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1. [WO/2021/180673](#) FILLING DEVICE AND METHOD FOR FILLING

WO - 16.09.2021

Int.Class [F17C 5/06](#) Appl.No PCT/EP2021/055836 Applicant NPROXX B.V. Inventor KRONHOLZ, Stephan

The invention relates to a filling device [1] for filling various containers [2, 2a, 2b, 2c], in particular containers [2] in vehicles, with gaseous substances, in particular hydrogen, comprising at least one storage container [3], at least one pipe [4], and a controller [5]. According to the invention, the filling device [1] also has a pressure vessel [6, 6a, 6b] containing a gaseous substance under at least one maximum operating pressure  $p_{b\_max}$ , wherein the pressure vessel [6, 6a, 6b] can be operatively connected to the container [2, 2a, 2b, 2c].

2. [WO/2019/020597](#) FIBER-REINFORCED PRESSURE VESSEL

WO - 31.01.2019

Int.Class [F17C 13/00](#) Appl.No PCT/EP2018/069980 Applicant NPROXX B.V. Inventor MIDDENDORF, Christian

The invention relates to a pressure vessel [1] that is fiber-reinforced by means of fiber bands [FB] and to a method [100] for producing the fiber-reinforced pressure vessel [1], said pressure vessel comprising: an inner vessel [2], having a rotationally symmetrical center part [21] having an axis of symmetry [ZA] along the center part [21] and two domed pole caps [22], which close the center part [21]; and an outer layer [3] of fiber composite material formed of a plurality of layers of fibers [F] arranged one over the other and embedded in a matrix material, which outer layer is wound onto the inner vessel [2] in order to reinforce the inner vessel, the layers extending over the inner vessel [2] as a fiber band [FB] of a number of fibers [F] with a location- and layer-dependent fiber course. At least in some of the layers, the fiber band [FB] enters the region of the domed pole caps [22] from the center part [21] with a particular entry fiber angle [FW] relative to the axis of symmetry [ZA] and is guided there at a particular reversal point [31] in the winding direction [WR] of the fiber band back in the direction of the center part [22]. At least the fiber bands [FB] of some of the layers have at least one twist [32] in the region of the pole caps [22].

3. [WO/2018/184732](#) FIBER-REINFORCED PRESSURE VESSEL

WO - 11.10.2018

Int.Class [F17C 1/06](#) Appl.No PCT/EP2018/025078 Applicant NPROXX B.V. Inventor SONNEN, Michael

The invention relates to a fiber-reinforced pressure vessel [1] having a securely fixed fiber end [FE] and to a corresponding method [100]. The pressure vessel [1] according to the invention comprises an inner vessel [2] having a cylindrical central part [21] which has a cylinder axis [ZA] and two polar caps [22] closing the cylindrical central part [21], and an outer layer [3] wound on the inner vessel [2] for reinforcement thereof, said outer layer made of composite fiber material [FVM], consisting of a plurality of layers [L1, L2 and L3] of fibers [F] arranged one atop the other, embedded in a matrix material, wherein the fiber [F] from the last wound layer [L3] is guided out of the central part [21] to a region [33] of the pressure vessel [1] which, under pressure load, exhibits at most a negligible elongation relative to the central part [21], and a last portion [FL] of the fiber [F] is fixed in said region at least by one fiber end [FE].

4. [WO/2021/038000](#) METHOD FOR PRODUCING A PRESSURE CONTAINER AND PRESSURE CONTAINER

WO - 04.03.2021

Int.Class [F17C 1/06](#) Appl.No PCT/EP2020/074009 Applicant NPROXX B.V. Inventor MÜLLER, Dietmar

The invention relates to a method for producing a pressure container and to a corresponding pressure container. The invention also relates to a production method for a pressure container, wherein initially a pressure container blank comprising at least one liner type 4 and a cylindrical tube operatively connected thereto is produced and subsequently the pressure container blank is overwound with, for example, a fibre composite material.

