated first turning signal when passing the first open end (11) towards the main cam (3).

9. A vehicle (26) according to any one of the claims 7 or 8, **characterized in** that the sliding cams (9a, 9b, 9c; 10a, 10b, 10c) are biased by corresponding spring means (15a, 15b, 15c; 16a, 16b, 16c), the force of the respective spring means (15, 16) being adapted to fall below the force necessary to actuate the reset lever (15a, 15b, 15c; 16a, 16b, 16c).

10. A vehicle (26) according to any one of the claims 7-9, **characterized in** that the sliding cams (9, 10) and the main cam (3) are arranged to follow a curved shape around the common steering axis (8).

11. A vehicle (26) according to any one of the claims 7-10, **characterized in** that the sliding cams (9a, 10a) are arranged to slide on a side of the main cam (3a).

5 12. A vehicle (26) according to any one of the claims 7-10, **characterized in** that the sliding cams (9b, 10b; 9c, 10c) are arranged to slide inside or outside the main cam (3b, 3c).

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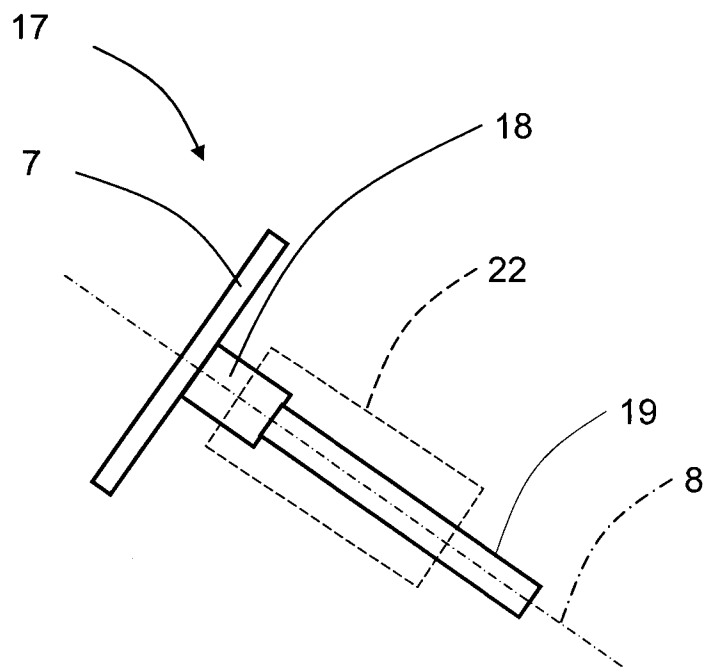


