(19) DANMARK

(10) DK/EP 2539163 T3

(12) Oversættelse af europæisk patentskrift

Patent- og Varemærkestyrelsen

(51) Int.Cl.: *B 60 C 29/02 (2006.01)*

(45) Oversættelsen bekendtgjort den: **2015-09-21**

(80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2015-06-17**

(86) Europæisk ansøgning nr.: **11706200.0**

(86) Europæisk indleveringsdag: **2011-02-16**

(87) Den europæiske ansøgnings publiceringsdag: **2013-01-02**

(86) International ansøgning nr.: **EP2011052262**

(87) Internationalt publikationsnr.: **WO2011104148**

(30) Prioritet: **2010-02-24 DE 202010000254 U**

(84) Designerede stater: **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**

(73) Patenthaver: **PTG Reifendruckregelsysteme GmbH, Habichtweg 9, 41468 Neuss, Tyskland**

(72) Opfinder: **TIGGES, Bertram, Strundener Straße 180, 51089 Köln, Tyskland**

(74) Fuldmægtig i Danmark: **Zacco Denmark A/S, Arne Jacobsens Allé 15, 2300 København S, Danmark**

(54) Benævnelse: **DÆKVENTIL**

(56) Fremdragne publikationer:
**EP-A2- 1 182 061**
**WO-A1-99/37492**
**DE-U1-202006 012 729**

## Description

**[0001]** The invention relates to a tire valve, comprising a valve channel having a valve body enclosing a valve seat, having at least one connecting means for connecting the valve body to a valve base, wherein the valve body comprises a valve part inserted in the valve channel and displaceable in the axial direction therein, sealingly bearing against the valve seat of the valve body in the closed position of the valve, and wherein the connecting means of the valve body is disposed in a connecting segment at a distance in the axial direction and the valve body is implemented as a single piece.

**[0002]** Tire valves for vehicles are designed as rim valves or as hose valves. Since motor vehicle tires for the most part are tubeless, mostly rim valves are used with their rims. Such valves, the same however also applies to hose valves, comprise a valve base, which in the case of a rim valve is sealingly screwed together with the rim. The valve base comprises an annular cylindrical tube section with an external thread. The external thread can be subdivided into two segments: a thread segment for securing the valve base on the rim; and another thread segment for screwing on a valve cap to close the valve. In addition, the tube exhibits an internal thread to secure the actual valve. The valve exhibits a valve body with a connecting means configured as a connecting thread serving for connecting the valve body to the external thread on the valve base, by which this is screwed into the tube of the valve base. The valve body exhibits a valve channel that extends through it in the axial direction and makes available a valve seat for a valve part movable in the axial direction in the valve channel. In the closed position of the valve, the valve acts with its sealing surface against the valve seat of the valve body. The valve part exhibits a pin which

projects beyond the valve body up into the region of the upper opening of the tube of the valve base. By pressing the pin into the valve body, the valve part is lifted away from the valve seat, so that air can then be released from the tire. The valve part is also lifted away from its valve seat when air is put in, if a clamp coupling is connected to the tube of the valve base.

**[0003]** Although the functionality of such a valve has proven itself, for some applications it would be desirable if the air pressure in a tire could be changed more quickly. This is especially true when letting air out. Such an application is needed for vehicles that are operated on different surfaces. Occasionally it is necessary to lower the air pressure in a tire to increase the tire footprint when traveling over a softer surface. This customarily is done by pressing in the pin assigned to the valve part of the tire valve, either manually or by connecting a pressure gauge or a hose as part of a control device on the vehicle side. A coupling piece is clamped onto the threaded end of the tube of the valve base for connecting such a pressure gauge or hose. Part of the coupling is an actuating pin which acts on the pin of the valve part to open the valve. The clamping should be done with care when such couplings are used for connecting a pressure gauge or a house on a tire valve since otherwise the clamp coupling, particularly at the higher air pressures, can pop off. Couplings that are screwed onto the external thread of the tube to avoid this problem are viewed as troublesome in terms of handling.

**[0004]** Tire valves according to the preamble of the claim 1 are known from DE 20 2006 012 729 U1, WO 99/37492A1 or EP 1 182 061 A2. In the case of the tire valve described in DE 2006 012 729 U1, an elastomeric annular body is used against which the movable valve part is to be moved for opening and through which it is held so as to act against the valve seat. Due to size

required for such a return element, the cross-sectional area through which a flow can freely flow when the valve is open is limited.