5. [3575668](#) SELF-SEALING VALVE CONNECTION FOR PRESSURE VESSEL

EP - 04.12.2019

Int.Class [F17C 13/04](#) Appl.No 18185283 Applicant NPROXX BV Inventor KRONHOLZ STEPHAN

Die Erfindung betrifft einen Druckbehälter [1] mit einem Innenbehälter [2] aus einem Innenbehältermaterial und einer darauf angeordneten Außenschicht [3] sowie einem Ventilanschlussstück [4] mit Dichtkonus [41] und Außenstück [42], wobei der Dichtkonus [41] an einer Innenseite [23i] einer Auswölbung [23] des Innenbehälters und das Außenstück [42] zur Erzeugung eines Abdichtdrucks [AD] zwischen Dichtkonus [41], Auswölbung [23] und Außenstück [42] auf einer Außenseite [23a] der Auswölbung [23] positioniert ist, wobei das Außenstück [42] zur Auswölbung [23] hin eine geeignet geformte Nut [421] mit einer ersten und zweiten Kante [421a, 421b] zur Aufnahme eines unter Abdichtdruck [AD] abdichtenden Dichtungsring [6] aufweist, wobei Nut [421] und Dichtungsring [6] so dimensioniert sind und das Innenbehältermaterial dazu vorgesehen ist, unter dem Abdichtdruck [AD] aufgrund seiner plastischen Verformbarkeit zumindest in beiden Lücken [L1, L2] zwischen Dichtungsring [6] und erster sowie zweiter Kante [421a, 421b] hineinragende erste und zweite Dichtungswülste [24a, 24b] auszubilden.

6. [WO/2019/206959](#) METHOD FOR PRODUCING A FIBRE-REINFORCED PRESSURE VESSEL WITH POLE CAP REINFORCEMENT

WO - 31.10.2019

Int.Class [F17C 1/16](#) Appl.No PCT/EP2019/060459 Applicant NPROXX B.V. Inventor BÄUMER, Tristan

The invention relates to a method for producing a pressure vessel [10], comprising an inner vessel [20] and an outer layer [34] wound onto the inner vessel [20] and consisting of a fibre material. In the method, a holding device having multiple holding elements protruding therefrom is attached to an inner vessel [20] in order to wind a local pole cap reinforcement in a dome-shaped pole cap region [21; 22] of the inner vessel. The holding device is then removed and an outer layer [34] is produced by winding fibre material, the outer layer [34] enclosing the central region [23] and the pole cap regions [21; 22] of the inner vessel [20].



7. [3879164](#) METHOD AND DEVICE FOR FILLING

EP - 15.09.2021

Int.Class [F17C 5/06](#) Appl.No 20161757 Applicant NPROXX B.V Inventor KRONHOLZ STEPHAN

Die Erfindung betrifft eine Befüllvorrichtung 1 zum Befüllen diverser Behälter 2, 2a, 2b, 2c, insbesondere von Behältern 2 in Fahrzeugen, mit gasförmigen Stoffen, insbesondere Wasserstoff, umfassend mindestens einen Vorratsbehälter 3, mindestens eine Rohrleitung 4 und eine Steuerungseinrichtung 5. Es wird vorgeschlagen, dass die Befüllvorrichtung 1 weiterhin eine Druckflasche 6, 6a, 6b enthaltend einen gasförmigen Stoff unter mindestens einem maximalen Betriebsdruck  $p_{b,max}$  aufweist, wobei die Druckflasche 6, 6a, 6b mit dem Behälter 2, 2a, 2b, 2c wirkverbinderbar ist.

8. [WO/2021/037908](#) FIBRE-REINFORCED PRESSURE VESSEL

WO - 04.03.2021

Int.Class [F17C 1/06](#) Appl.No PCT/EP2020/073846 Applicant NPROXX B.V. Inventor TARNOWSKI, Benjamin

The invention relates to a fibre-reinforced pressure vessel [1] and to a method [100] for producing such a pressure vessel having an inner container [2] made from a thermoplastic material to accommodate a filling medium, having an outside and a fibre composite layer [3] arranged around the outside to provide the pressure vessel with a pressure resistance, and having at least one valve connection [4] connected to the inner container and the fibre composite layer. In addition, a thermoplastic band [5] is applied to at least some regions of the outside of the inner vessel, the thermoplastic band having a coefficient of thermal expansion which is low enough such that due to the thermal expansion any gap [6] produced by thermal shrinkage between the fibre composite layer and the inner container is kept lower than it would be without the presence of the thermoplastic band.