FIG. 1

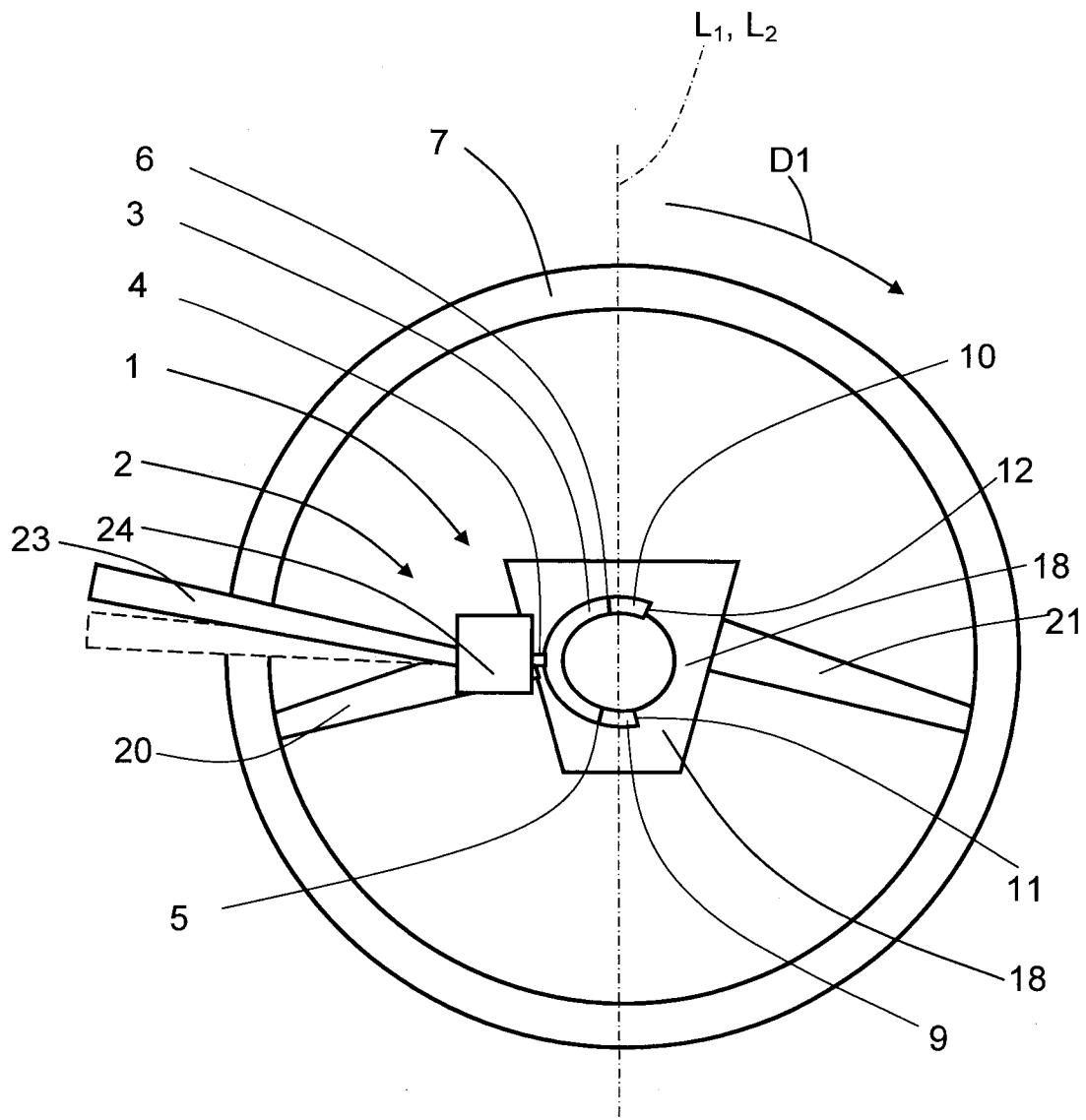


FIG. 2

