

Valve shaft locking mechanism

The present invention relates to a tapping armature for liquid containers,
5 in particular for being connected to the outlet port or the outlet opening
of a transport and storage container for liquids, the tapping armature comprising an armature housing in which a valve body pivotable by means of a valve shaft and serving to open and close a flow cross section of an outlet tube is disposed, a connection end of the valve shaft for being connected
10 to the valve body being disposed in the outlet tube of the armature housing and an operating end of the valve shaft protruding from the armature housing through a housing dome formed on the armature housing.

DE 10 2018 102 062 A1 discloses a tapping armature of the kind mentioned above in which the valve shaft is axially secured in the armature housing
15 between the housing dome and the valve shaft portion housed in the housing dome by a force-fitting connection between the valve shaft portion and the housing dome achieved by a suitable fit between the diameter of the valve shaft portion and the inner diameter of the housing dome.

Hence, in order to install the valve shaft in the housing dome of the armature housing, the valve shaft portion of the valve shaft has to be pressed
20 into the bore of the housing dome so as to ensure that an axial fixation of the valve shaft in the armature housing is made possible by sufficient frictional locking between the valve shaft portion and the housing dome. The pressing force required for installation, which posits a corresponding pulling force for removing the valve shaft, has to be great enough to preclude
25 unintentional removal of the valve shaft from the armature housing during operation of the tapping armature. Thus, the pressing force is greater than would actually be necessary for installing the valve shaft.

Hence, the object of the invention is to propose a tapping armature comprising a valve shaft whose installation requires little installation force
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without adversely affecting a secure axial fixation of the valve shaft in the armature housing.

To attain said object, the tapping armature according to the invention has the features of claim 1.

- 5 According to the invention, a form-fitting engagement is established between the housing dome and a valve shaft portion housed in the housing dome in order to axially secure the valve shaft in the armature housing.

By axially securing the valve shaft via a form fit between the valve shaft and the housing dome, the installation force required for installing the
10 valve shaft merely has to be great enough for the form fit to be established, the valve shaft being axially secured via the established form fit irrespective of the installation force.

Particularly preferably, an engagement means having a radial dome projection formed in a passage opening of the housing dome, which serves for
15 the passage of the valve shaft portion, is realized for establishing the form-fitting engagement, the radial dome projection forming an axial locking mechanism together with a radial valve shaft projection of the valve shaft portion. Owing to this preferred embodiment, the armature housing, which is typically produced by injection molding, can be produced without hav-
20 ing to change the mold used for the injection molding process. Instead, the armature housing having the housing dome which is formed on the armature housing and whose production necessitates the use of a mold core defining the receiving bore for receiving the valve shaft can be produced by just slightly modifying the mold core used thus far without having to
25 change the mold itself or even needing a new mold.

If the dome projection is formed at the axially lower end of the passage opening in the housing dome, axial fixation is realized in the area of transition between the outlet tube and the housing dome and thus at a particularly stiff point of the armature housing.

Preferably, the dome projection is ramp-shaped and has a relatively short locking ramp steeply rising in the installation direction of the valve shaft and a relatively long and flat latching ramp descending in the installation direction of the valve shaft, which means that the locking ramp and the latching ramp are easy to produce in an injection molding process for producing the armature housing using a forcibly demolded core. Additionally, the locking ramp forms an obstacle relatively easy to overcome during installation of the valve shaft, and the latching ramp forms a ramp rising in the removal direction and hindering the valve shaft from being removed unless a relatively great pulling force is applied.

It is particularly advantageous if, in combination with the advantageous configuration of the dome projection described above, the valve shaft projection is also ramp-shaped and has a locking ramp descending in the installation direction and a locking shoulder formed at the end of the ramp since the inverse design of the locking ramps of the dome projection and of the valve shaft projection allows the locking ramps to slide on each other during installation and thus makes installation possible with very little installation force.

In the removal direction, however, the locking shoulder of the valve shaft projection and the latching ramp rising in the removal direction together form an obstacle to axial movement, a removal force significantly greater than the installation force having to be applied in order to move the locking shoulder of the valve shaft projection past the dome projection.