9. [WO/2018/210606](#) POLAR CAP-REINFORCED PRESSURE CONTAINER

WO - 22.11.2018

Int.Class [F17C 1/06](#) Appl.No PCT/EP2018/061774 Applicant NPROXX B.V. Inventor SONNEN, Michael

The invention relates to a method [100] for producing a fiber-reinforced pressure container [1] with fiber-reinforced polar caps [12] and a corresponding pressure container [1] comprising said polar caps [12]. The method has the steps of applying [220] fiber composite material [FCM] onto a provided winding body [100] in the shape of the polar caps by means of a winding process at at least one of the ends [110]; temporarily curing [230] the fiber composite material [FCM] in order to stabilize the shape, said material then remaining chemically active for a crosslinking process later; and separating [240] the fiber composite material in order to produce a polar cap reinforcement layer [32] which is released [250] from the winding body and positioned [260] on a liner support of the pressure container [1]. The polar cap reinforcement layer [32] is then crosslinked with the fiber composite material of the pressure container in order to produce the pressure container reinforcement layer [3].

10. [WO/2019/238678](#) FLUSHABLE PRESSURE VESSEL

WO - 19.12.2019

Int.Class [F17C 5/06](#) Appl.No PCT/EP2019/065213 Applicant NPROXX B.V. Inventor KRONHOLZ, Stephan

The invention relates to a pressure vessel [1] having a flushing lance [5], to a transport container [10] containing pressure vessels [1], and to a method [100, 200] for filling said pressure vessel [1] and for producing the pressure vessel [1]. Said pressure vessel comprises an inner vessel [2], an outer layer [3] applied to the inner vessel [2], a valve connection piece [4] arranged on one of the pole caps [22a] of the inner vessel [1], and a hollow, outwardly open flushing lance [5], which passes through the valve connection piece [4] and is held sealingly therein. The flushing lance [5] protrudes into the storage volume [SV] and is provided with a perforation [51] along the entire length [L5] thereof as far as a first end [52] of the flushing lance [5] facing the pole cap [22b] opposite the valve connection piece [4] in the storage volume [SV], for gas exchange with the storage volume. The flushing lance [5] extends so far to the pole cap [22b] opposite the valve connection piece [4] that the gas exchange extends as far as the opposite pole cap [22b].

11. [WO/2019/243413](#) SELF-SEALING VALVE CONNECTION FOR PRESSURE VESSELS

WO - 26.12.2019

Int.Class [F17C 13/04](#) Appl.No PCT/EP2019/066180 Applicant NPROXX B.V. Inventor KRONHOLZ, Stephan

The invention relates to a pressure vessel [1], comprising an inner container [2] made of an inner container material, and an outer layer [3] arranged thereon, and a valve connection piece [4] having a two-part sealing canus [41] and an outer piece [42], The sealing canus [41] is positioned on an inner side [23i] of a bulge [23] of the inner container, and the outer piece [42] is positioned between the two-part sealing canus [41], the bulge [23], and the outer piece [42] on an outer side [23a] of the bulge [23] for generating a sealing pressure [AD]. Towards the bulge [23], the outer piece [42] is provided with a suitably shaped groove [421] having a first and second edge [421a, 421b] for receiving a sealing ring [6] that seals off under sealing pressure [AD]. The groove [421] and the sealing ring [6] are dimensioned in such a way, and the purpose of the inner container material is such that at the sealing pressure [AD] on account of its plastic deformability, first and second sealing beads [24a, 24b] projecting at least into both gaps [L1, L2] between the sealing ring [6] and the first and second edges [421a, 421b] are formed.

12. [107850259](#) POLAR CAP-REINFORCED PRESSURE VESSEL

CN - 27.03.2018

Int.Class [F17C 1/06](#) Appl.No 201780002228.6 Applicant ENRICHMENT TECH COMPANY LTD ZWEIGNIEDERLASSUNG DEUTSCHLAND Inventor BAUMER THOMAS

The invention relates to a pressure vessel [1] having reinforced polar caps [22] and to a method for producing such a pressure vessel [1], which comprises an inner vessel [2] composed of a cylindrical central part [21] and two dome-shaped polar caps [22] which respectively close the central part [21] on both sides, and an outer layer [3] which is wound onto the inner vessel [2] and intended for reinforcing the inner vessel [2] against pressure loading, wherein the outer layer [3] has at least one polar cap-reinforcing layer [31] and a pressure vessel-reinforcing layer [32] of fibre composite material [FCM], wherein the polar cap-reinforcing layer [31] at least partially covers the polar caps [22] and the pressure vessel-reinforcing layer [32] covers the polar caps [22] and the central part [21], and a contour-stable preform [5] is arranged as the polar cap-reinforcing layer [31] on at least one of the polar caps [22], preferably on both polar caps [22].