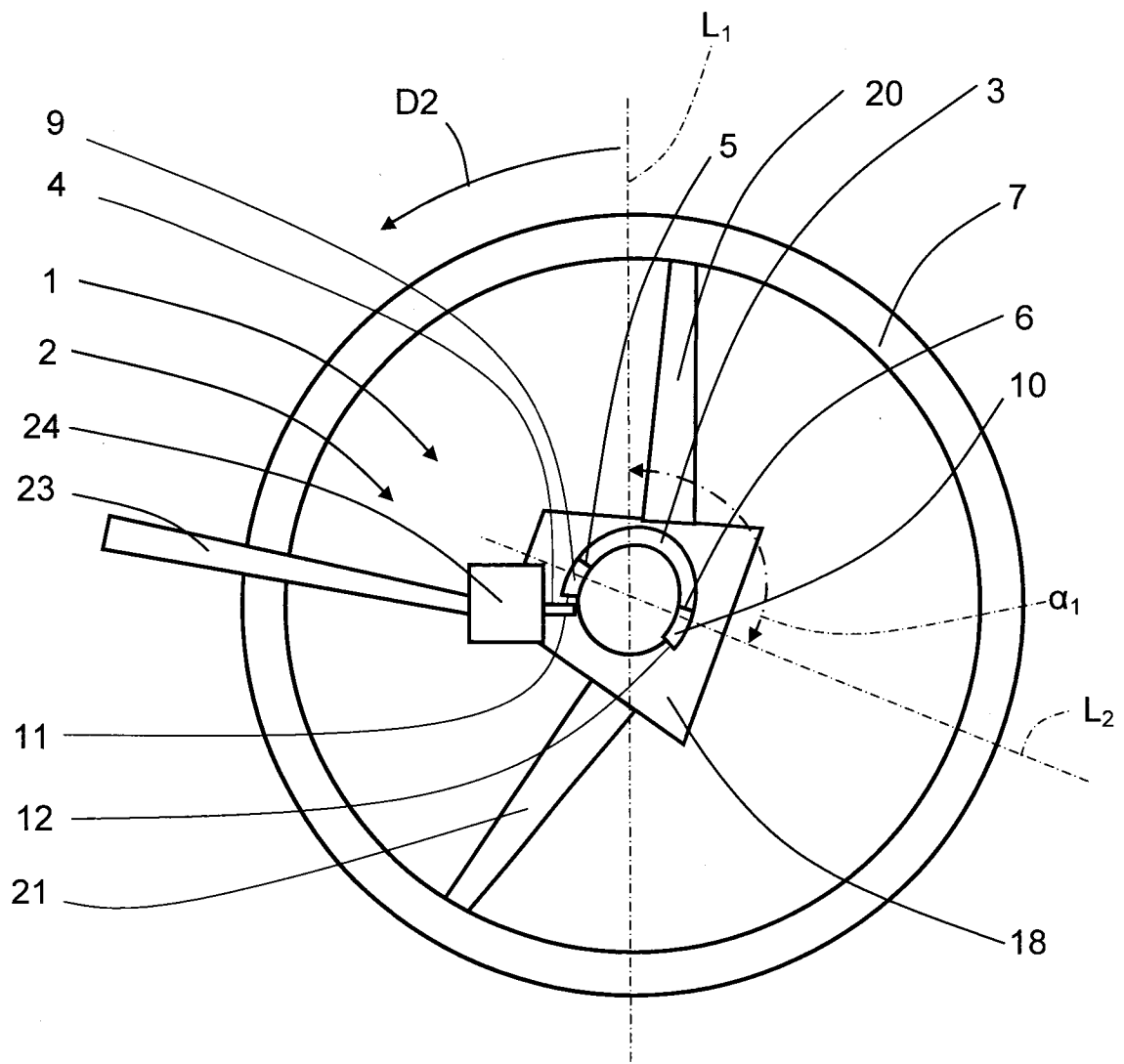
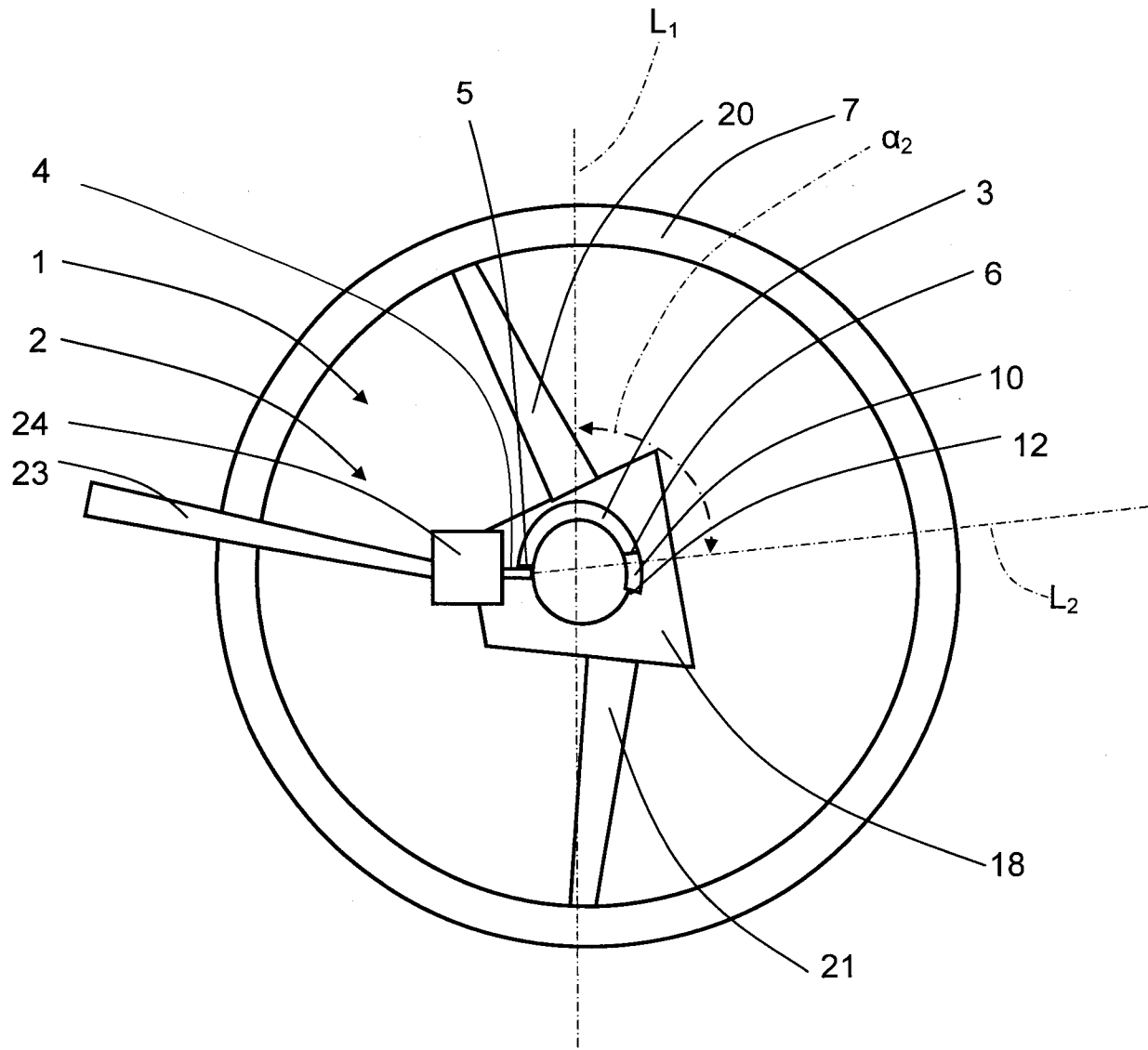


