Patent claims

1. Closure element ~~(20,20',20'')~~, in particular a valve disk, for a vacuum valve and configured for the gastight close-off of a process volume by means of cooperation with a vacuum valve opening ~~(2)~~, provided for the process volume, of the vacuum valve, comprising

   - a first sealing surface ~~(22)~~, corresponding, in particular in terms of shape and size, to a second sealing surface of the vacuum valve opening ~~(2)~~ wherein the second sealing surface surrounds the vacuum valve opening ~~(2)~~, and
   - a sealing material ~~(25,25',37)~~ vulcanized onto the first sealing surface ~~(22)~~ and in accordance with the course thereof and having a defined height in the direction of the surface normal of the first sealing surface ~~(22)~~, wherein the sealing material ~~(25,25',37)~~ has a defined shape with respect to a sealing material cross section, comprising
     - a first seal portion ~~(26)~~, provided, in particular, on the process volume side, and
     - a second seal portion, provided, in particular, facing away from the process volume,

   characterized in that

   - the closure element ~~(20,20',20'')~~ has a compression ~~(24,24',24'')~~ adjoining the first seal portion ~~(26)~~ and having a pressing edge ~~(28,28')~~, and
   - the pressing edge ~~(28,28')~~ is shaped, and is configured with respect to the first seal portion ~~(26)~~, such that the surface course of the sealing material ~~(25,25',37)~~, which surface course is given by the shape of the first seal portion ~~(26)~~ and tapers into the pressing edge ~~(28,28')~~, is continued substantially homogeneously, in particular linearly.

2. Closure element ~~(20,20',20'')~~ according to Claim 1, **characterized in that**
the first seal portion ~~(26)~~ is shaped, in a region ~~(27)~~ adjoining the compression ~~(24,24',24'')~~, such that in this region ~~(27)~~ the surface course of the sealing material ~~(25,25',37)~~ is homogeneous and has a homogeneous curvature which produces an edgeless change of direction of the surface course, in particular between 75° and 105°.

3. Closure element ~~(20,20',20'')~~ according to Claim 2, **characterized in that**

- the curvature is free from turning points, in particular has a constant direction of curvature, and/or
- the change of direction of the surface course in the region ~~(27)~~ adjoining the compression amounts substantially to 90°.

4. Closure element ~~(20,20',20'')~~ according to any one of Claims 1 to 3,
characterized in that
the compression ~~(24,24',24'')~~ has a depth (t) in the direction of the surface normal of the first sealing surface ~~(22)~~ and with respect to the surface of the first sealing surface ~~(22)~~ within the range from 0.15 to 0.25 mm.

5. Closure element ~~(20,20',20'')~~ according to any one of Claims 1 to 4,
characterized in that
the pressing edge ~~(28,28')~~ has a length between 0.15 mm and 0.25 mm.

6. Closure element ~~(20,20',20'')~~ according to any one of Claims 1 to 5,
characterized in that
the pressing edge ~~(28,28')~~ runs substantially parallel to the surface normal of the first sealing surface ~~(22)~~.

7. Closure element ~~(20,20',20'')~~ according to any one of Claims 1 to 6,
characterized in that
the first seal portion ~~(26)~~ has, at least in the region ~~(27)~~ adjoining the compression, a mean surface roughness R_a between 0.02 µm and 0.15 µm, in particular between 0.05 µm and 0.1 µm.

8. Closure element ~~(20,20',20'')~~ according to any one of Claims 1 to 7,
characterized in that
the first seal portion ~~(26)~~ has, at least in the region ~~(27)~~ adjoining the compression, an average surface roughness depth R_z between 0.2 µm and 1.5 µm, in particular between 0.5 µm and 1 µm.

9. Closure element ~~(20,20',20'')~~ according to any one of Claims 1 to 8,
characterized in that
the sealing material ~~(25,25',37)~~ has an elastomer, in particular a fluoroelastomer.