13. [20210324999](#) POLAR CAP-REINFORCED PRESSURE VESSEL

US - 21.10.2021

Int.Class [F17C 1/06](#) Appl.No 16076768 Applicant Enrichment Technology Company Ltd. Inventor Thomas Bäumer

The invention relates to a pressure vessel with reinforced pole caps and a method for producing such a pressure vessel, which comprises an inner vessel of a cylinder-shaped central part and two dome-shaped pole caps closing the central part on both sides and an outer layer wound on the inner vessel for the reinforcement of the inner vessel against a pressure load, wherein the outer layer comprises at least one pole cap reinforcement layer and a pressure vessel reinforcement layer of fiber composite material, wherein the pole cap reinforcement layer at least partially covers the pole caps and the pressure vessel reinforcement layer covers the pole caps and the central part and a contour-stable preform is arranged as the pole cap reinforcement layer on at least one of the pole caps, preferably on both pole caps.

14. [WO/2021/037983](#) PRESSURE VESSEL

WO - 04.03.2021

Int.Class [F17C 1/06](#) Appl.No PCT/EP2020/073979 Applicant NPROXX B.V. Inventor SONNEN, Michael

The invention relates to a hybrid pressure vessel having a fiber composite component and a metal component. The invention furthermore relates to a method for producing such a hybrid pressure vessel. The hybrid pressure vessel according to the invention has a liner having an inner side and an outer side and having an outside diameter DL and a metal boss having an outside diameter DB, wherein the metal boss is designed to receive a valve, the hybrid pressure vessel having a storage volume in the interior thereof, the liner being tubular and wherein the outside diameter DB of the boss is at least exactly as large as the outside diameter DL of the liner.

15. [WO/2018/153779](#) POLE CAP WITH PRESSURE CONNECTION ELEMENT FOR PRESSURE VESSELS

WO - 30.08.2018

Int.Class [F17C 1/00](#) Appl.No PCT/EP2018/053860 Applicant NPROXX B.V. Inventor BÄUMER, Thomas

The invention relates to a pole cap [1] made from a plastic material for the pressure tight closure of a pressure vessel [100], a pressure vessel [100] having a pole cap [1] of this kind and a method [200, 300] for producing a pole cap [1] of this kind and for producing a pressure vessel [100] of this kind. The pole cap [1] comprises an inner face [11] for the later closure of the pressure vessel [100], an outer face [12] to be wound with a fibre composite material [3] after closure of the pressure vessel [100], a neck-shaped open through-hole [13] projecting from the outer face outwards having an inner contour [13i], each made from a plastic material, and a pressure connection element [2] connected to the through-hole [13] to close the through-hole [13], wherein the pressure connection element [2] comprises a metal sealing taper [21] having a first section [21a] projecting outwards through the through-hole [13] and having a second section [21b] tapering conically at least in the region of the through-hole [13] in the direction of the first section [21a], which second section is retained by means of a fixing means [22] arranged from the outside on the first section [21a] in a pressure tight pressed fit in the inner contour [13i].

16. [3434962](#) FIBRE-REINFORCED PRESSURE VESSEL

EP - 30.01.2019

Int.Class [F17C 13/00](#) Appl.No 17183176 Applicant NPROXX BV Inventor MIDDENDORF CHRISTIAN

Die Erfindung bezieht sich auf einen mittels Faserbändern (FB) faserverstärkten Druckbehälter (1) und auf ein Verfahren (100) zur Herstellung des faserverstärkten Druckbehälters (1) umfassend einem Innenbehälter (2) mit einem drehsymmetrischen Mittelteil (21) mit einer Symmetrieachse (ZA) entlang des Mittelteils (21) und zwei das Mittelteil (21) abschließende kuppelförmige Polkappen (22), und eine auf den Innenbehälter (2) zu dessen Verstärkung gewickelte Außenschicht (3) aus Faserverbundmaterial (FVM) aus mehreren übereinander angeordneten Lagen an Fasern (F) eingebettet in einem Matrixmaterial, die als Faserband (FB) aus einer Anzahl an Fasern (F) mit einem orts- und lagenabhängigen Faserverlauf über den Innenbehälter (2) verlaufen, wobei das Faserband (FB) zumindest in einigen der Lagen aus dem Mittelteil (21) mit einem jeweiligen Eintrittsfaserwinkel (FW) relativ zu der Symmetrieachse (ZA) in den Bereich der kuppelförmigen Polkappen (22) eintritt und dort in einem jeweiligen Umkehrpunkt (31) in seiner Wickelrichtung (WR) zurück in Richtung des Mittelteils (22) geführt wird, wobei zumindest die Faserbänder (FB) eines Teils der Lagen im Bereich der Polkappen (22) mindestens eine Verdrehung (32) aufweist.