**[0005]** Based on this discussed prior art it is therefore an object of the invention to improve the aforementioned tire valve in such a manner that it is possible with said valve not only to let air deflate more rapidly from a tire and to basically also securely connect a coupling thereto, but that such a tire valve is in particular also suitable for smaller tires.

**[0006]** This object is achieved according to the invention by an aforementioned generic tire valve, wherein the connecting means is disposed in a connecting segment at a distance in the axial direction from the functional valve segment and the valve body is implemented as a single piece.

**[0007]** In this valve, the connecting means, which typically is designed as a connecting thread, is not in radial arrangement with respect to the elements necessary for the functionality of the valve, like the valve seat and the movable valve part, but rather in a connecting segment arranged axially offset to these elements. Thus the valve body with its valve-functioning elements is at a distance from the end of the tube of the valve base. The spatial separation in axial direction between the connecting segment and the functional elements of the valve of the tire valve permits to arrange the functional elements of the valve outside of the tube of the valve base and therefore at a place that is not impaired in the radial direction by the inner width of the tube of the valve base. Consequently, such a tire valve can have a valve channel of greater diameter and a valve part designed with a correspondingly larger diameter. The larger diameter of the valve channel results in a larger flow cross-section of the open valve and thus in a quicker release of air from the tire as well as faster feeding of air into the tire. Due

to the arrangement of the valve body with its functional valve elements outside the tube of the valve base, a configuration of the valve body that corresponds to the requirements, namely independent of the otherwise present limitations of the tube of the valve base, is permitted. For example, the valve body can have a circumferential clamping groove and/or other connection elements for connecting the coupling of a hose or pressure gauge. This allows the coupling to be connected to the valve in form-locking manner, in particular without a required screwing of the coupling piece onto a thread.

**[0008]** Moreover, the valve body of this tire valve is a single-piece design. The single-piece configuration of the valve body permits a production thereof with low material usage while still meeting the strength requirements placed on the valve body. As a consequence of the low material usage, such a tire valve is relatively low in weight and therefore suitable for use on smaller tires, for example those for passenger cars. It is precisely with passenger vehicles, especially if they are capable of off-the-road travel like SUVs, that such tire valves can be used, even if the tires for such vehicles must withstand higher rotational velocities than truck tire valves, for example. The previously-described separation of the functional valve segment and the segment including the connecting means from each other in the axial direction permits a leaner configuration, which is a prerequisite for using as little material as possible and therefore for a weight of the tire valve as low as possible.

**[0009]** The connecting means preferably implemented as a connecting thread can principally be designed as an external or internal thread. If it is desired that the valve channel has as large a flow-through cross section as possible, the connecting thread of the valve body is designed as an interior thread so that the valve body can be screwed onto the external thread of

the tube of a valve base. Such a tire valve is then screwed like a customary protective cap onto the tube of the valve base, and extends it correspondingly. Connecting the valve body with its connecting means to the valve base is carried out such that it is sealed. When using a tire valve according to the invention, the valve part can be designed to be shorter overall since the valve part does not need to be accommodated in the tube of the valve base, at least not completely.

**[0010]** Due to the relatively large constructed space available within the valve channel, the latter can include installed components. For example, there could be a stop surface to limit the movement of the valve part in the closing direction. Correspondingly, the valve part has a complementary stop, wherein these stop surfaces are preferably configured as circumferential radial projections which can be inclined in the direction of the longitudinal axis and towards the valve opening. By providing such a stop, and when the sealing ring as part of the valve part rests against the valve seat, the elastomeric sealing ring is deformed at a maximum only to an extent as this is allowed by the above-described movement stop before the two stop surfaces rest against one another. Through this measure, the sealing element used is treated with care. It is understood, that this effect occurs not only if the sealing element is part of the movable valve part, but also if a sealing element used is assigned to the valve body that is fixed with respect to the valve part.

**[0011]** Further advantages and configurations of the invention arise from the following description of an exemplary embodiment with reference to the attached Figure 1. Figure 1 shows a partial longitudinal section through a tire valve 1 which, in the illustrated exemplary embodiment, is connected to a valve base 2 configured for mounting on a vehicle rim. The valve base 2 is a valve base having a tube 3 with a longitudinal channel, a

connecting flange 4, a shoulder seal 5 and a mounting nut 6 or bracing the valve base 2 on the rim bed of a vehicle tire while interpositioning a shim B. The tube 3 carries an external thread 7 on its end opposite the connecting flange 4. The channel formed by the tube 3 serves for providing a pathway between the interior of a tire mounted on a rim and the surroundings. The mounting nut 6 is designed as a grooved nut and has an annularly and circumferentially extending recess 6.1 into which an O-ring 6.2 from an elastomeric material is inserted. The diameter of the O-ring 6.2 is dimensioned such that, in its state unloaded in the axial direction, the O-ring projects over the mounting nut's 6 surface facing away from the shim B.