10. Closure element ~~(20,20',20'')~~ according to any one of Claims 1 to 9,
characterized in that
the closure element ~~(20,20',20'')~~ has

- a coupling for connecting to a drive unit ~~(7)~~ of a vacuum valve in order to provide a controlled motion of the closure element ~~(20,20',20'')~~ in the vacuum valve,
  in particular a receptacle for a push rod ~~(6)~~ of the drive unit ~~(7)~~, in particular wherein
  - the receptacle is shaped in the side of the closure element ~~(20,20',20'')~~, for the removable mounting of the closure element ~~(20,20',20'')~~ on the push rod ~~(6)~~ by engagement of a connecting portion of the push rod in the receptacle, and
  - the push rod ~~(6)~~ is supported and adjustable by means of the drive unit ~~(7)~~ such that the vacuum valve opening ~~(2)~~ is closable by displacement of the closure element ~~(20,20',20'')~~ substantially along the push rod axis ~~(8)~~ over the vacuum valve opening ~~(2)~~ and pressing of the closure element ~~(20,20',20'')~~ with its sealing material ~~(25,25',37)~~ onto a valve seat ~~(3)~~ surrounding the vacuum valve opening ~~(2)~~,

and/or

- at least one grip recess, which is shaped in a side lying opposite a closure side ~~(21)~~ with the vulcanized-on sealing material ~~(25,25',37)~~ of the closure element ~~(20,20',20'')~~, for the manual application of force to the closure element ~~(20,20',20'')~~ substantially along the push rod axis ~~(8)~~, in particular for the removal or mounting of the closure element ~~(20,20',20'')~~ from or on the push rod ~~(6)~~.

11. Vacuum valve for the gastight close-off of a process volume, comprising

- a valve housing, which has a vacuum valve opening ~~(2)~~ and a valve seat ~~(3)~~ surrounding the vacuum valve opening ~~(2)~~ and having a second sealing surface,
- a closure element ~~(20,20',20'')~~ for the substantially gastight closure of the vacuum valve opening ~~(2)~~, having a first sealing surface ~~(22)~~ corresponding to the second sealing surface, wherein the first sealing surface ~~(22)~~ has a vulcanized-on sealing material ~~(25,25',37)~~ having a defined height in the direction of the surface normal of the first sealing surface, and the sealing material ~~(25,25',37)~~ has a defined shape with respect to a sealing material cross section, having
  - a first seal portion ~~(26)~~, provided, in particular, on the process volume side, and
  - a second seal portion, provided, in particular facing away from the process volume,
- a drive unit ~~(7)~~ coupled with the closure element ~~(20,20',20'')~~, which drive unit is configured such that the closure element ~~(20,20',20'')~~ is adjustable at least substantially along a geometric longitudinal axis ~~(8)~~ in a longitudinal closing direction from
  - an open position, in which the closure element ~~(20,20',20'')~~ frees the vacuum valve opening ~~(2)~~, into
  - a closing position, in which the first sealing surface ~~(22)~~ of the closure element ~~(20,20',20'')~~ is pressed onto the second sealing surface and closes the vacuum valve opening ~~(2)~~ in a substantially gastight manner,

  and back,
  - in particular by virtue of a mobility of the closure element ~~(20,20',20'')~~ substantially along a

geometric transverse axis (9) running at right angles to the longitudinal axis, is adjustable in a transverse closing direction into an intermediate position, in which the closure element (20,20',20'') covers the vacuum valve opening (2) and a closure side (21) of the closure element (20,20',20'') is in a remote opposite position to the valve seat (3), and back,

characterized in that

- the closure element (20,20',20'') has a compression (24,24',24'') adjoining the first seal portion (26) and having a pressing edge (28,28'), and
- the pressing edge (28,28') is shaped, and configured with respect to the first seal portion (26), such that the surface course of the first seal portion (26), which surface course is given by the shape of the first seal portion (26) and tapers into the pressing edge (28,38'), is continued substantially homogeneously, in particular linearly,

in particular wherein the closure element (20,20',20'') is configured according to any one of Claims 1 to 10.