17. [20210088183](#) FIBER-REINFORCED PRESSURE VESSEL

US - 25.03.2021

Int.Class [F17C 1/06](#) Appl.No 16633798 Applicant NPROXX B.V. Inventor Christian Middendorf

A pressure vessel is disclosed comprising an inner vessel with a rotationally symmetrical middle part with an axis of symmetry along the middle part and two dome-shaped polar caps which close off the middle part, and an outer layer, wound on the inner vessel to reinforce it, made of fiber composite material made of a plurality of plies of fibers embedded in a matrix material which are arranged one above another, which run as a fiber band made of a number of fibers with a location-dependent and position-dependent fiber orientation across the inner vessel, wherein the fiber band at least in some of the plies enters from the middle part at a respective entry fiber angle relative to the axis of symmetry into the region of the dome-shaped polar caps.

18. [20220275908](#) METHOD FOR PRODUCING A PRESSURE CONTAINER AND PRESSURE CONTAINER

US - 01.09.2022

Int.Class [F17C 1/06](#) Appl.No 17637573 Applicant NPROXX B.V. Inventor Dietmar Müller

The invention relates to a method of manufacturing a pressure vessel and to a corresponding pressure vessel. The invention proposes a manufacturing method for a pressure vessel where first a pressure vessel blank having at least one liner type 4 and a cylindrical pipe operatively connected to it is manufactured and subsequently, for instance, a fibre composite material is wrapped onto the pressure vessel blank.

19. [202217010015](#) METHOD FOR PRODUCING A PRESSURE CONTAINER AND PRESSURE CONTAINER

IN - 22.04.2022

Int.Class [F17C /](#) Appl.No 202217010015 Applicant NPROXX B.V. Inventor MÜLLER, Dietmar

The invention relates to a method for producing a pressure container and to a corresponding pressure container. The invention also relates to a production method for a pressure container, wherein initially a pressure container blank comprising at least one liner type 4 and a cylindrical tube operatively connected thereto is produced and subsequently the pressure container blank is overwound with, for example, a fibre composite material.

20. [3786512](#) METHOD FOR PRODUCING A PRESSURISED CONTAINER AND PRESSURISED CONTAINER

EP - 03.03.2021

Int.Class [F17C 1/06](#) Appl.No 19194566 Applicant NPROXX BV Inventor MÜLLER DIETMAR

Die Erfindung betrifft ein Verfahren zur Herstellung eines Druckbehälters sowie einen entsprechenden Druckbehälter. Die Erfindung schlägt ein Herstellverfahren für einen Druckbehälter vor, wobei zunächst ein Druckbehälterrohling, aufweisend zumindest einen Liner und ein mit ihm wirkverbundenes zylindrisches Rohr, hergestellt wird und anschließend der Druckbehälterrohling beispielsweise mit einem Faserverbundmaterial überwickelt wird.

21. [3149338](#) METHOD OF MANUFACTURING A PRESSURE VESSEL AND PRESSURE VESSEL

CA - 04.03.2021

Int.Class [F17C 1/06](#) Appl.No 3149338 Applicant NPROXX B.V. Inventor MULLER, DIETMAR

The invention relates to a method for producing a pressure container and to a corresponding pressure container. The invention also relates to a production method for a pressure container, wherein initially a pressure container blank comprising at least one liner type 4 and a cylindrical tube operatively connected thereto is produced and subsequently the pressure container blank is overwound with, for example, a fibre composite material.

22. [20210239269](#) METHOD FOR PRODUCING A FIBRE-REINFORCED PRESSURE VESSEL WITH POLE CAP REINFORCEMENT US - 05.08.2021

Int.Class [F17C 1/06](#) Appl.No 17050150 Applicant NPROXX B.V. Inventor Tristan Baumer

The invention refers to a method of manufacturing a pressure tank, comprising an inner container and an outer layer made of a fiber material which is wound around the inner container. In performing the method, a retention device with several retention elements protruding therefrom is attached to an inner container so as to wind a local pole cap reinforcement in a dome-shaped pole cap portion of the inner container. Then the retention device is removed and an outer layer is produced by winding of fiber material, the outer layer surrounding the central portion and the pole cap portions of the inner container.