Preferably, the valve shaft portion is realized as a sealing portion for receiving radial sealing elements of a sealing means for sealing the valve shaft against the housing dome, the housing dome thus having a constant inner diameter across the height of the dome projection with the exception of the area in which the dome projection is formed, which further simplifies production of the armature housing in the injection molding process.

If the outer diameter of the valve shaft projection corresponds to the outer diameter of the valve shaft portion, the valve shaft projection can simultaneously function as a surge collar disposed upstream of the sealing means, making it possible for the volume forces of the liquid flowing out
 5 of the armature housing which act on the seals in the sealing portion to be dampened in terms of their effect on the sealing means.

Adjacent to the dome projection, the valve shaft portion particularly advantageously has a supporting collar for resting on the locking ramp of the dome projection in a supporting manner, the locking ramp of the dome
 10 projection thus simultaneously serving as an axial abutment for the valve shaft.

If the supporting collar and the locking protrusion additionally have corresponding cross-sectional contours, the dome projection and the supporting collar together form an axial sliding bearing for comfortable operation
 15 of the tapping armature.

Hereinafter, a preferred embodiment of the tapping armature will be explained in more detail with reference to the drawings.

Fig. 1 is an isometric illustration of a tapping armature connected to a transport and storage container for liquids with a valve shaft guided in a housing dome of an armature housing;
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Fig. 2 shows a valve shaft portion mounted in the housing dome of the armature housing;

Fig. 3 shows another embodiment of the valve shaft portion;

Fig. 4 is a longitudinal-section view of a tapping armature with the valve shaft portion mounted in the housing dome of the armature housing.
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Fig. 1 shows a tapping armature 10 having an armature housing 11, an inlet end 12 of armature housing 11 being connected to an outlet port 14

by means of a cap nut 13, outlet port 14 being disposed on a liquid container 15 of which only the armature connection portion is illustrated in **Fig. 1**. Liquid containers 15 of the kind illustrated in **Fig. 1** are produced by blow molding, for example, and form a part of an intermediate bulk container (IBC), where they are disposed in a cage disposed on a pallet.

Fig. 1 shows tapping armature 10 in its closed position, in which a valve body 17 disposed on a valve shaft 16 blocks a flow cross section of an outlet tube 19 formed by armature housing 11. In the embodiment example illustrated here, valve body 17 is connected to a connection end 22 of valve shaft 16 via a shaft-hub connection 18. An operating end 20 of valve shaft 16 protrudes from armature housing 11 through a housing dome 21 formed on armature housing 11, and a valve shaft portion 23 of valve shaft 16 is housed in housing dome 21.

As can be seen in **Fig. 2** in particular, an engagement means 24 is formed between housing dome 21 and valve shaft portion 23 formed in the area of transition between connection end 22 and operating end 20, engagement means 24 having a radial dome projection 26 which is formed in a passage opening 25 of housing dome 21 and which is realized as a ring web in the embodiment example at hand. A radial valve shaft projection 27 is formed on valve shaft portion 23. As can be gathered from **Fig. 2**, valve shaft projection 27 and dome projection 26 together form an axially acting locking mechanism when valve shaft 16 is installed in armature housing 11, for which purpose valve shaft 16 is introduced into housing dome 21 from above in the installation direction 32.

Both dome projection 26 and valve shaft projection 27 are ramp-shaped; when viewed in installation direction 32, dome projection 26 first has a relatively short, steeply rising locking ramp 28, past which valve shaft projection 27 is guided during installation, causing valve shaft projection 27 to lock behind dome projection 26 once a locking ramp 29 which is formed on valve shaft projection 27 and descends in the installation direction has slid past dome projection 26.

In contrast to the relatively low pressing force necessary during installation for reaching the configuration illustrated in **Fig. 2**, in which valve shaft projection 27 is locked behind dome projection 26, a pulling force which is significantly greater than the pressing force is necessary for
 5 severing the locked connection between valve shaft 16 and housing dome 21 of armature housing 11 owing to a latching ramp 30 of dome projection 26 rising in removal direction 33 and a locking shoulder 31 formed on valve shaft projection 27.