**[0012]** The tire valve 1 has a connecting segment 8 with an interior thread 9 complementary to the exterior thread 7 of the tube 3 and serving as a connecting means for connecting the tire valve 1 to the valve base 2. The tire valve 1 is screwed onto the tube 3 by means of its internal thread 9. The connecting segment 8 of the tire valve 1 is part of the valve body 10 of the tire valve 1. A coupling segment with the functional valve elements of the tire valve 1 is located adjacent to the connecting segment 8 of valve body 10. The valve body 10 is manufactured as a single piece, typically in the course of one or a plurality of machining steps. The valve body 10 encloses a valve channel 11 within its coupling segments K as a continuation of the channel enclosed by the tube 3 of the valve base 2. A valve part 12 movable in the longitudinal axial direction is disposed in the valve channel 11 of the valve body 10. The valve part 12 is illustrated in Figure 1 in its closed position. The opening movement of the valve part 12 is indicated by a block arrow. The valve part 12 carries a sealing ring 14 in a groove 13 at its end region facing away from the connecting segment 8, which sealing ring is implemented in the illustrated exemplary embodiment as an O-ring made from an

elastomer material. In its closed position, the sealing ring 14 rests sealingly against a valve seat 15 provided by the valve body 10. As shown in Figure 1, the valve 12 is held in its closed position by the force of a compression spring 16. The compression spring 16 is configured as a conical spring and is supported at its tapered end on a spring seat that is designed as a shoulder 17 located on the side of the valve part 12 facing towards the connecting segment 8, and is supported at its other end on a shoulder 18 serving as a spring seat on the valve body side provided on the internal thread 9 at the end of the valve body.

**[0013]** The valve body 10 has a circumferential stop surface 19 that is inclined in the direction towards the longitudinal axis of the tire valve 1 and in the direction towards the valve seat 15. The valve part 12 has a complementarily designed stop surface 20. In the closed position of the valve part 12, both stop surfaces 19, 20 rest against one another. This limits the mobility of the valve part 12 in the closing direction with the consequence that the sealing ring 14 is deformed with a defined preload for creating the sealing, regardless of the pressure prevailing in the tire. Moreover, this spring preload ensures that the tire valve 1 is closed even if there is no pressure in the tire.

**[0014]** The valve body 10 has an outer circumferential groove 21 in the free end region of its coupling segment K. Said groove 21 serves as a connecting or clamping groove for a coupling piece to be connected to the tire valve 1, such as a pressure gauge or a hose of a tire pressure control system. A clamping element of such a coupling piece engages in the groove 21 so that the coupling piece can be connected to the tire valve 1 in a form-locking manner. Similarly, the tire valve 1 can be closed by a cap fixed in the groove 21.

**[0015]** The valve part 12 has a recess 22 on its outwardly facing head side, which is designed in the illustrated exemplary embodiment as a hollow-shaped recess. The recess 22 serves for receiving an actuator of a coupling to be connected to the tire valve 1, through which actuator the valve part 12 is moved against the force of the spring 16 from its closed position shown in Figure 1 in the direction towards the connecting segment 8 so as to open the tire valve 1.

**[0016]** An annular gap 25 is located between the outer shell surface 23 of the valve part 12 and the inner shell surface 24 of the valve body 10. While conventional tire valves, which are screwed into the internal thread of the tube 3, are provided with an inner cross-sectional width through which a flow can pass of about 0.5 mm, the diameter through which a flow can pass of the tire valve 1 illustrated in the Figure is about 3.5 to 4 mm. This is achieved, on the one hand, by a relatively large gap dimension of the annular gap 25 and by the arrangement thereof at a relatively large distance from the longitudinal axis of the valve 1, compared to previously known valves, as a result of which the width of the annular gap 25 is longer and thus the area through which a flow can pass is correspondingly larger.