23. [2905480](#) PROCEDIMIENTO PARA LA FABRICACIÓN DE UN RECIPIENTE A PRESIÓN REFORZADO CON FIBRA CON REFUERZO DE TAPA POLAR ES - 08.04.2022

Int.Class [F17C 1/16](#) Appl.No 19720109 Applicant NPROXX B.V. Inventor BÄUMER, Tristan

Procedimiento para la fabricación de un recipiente a presión [10], que comprende un recipiente interior [20] y una capa exterior [34] de un material de fibra, enrollada sobre el recipiente interior [20], caracterizado por las etapas: a) proporcionar un recipiente interior [20] con una porción central de forma cilíndrica [23] que presenta dos secciones terminales opuestas, cada una de cuyas aberturas está sellada con una porción de tapa polar en forma de cúpula [21; 22]; b) fijar un dispositivo de sujeción con varios elementos de sujeción sobresalientes [44; 45] en la zona de una sección terminal de la porción central [23], en el que el dispositivo de sujeción se fija separado axialmente de la abertura de la sección terminal; c) fabricar un refuerzo de tapa polar [33] enrollando material de fibra alrededor de al menos una parte de la porción de tapa polar [21; 22] y la sección terminal con el dispositivo de sujeción, en el que el material de fibra es guiado alrededor de los elementos de sujeción sobresalientes [44; 45] del dispositivo de sujeción con inversión de sentido; d) enrollar una bobina circunferencial [32] alrededor de la sección terminal con el refuerzo de tapa polar [33], en el que la bobina circunferencial [32] está situada entre la abertura de la sección terminal y el dispositivo de sujeción; e) cortar el material de fibra del refuerzo de tapa polar [33] entre el dispositivo de sujeción y la bobina circunferencial [32]; f) retirar el dispositivo de sujeción; g) fabricar una capa exterior [34] enrollando material de fibra, en el que la capa exterior [34] encierra la porción central [23] y las porciones de tapa polar [21; 22] del recipiente interior [20].

24. [102018110049](#) VERFAHREN ZUR HERSTELLUNG EINES FASERVERSTÄRKTEN DRUCKBEHÄLTERS MIT POLKAPPENVERSTÄRKUNG DE - 31.10.2019

Int.Class [F17C 1/04](#) Appl.No 102018110049 Applicant NPROXX B.V. Inventor Bäumer Tristan

Verfahren zur Herstellung eines Druckbehälters [10], umfassend einen Innenbehälter [20] und eine auf den Innenbehälter [20] gewickelte Außenschicht [34] aus einem Faserwerkstoff, gekennzeichnet durch folgende Schritte: a) Bereitstellen eines Innenbehälters [20] mit einem zylinderförmigen Mittelbereich [23], der zwei gegenüberliegende Endabschnitte aufweist, deren Öffnungen jeweils mit einem kuppelförmigen Polkappenbereich [21;22] verschlossen sind; b) Anbringen einer Haltevorrichtung mit mehreren abstehenden Halteelementen [44;45] im Bereich eines Endabschnittes des Mittelbereichs [23], wobei die Haltevorrichtung von der Öffnung des Endabschnitts axial beabstandet angebracht wird; c) Herstellen einer Polkappenverstärkung [33] durch Wickeln von Faserwerkstoff um wenigstens einen Teil des Polkappenbereiches [21;22] und den Endabschnitt mit der Haltevorrichtung, wobei der Faserwerkstoff mit Richtungsumkehr um die abstehenden Halteelemente [44;45] der Haltevorrichtung geführt wird; d) Wickeln einer Umfangswicklung [32] um den Endabschnitt mit der Polkappenverstärkung [33], wobei die Umfangswicklung [32] zwischen der Öffnung des Endabschnitts und der Haltevorrichtung liegt; e) Durchtrennen des Faserwerkstoffes der Polkappenverstärkung [33] zwischen der Haltevorrichtung und der Umfangswicklung [32]; f) Entfernen der Haltevorrichtung; g) Herstellen einer Außenschicht [34] durch Wickeln von Faserwerkstoff, wobei die Außenschicht [34] den Mittelbereich [23] und die Polkappenbereiche [21;22] des Innenbehälters [20] umschließt. 