FIG. 3

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FIG. 4

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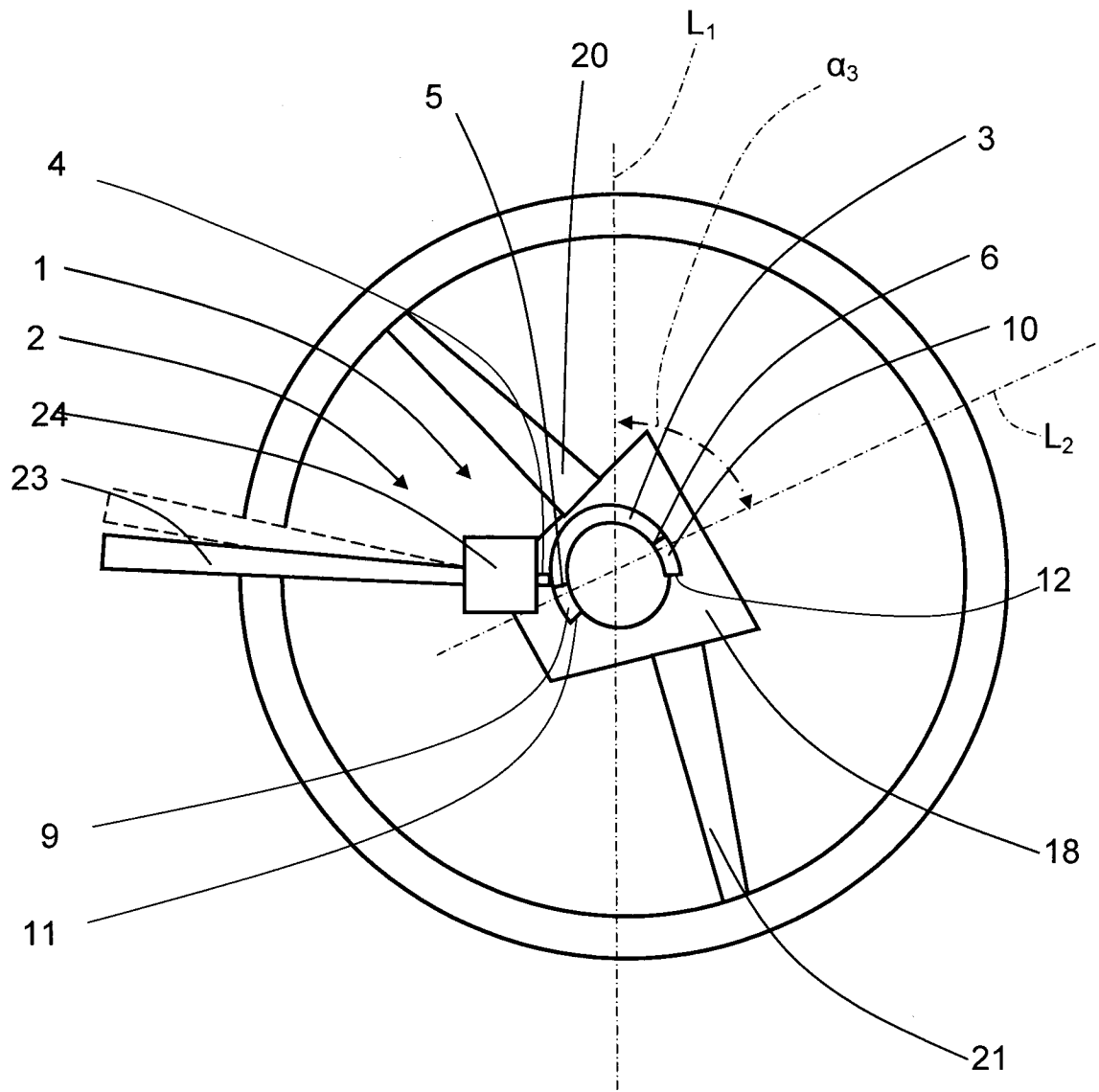