This ensures that a separation of valve shaft 16 from armature housing
 10 11 can only ever be the result of an intentional removal process and cannot occur during a normal opening process of the valve. By contrast, only a relatively low pressing or joining force is required owing to the inverse rising directions of locking ramp 28 of dome projection 26 and locking ramp 29 of valve shaft projection 27, which allow locking ramps
 15 28, 29 to slide on each other when establishing the connection between valve shaft 16 and dome projection 26.

As further shown in **Fig. 2**, adjacent to dome projection 26, valve shaft portion 23 has a supporting collar 34 for resting on locking ramp 28 of dome projection 26 in a supporting manner, locking ramp 28 and sup-
 20 porting collar 34 having corresponding cross-sectional contours 35, 36.

In another embodiment, **Fig. 3** shows a valve shaft portion 37 which differs from valve shaft portion 23 in that it does not have a supporting collar which is formed on a groove flank 38 of a receiving groove 39 designed to receive a radial sealing element 43 and which has a cross-sectional contour 36 matching cross-sectional contour 35 of dome projection
 25 26, but a chamfer 40 disposed on groove flank 38 opposite dome projection 26. This ensures that valve shaft 16 is axially supported as illustrated in **Fig. 4** by a handle 40, which is connected to valve shaft 16, coming into contact with an upper edge 42 of housing dome 21 only, and
 30 that a physical contact between groove flank 38 and dome projection 26

is precluded. This ensures that groove flank 38 cannot undesirably damage dome projection 26 if valve shaft 16 is pressed too far into housing dome 21 during installation, which could lead to the desired great pulling forces not being achieved.

Claims

1. A tapping armature (10) for liquid containers, in particular for being connected to the outlet port or the outlet opening of a transport and storage container for liquids, the tapping armature comprising an armature housing (11) in which a valve body (17) pivotable by means of a valve shaft (16) and serving to open and close a flow cross section of an outlet tube (19) is disposed, a connection end (22) of the valve shaft (16) for being connected to the valve body (17) being disposed in the outlet tube (19) of the armature housing (11) and an operating end (20) of the valve shaft (16) protruding from the armature housing (11) through a housing dome (21) formed on the armature housing (11),
characterized in that
a form-fitting engagement is established between the housing dome (21) and a valve shaft portion (23) housed in the housing dome (21) in order to axially secure the valve shaft (16) in the armature housing (11); and
an engagement means (24) is realized for establishing the form-fitting engagement, the engagement means (24) having a radial dome projection (26) formed in a passage opening (25) of the housing dome (21), which serves for the passage of the valve shaft portion (23), the radial dome projection (26) forming an axial locking mechanism together with a radial valve shaft projection (27) of the valve shaft portion (23).
2. The tapping armature according to claim 1,
characterized in that
the dome projection (26) is formed at the axially lower end of the passage opening (25) in the housing dome (21).

3. The tapping armature according to claim 1 or 2,
characterized in that
the dome projection (26) is ramp-shaped and has a relatively short
locking ramp (28) steeply rising in the installation direction (32) of
the valve shaft (16) and a relatively long and flat latching ramp (30)
descending in the installation direction (32) of the valve shaft (16).
4. The tapping armature according to claim 3,
characterized in that
the valve shaft projection (27) is also ramp-shaped and has a locking
ramp (29) descending in the installation direction (32) and a locking
shoulder (31) formed at the end of the locking ramp (29).
5. The tapping armature according to any one of claims 1 to 4,
characterized in that
the valve shaft portion (23) is realized as a sealing portion for re-
ceiving radial sealing elements (43) for sealing the valve shaft (16)
against the housing dome (21).
6. The tapping armature according to claim 5,
characterized in that
the outer diameter of the valve shaft projection (27) corresponds to
the outer diameter of the valve shaft portion (23).
7. The tapping armature according to any one of claims 1 to 6,
characterized in that
adjacent to the dome projection (26), the valve shaft portion (23) has
a supporting collar (34) for resting on the locking ramp (28) of the
dome projection (26) in a supporting manner.
8. The tapping armature according to claim 7,
characterized in that

the supporting collar (34) and the valve shaft projection (27) have corresponding cross-sectional contours (35, 36).