25. [3784951](#) METHOD FOR PRODUCING A FIBRE-REINFORCED PRESSURE VESSEL WITH POLE CAP REINFORCEMENT EP - 03.03.2021

Int.Class [F17C 1/16](#) Appl.No 19720109 Applicant NPROXX B.V. Inventor BÄUMER TRISTAN

The invention relates to a method for producing a pressure vessel [10], comprising an inner vessel [20] and an outer layer [34] wound onto the inner vessel [20] and consisting of a fibre material. In the method, a holding device having multiple holding elements protruding therefrom is attached to an inner vessel [20] in order to wind a local pole cap reinforcement in a dome-shaped pole cap region [21; 22] of the inner vessel. The holding device is then removed and an outer layer [34] is produced by winding fibre material, the outer layer [34] enclosing the central region [23] and the pole cap regions [21; 22] of the inner vessel [20].

26. [3097786](#) METHOD OF MANUFACTURING A FIBER-REINFORCED PRESSURE TANK WITH POLE CAP REINFORCEMENT CA - 31.10.2019

Int.Class [F17C 1/16](#) Appl.No 3097786 Applicant NPROXX B.V. Inventor BAUMER, TRISTAN

The invention relates to a method for producing a pressure vessel [10], comprising an inner vessel [20] and an outer layer [34] wound onto the inner vessel [20] and consisting of a fibre material. In the method, a holding device having multiple holding elements protruding therefrom is attached to an inner vessel [20] in order to wind a local pole cap reinforcement in a dome-shaped pole cap region [21; 22] of the inner vessel. The holding device is then removed and an outer layer [34] is produced by winding fibre material, the outer layer [34] enclosing the central region [23] and the pole cap regions [21; 22] of the inner vessel [20].

27. [201917051421](#) POLAR CAP-REINFORCED PRESSURE CONTAINER IN - 24.01.2020

Int.Class [F17C 1/06](#) Appl.No 201917051421 Applicant NPROXX B.V. Inventor SONNEN, Michael

The invention relates to a method [100] for producing a fiber-reinforced pressure container [1] with fiber-reinforced polar caps [12] and a corresponding pressure container [1] comprising said polar caps [12]. The method has the steps of applying [220] fiber composite material [FCM] onto a provided winding body [100] in the shape of the polar caps by means of a winding process at at least one of the ends [110]; temporarily curing [230] the fiber composite material [FCM] in order to stabilize the shape, said material then remaining chemically active for a crosslinking process later; and separating [240] the fiber composite material in order to produce a polar cap reinforcement layer [32] which is released [250] from the winding body and positioned [260] on a liner support of the pressure container [1]. The polar cap reinforcement layer [32] is then crosslinked with the fiber composite material of the pressure container in order to produce the pressure container reinforcement layer [3].

28. [20220299160](#) FIBRE-REINFORCED PRESSURE VESSEL US - 22.09.2022

Int.Class [F17C 1/06](#) Appl.No 17638284 Applicant NPROXX B.V. Inventor Benjamin TARNOWSKI

The invention relates to a fiber-reinforced pressure vessel [1] and to a method [100] of manufacturing the same, having an inner vessel [2] made of a thermoplastic material for receiving a filling medium, with an outer face and a fiber composite layer [3] arranged around the outer face for providing pressure

resistance of the pressure vessel and at least one valve connection [4] connected to the inner vessel and the fiber composite layer; a thermoplastic band [5] being applied additionally at least on a portion of the outer face of the inner vessel, the thermoplastic band having a thermal expansion coefficient which is small enough to keep any gap [6] which may be created by thermal shrinkage between the fiber composite layer and the inner vessel by its thermal expansion coefficient smaller than would be the case without the presence of the thermoplastic band.

29. [20200240586](#) POLAR CAP-REINFORCED PRESSURE CONTAINER

US - 30.07.2020

Int.Class [F17C 1/06](#) Appl.No 16614641 Applicant NPROXX B.V. Inventor Michael Sonnen

The invention relates to a method for manufacturing a fibre-reinforced pressure vessel having fibre-reinforced polar caps as well as a corresponding pressure vessel having these polar caps. Therein, the method comprises the steps of applying fibre composite material onto a provided winding body having the shape of the polar caps at at least one of the ends, using a winding process; of intermediately curing the fibre composite material for dimensional stabilisation, said fibre composite material, however, subsequently still remaining chemically active for later cross-linking; of severing the fibre composite material for producing a polar cap reinforcing layer which is detached from the winding body and placed onto a liner underlay of the pressure vessel. Subsequently, the polar cap reinforcing layer is cross-linked with the fibre composite material of the pressure vessel for producing the pressure vessel reinforcing layer.