FIG. 5

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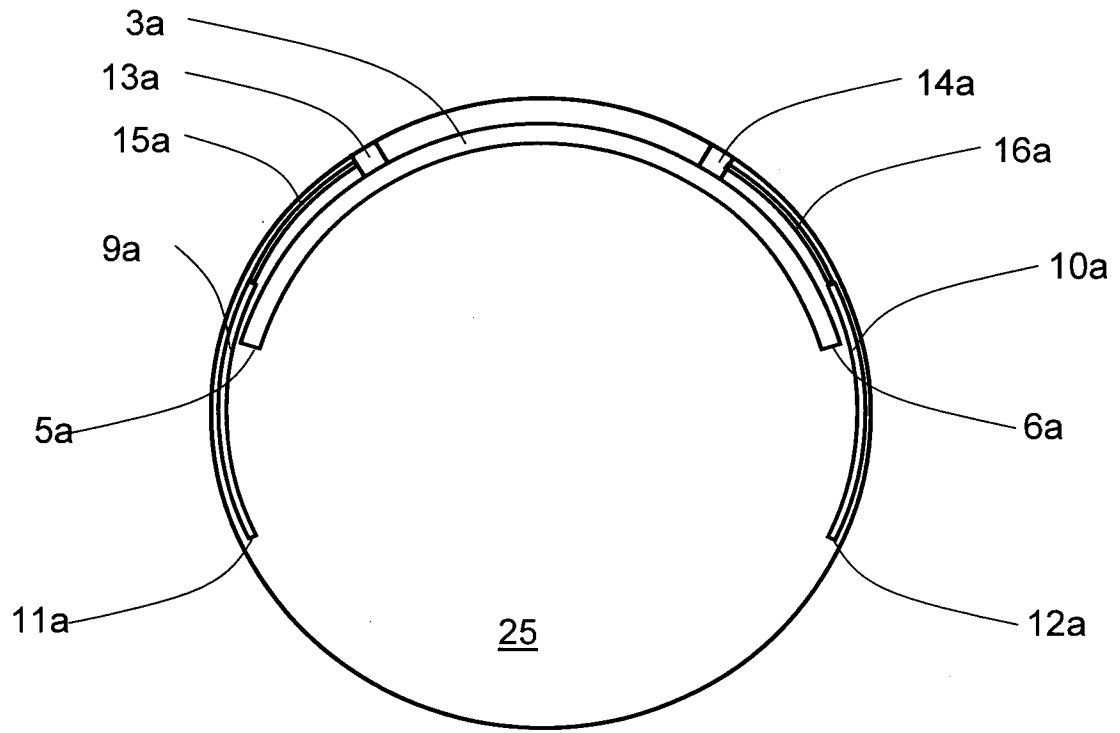