12. Multifunctional tool (30) for the application and shaping of a sealing material (25,25',37), in particular to a closure element (20,20',20'') according to any one of Claims 1 to 10, on a material blank (40), comprising

- a recess (34) defining the shape of the resulting, vulcanized sealing material (25,25',37),
- a press-off edge (33) forming a first end of the recess (34) with respect to a tool cross section,
- a slot (35) connecting to the recess (34) at its second end, and

- a receptacle ~~(36)~~ for the sealing material ~~(25,25',37)~~,

wherein

- the recess ~~(34)~~ is shaped, in a region adjoining the press-off edge ~~(33)~~, such that a course of the press-off edge ~~(33)~~ with respect to the tool cross section is continued in this region by an adapted tool surface course substantially homogeneously, in particular linearly,
- the multifunctional tool ~~(30)~~, upon closure of the tool, cooperates with the introduced material blank ~~(40)~~ such that
  - the press-off edge ~~(33)~~ is compressed into the material blank ~~(40)~~ and closes off the recess ~~(34)~~ at its first end with the material blank ~~(40)~~,
  - the slot ~~(35)~~ forms at the second end an overflow channel ~~(38)~~, and
  - a sealing material ~~(25,25',37)~~ present in the receptacle ~~(36)~~ is forced and/or flows through the overflow channel ~~(38)~~ into the recess ~~(34)~~, and
- the sealing material ~~(25,25',37)~~, in a closed tool state, is vulcanizable,

in particular wherein

- the multifunctional tool can be tempered according to a predetermined cross-linking curve and/or
- the material blank forms a closure element ~~(20,20',20'')~~ or a part of the closure element ~~(20,20',20'')~~ according to any one of Claims 1 to 10.

13. Multifunctional tool ~~(30)~~ according to Claim 12, **characterized in that**

- the recess ~~(34)~~, in the region adjoining the press-off edge ~~(33)~~ has a homogeneous curvature producing an edgeless change of direction of the tool surface course, in particular between 75° and 105°, and/or
- has a homogeneous transition of the surface line along the tool cross section from the press-off edge ~~(33)~~ to the recess ~~(34)~~.

14. Method for manufacturing a closure element ~~(20,20',20'')~~ having a seal ~~(25,25',37)~~ for a vacuum valve, comprising

- a multifunctional tool ~~(30)~~ according to Claim 12 or 13 and
- a material blank ~~(40)~~ embodying the closure element ~~(20,20',20'')~~ or a part of the closure element ~~(20,20',20'')~~,

wherein

- in an open tool state, the material blank ~~(40)~~ and a sealing material ~~(25,25',37)~~ are introduced into the multifunctional tool ~~(30)~~, in particular into the receptacle for the sealing material ~~(25,25',37)~~,
- in a compression step, by closing of the multifunctional tool ~~(30)~~,
  - the press-off edge ~~(33)~~ is pressed into the material blank ~~(40)~~, whereby
    - a compression ~~(24,24',24'')~~ corresponding to the press-off edge ~~(33)~~ and having a pressing edge ~~(28,28')~~ is created in the material blank ~~(40)~~, and
    - the recess ~~(34)~~ is shut off at its first end, and
  - the sealing material ~~(25,25',37)~~ is deformed and/or liquefied such that at least a part of the sealing material ~~(25,25',37)~~ makes its way into the

recess ~~(34)~~ through the overflow channel ~~(38)~~ formed in the compression step by the slot ~~(35)~~ and fills said recess, and

- in a vulcanization step, a vulcanization of the sealing material ~~(25,25',37)~~ is effected substantially in accordance with the shape of the recess ~~(34)~~ in such a way that
  - the sealing material ~~(25,25',37)~~ is shaped, and configured with respect to the pressing edge ~~(28,28')~~, such that the surface course, created by the pressing edge ~~(28,28')~~, in the material blank ~~(40)~~ is continued substantially homogeneously, in particular linearly, and
  - the sealing material ~~(25,25',37)~~ is adhesively connected to the material blank ~~(40)~~,

  in particular wherein
  - the sealing material ~~(25,25',37)~~ is shaped, in a region ~~(27)~~ adjoining the pressing edge ~~(28,28')~~, such that in this region ~~(27)~~ the surface course of the sealing material ~~(25,25',37)~~ is homogeneous and has a homogeneous curvature producing an endless change of direction of the surface course, in particular between 75° and 105°, and/or
  - the multifunctional tool ~~(30)~~ is tempered during the vulcanization step according to a predetermined cross-linking curve.

15. Closure element ~~(20,20',20'')~~ acquired by implementation of a method according to Claim 14, in particular wherein a closure element ~~(20,20',20'')~~ is configured according to any one of Claims 1 to 10.