**[0017]** The conicity of the compression spring 16 also ensures a guiding of the valve part 12 when it is moved in the direction towards the connecting segment 8 for opening the tire valve 1. The valve part 12 is in its completely open position when the stop surface 20 is in an axial position below a further shoulder 26 of the valve body 10. Then, the flange 27 of the valve part 12 forming the stop surface 20 and the shoulder 17 for the spring seat is at a distance to the shoulder 26 so that a sufficiently large area through which the flow can pass is also provided circumferentially with respect to the flange 27. If the valve part 12 is only to be lifted slightly from the valve seat 15 for

opening, and thus for inflating or deflating a tire, the flange 27 may have openings such that in fact the flange is formed by individual flange segments spaced apart from one another by openings.

**[0018]** The diameter of the valve body 10 in the segment of the valve channel 11 adjoining the stop surface 19 up to the inclined shoulder 26, thus that segment of the valve channel 11 in which the flange is movable in the axial direction, corresponds to the inner diameter of the valve body 10 in the region of the internal diameter 9 thereof. Thus, the valve part 12, the largest diameter of which is defined by the flange 27, can be readily inserted through the opening of valve body 10 provided by the inner threading 9. Subsequently, the compression spring 16 is also inserted into the valve body 10 through this opening until the compression spring, with its largest-diameter end winding, comes to rest against the shoulder 18. Adapting the dimension of the diameter of the flange 27 of the valve part 10 to the diameter of the internal thread 9, wherein the latter has to be dimensioned only slightly larger than the diameter of the flange 27 by a certain play for inserting the valve part 12, ensures in the illustrated exemplary embodiment that only low material usage is necessary for producing the valve body 10. As a result, the valve body 10 can be kept slender. Thus, the outer diameter thereof basically only needs to have a material thickness that is sufficient for meeting the mechanical requirements and the strength requirements.

**[0019]** With the valve body 10 screwed onto the tube 3, the O-ring 6.2 serves for sealing with respect to the valve body 10.

**[0020]** The description of the invention was made based on an exemplary embodiment which features a connecting thread as a connecting means for connecting the tire valve to a valve base. Other devices can also be used as connecting means, in particular

if the valve base is adapted thereto. For example, the tire valve can also be connected to the valve base by means of bayonet catch. Similarly, other connecting means for connecting a tire valve to the external thread of a cylinder base can also be implemented, for example, by means of a clamp.

Reference list

[0021]

| | |
|---|---|
| 1 | tire valve |
| 2 | valve base |
| 3 | tube |
| 4 | connecting flange |
| 5 | shoulder seal |
| 6 | mounting nut |
| 6.1 | recess |
| 6.2 | O-ring |
| 7 | external thread |
| 8 | connecting segment |
| 9 | internal thread |
| 10 | valve body |
| 11 | valve channel |
| 12 | valve part |
| 13 | groove |
| 14 | sealing ring |
| 15 | valve seat |
| 16 | compression spring |
| 17 | shoulder |
| 18 | shoulder |
| 19 | stop surface |
| 20 | stop surface |
| 21 | recess |
| 22 | recess |
| 23 | surface shell |
| 24 | surface shell |
| 25 | annular gap |

26 shoulder

27 flange

B shim

K coupling segment

**Patentkrav**

1. Dækventil omfattende en ventilkanal (11) med et ventillegeme (10), som omgiver et ventilsæde (15), og som er udstyret med i det mindste et forbindelsesmiddel (9) til at forbinde ventillegemet (10) med en ventilfod (2), idet ventillegemet (10) omfatter en ventildel (12), som er indsat i ventilkanalen (11) og kan bevæges heri i aksial retning, og som, når ventilen (1) er i lukket stilling, ligger tætnende mod ventilsædet (15) på ventillegemet (10), idet forbindelsesmidlet (9) på ventillegemet (10) er placeret i et forbindelsesafsnit (8) med en afstand til det ventilfunktionelle afsnit på ventillegemet (10) i aksial retning, og ventillegemet (10) er udført i et stykke, **kendetegnet ved, at** ventildelen (12) holdes virkende mod ventilsædet (15) ved hjælp af en trykfjeder (16), og at ventildelen (12) skal bevæges mod trykfjederens (16) kraft for at åbne ventilen (1).

2. Dækventil ifølge krav 1, **kendetegnet ved, at** forbindelsesmidlet er udført som forbindelsesgevind (9).

3. Dækventil ifølge krav 2, **kendetegnet ved, at** forbindelsesgevindet (9) på ventillegemet (10) er udført som indvendigt gevind, der er egnet til at skrue på det udvendige gevind (7) på en ventilfod (2).

4. Dækventil ifølge krav 3, **kendetegnet ved, at** forbindelsesafsnittet (8) med sit indvendige gevind er en del af en del af ventillegemet (10) omfattende en cylindrisk kappeflade.