FIG. 6

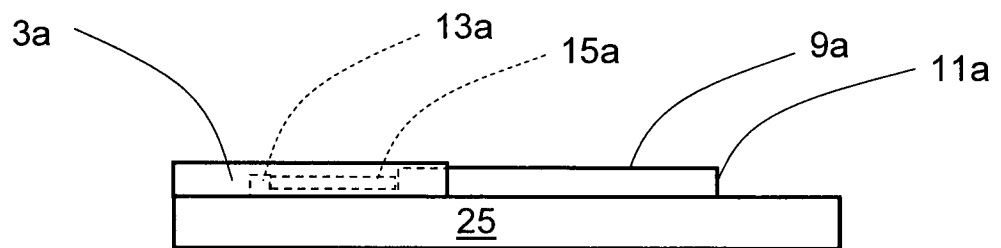


FIG. 7

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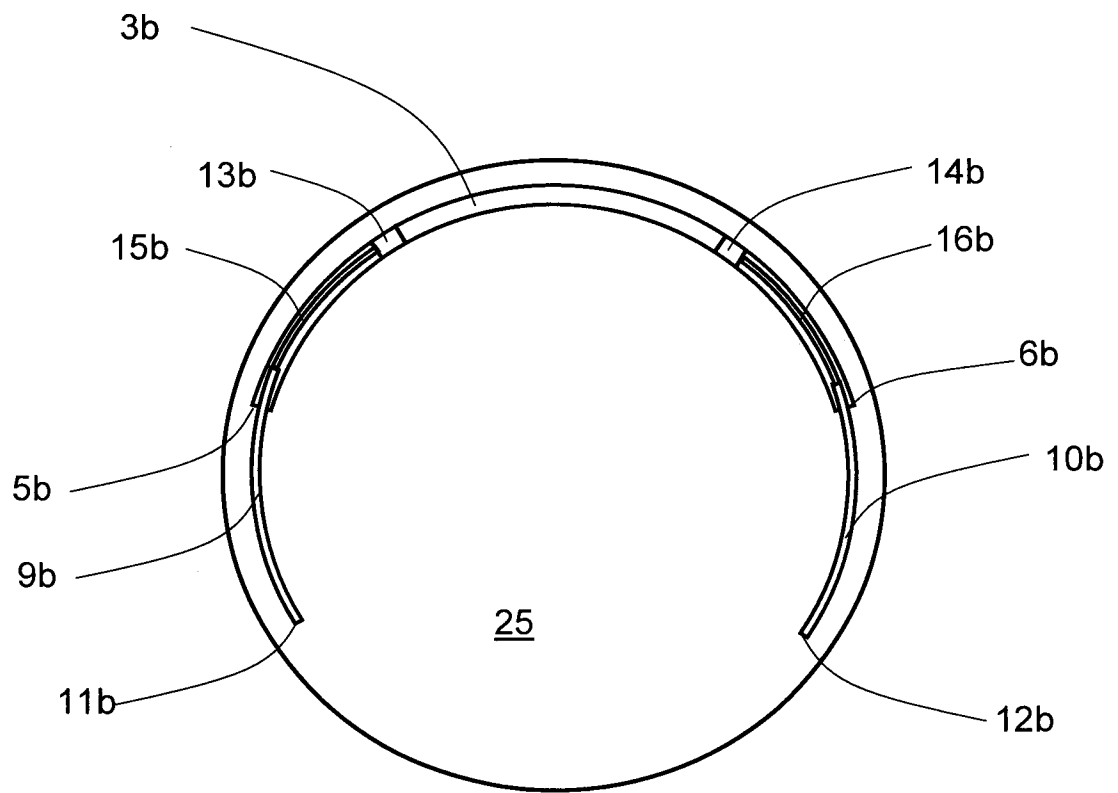


FIG. 8

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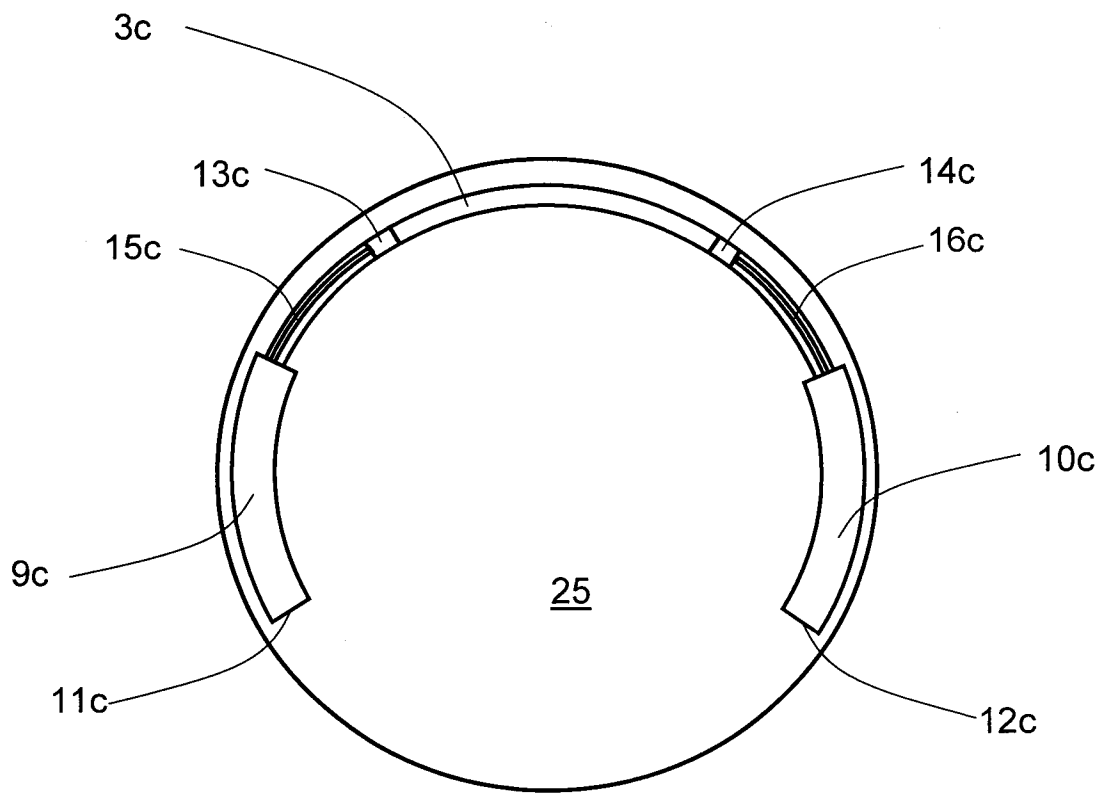


FIG. 9

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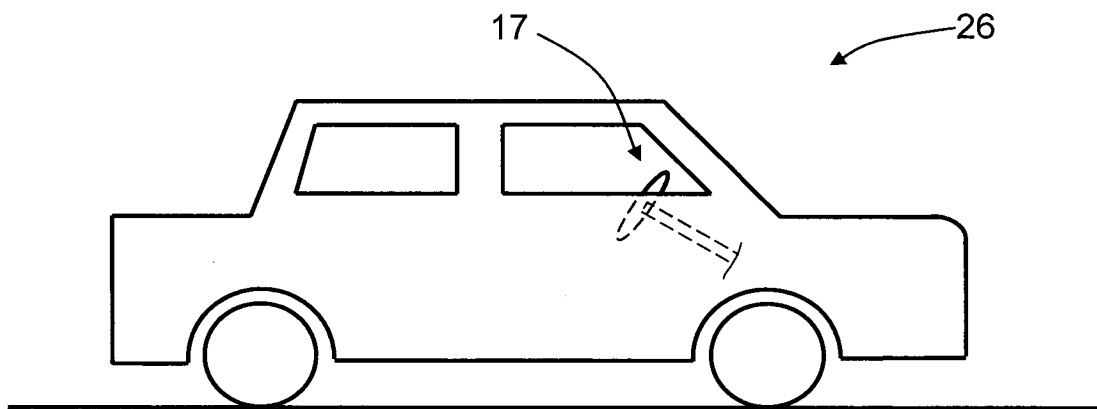


FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2011/000116

A. CLASSIFICATION OF SUBJECT MATTER IPC: see extra sheet 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) IPC: B60Q Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched SE, DK, FI, NO classes as above Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, PAJ, WPI data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 20020100668 A1 (ITO HIDETAKA), 1 August 2002 (2002-08-01); abstract; figures 1-9 --	1-12
A	US 4638290 A (WAGNER DAVID J), 20 January 1987 (1987-01-20); abstract; figure 1 --	1-12
A	US 4888456 A (SUZUKI MASARU), 19 December 1989 (1989-12-19); abstract; Cited in the description --	1-12
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