5. Dækventil ifølge krav 4, **kendetegnet ved, at** der på forbindelsesafsnittet (8) på ventillegemet (10) er formet et koblingsafsnit (K) med en låsekontur (21) til at forbinde et koblingsstykke, for eksempel et manometer eller en slange til en dæktryksreguleringsanordning eller en beskyttelseshætte.

6. Dækventil ifølge et af kravene 1 til 5, **kendetegnet ved, at** ventillegemet (10) indvendigt har en ansats (18), som rager ud i radial retning, som fjedersæde på ventillegemets side.

7. Dækventil ifølge et af kravene 1 til 6, **kendetegnet ved, at** ventildelen (12) har en tætningsring, som i den lukkede stilling virker mod ventilsædet (15).

8. Dækventil ifølge krav 6, **kendetegnet ved, at** ventillegemet (10) omfatter en stopflade (19), som rager indad i en radial retning, og ventildelen (12) omfatter en komplementær stopflade (20), som rager udad, idet ventildelens (12) bevægelighed i ventillegemet (10) i retning mod ventilsædet (15) er begrænset af disse to stopflader (19, 20).

9. Dækventil ifølge krav 8, **kendetegnet ved, at** stopfladerne (19, 20) hælder i retning mod ventilåbningen samt mod ventillegemets (10) længdeakse.

10. Dækventil ifølge krav 8 eller 9, **kendetegnet ved, at** stopfladerne (19, 20) er placeret på en sådan måde i forhold til positioneringen og/eller geometrien af tætningsringen (14) og ventilsædet (15), at de kommer til anslag for at begrænse en deformering af tætningsringen (14).

11. Dækventil ifølge et af kravene 1 til 10, **kendetegnet ved, at** ventildelen (12) på den ende, der vender væk fra forbindelsesafsnittet (8), har en fordybning (22) til at optage en aktuator, som hører til en kobling, som er beregnet til at forbindes med ventilen (1), til at åbne ventilen (1).

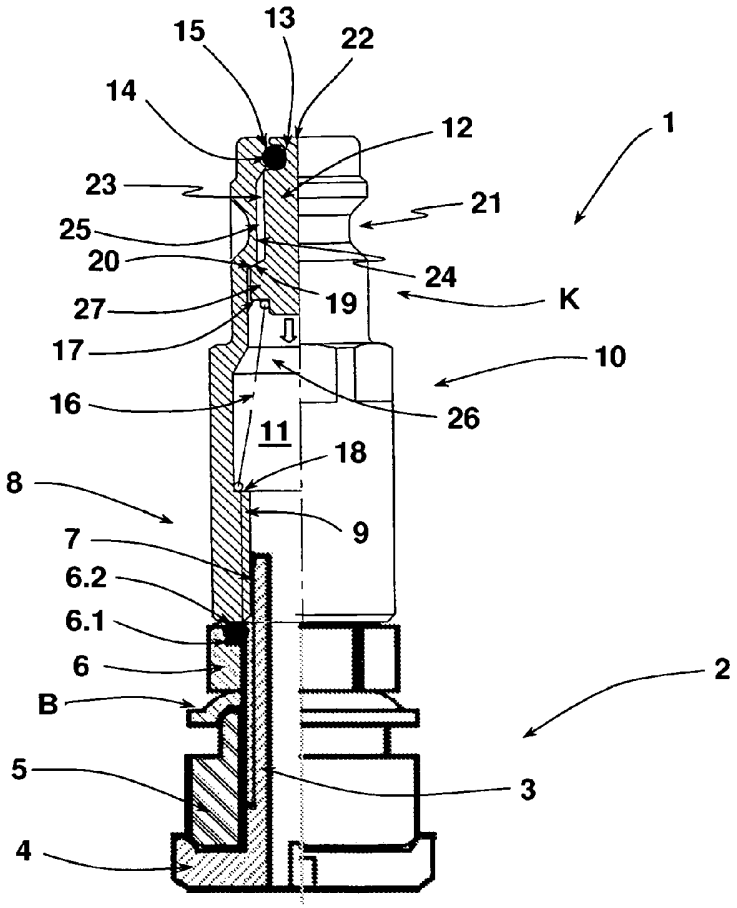
15
13
22
14
12
1
23
21
25
20
24
27
19
K
17
10
16
26
11
18
8
9
7
6.2
6.1
6
2
B
5
3
4

*Fig. 1*