30. [2018268783](#) POLAR CAP-REINFORCED PRESSURE CONTAINER

AU - 22.11.2018

Int.Class [F17C 1/06](#) Appl.No 2018268783 Applicant NPROXX B.V. Inventor Bickendorf, Heinz-Willi

The invention relates to a method [100] for producing a fiber-reinforced pressure container [1] with fiber-reinforced polar caps [12] and a corresponding pressure container [1] comprising said polar caps [12]. The method has the steps of applying [220] fiber composite material [FCM] onto a provided winding body [100] in the shape of the polar caps by means of a winding process at at least one of the ends [110]; temporarily curing [230] the fiber composite material [FCM] in order to stabilize the shape, said material then remaining chemically active for a crosslinking process later; and separating [240] the fiber composite material in order to produce a polar cap reinforcement layer [32] which is released [250] from the winding body and positioned [260] on a liner support of the pressure container [1]. The polar cap reinforcement layer [32] is then crosslinked with the fiber composite material of the pressure container in order to produce the pressure container reinforcement layer [3].

31. [110662918](#) POLAR CAP-REINFORCED PRESSURE CONTAINER

CN - 07.01.2020

Int.Class [F17C 1/06](#) Appl.No 201880032943.9 Applicant NPROXX B.V. Inventor SONNEN MICHAEL

The invention relates to a method [100] for producing a fiber-reinforced pressure container [1] with fiber-reinforced polar caps [12] and a corresponding pressure container [1] comprising the polar caps [12]. The method has the steps of applying [220] fiber composite material [FCM] onto a provided winding body [100] in the shape of the polar caps by means of a winding process at at least one of the ends [110]; temporarily curing [230] the fiber composite material [FCM] in order to stabilize the shape, the material then remaining chemically active for a crosslinking process later; and separating [240] the fiber composite material in order to produce a polar cap reinforcement layer [32] which is released [250] from the winding body and positioned [260] on a liner support of the pressure container [1]. The polar cap reinforcement layer [32] is then crosslinked with the fiber composite material of the pressure container in order to produce the pressure container reinforcement layer [3].

32. [2019013781](#) RECIPIENTE DE PRESION REFORZADO CON CASQUETES POLARES.

MX - 13.01.2020


Int.Class [F17C 1/06](#) Appl.No 2019013781 Applicant NPROXX B.V. Inventor Frank OTREMBA

The invention relates to a method [100] for producing a fiber-reinforced pressure container [1] with fiber-reinforced polar caps [12] and a corresponding pressure container [1] comprising said polar caps [12]. The method has the steps of applying [220] fiber composite material [FCM] onto a provided winding body [100] in the shape of the polar caps by means of a winding process at at least one of the ends [110]; temporarily curing [230] the fiber composite material [FCM] in order to stabilize the shape, said material then remaining chemically active for a crosslinking process later; and separating [240] the fiber composite material in order to produce a polar cap reinforcement layer [32] which is released [250] from the winding body and positioned [260] on a liner support of the pressure container [1]. The polar cap reinforcement layer [32] is then crosslinked with the fiber composite material of the pressure container in order to produce the pressure container reinforcement layer [3].

33. [102017208492](#) POLKAPPENVERSTÄRKTER DRUCKBEHÄLTER

DE - 22.11.2018

Int.Class [F17C 1/06](#) Appl.No 102017208492 Applicant NPROXX B.V. Inventor Sonnen Michael

Ein Verfahren [200] zur Herstellung eines verstärkten Druckbehälters [1] mit einem zylindrischen Mittelabschnitt [11] und den Mittelabschnitt [11] beidseitig verschließenden Polkappen [12] umfassend eine Liner-Unterlage [2] und ein auf die Liner-Unterlage [2] als Druckbehälterverstärkungsschicht [3] aufgebracht Faserverbundmaterial (FVM), umfassend die Schritte - Bereitstellen [210] eines ersten Wickelkörpers [100] umfassend mindestens ein einer Form der Liner-Unterlage [2] der Polkappen [12] entsprechendes kuppelförmiges Ende [110] und eine an das Ende [110] angrenzende zylindrische Mittelteilauflage [120]; - Aufbringen [220] des Faserverbundmaterials [FVM] mittels eines Wickelprozesses zumindest auf das Ende [110] und die Mittelteilauflage [120] des ersten Wickelkörpers [100]; - Nachfolgend Anwenden eines geeigneten Zwischenaushärtungsprozesses [230] zur Formstabilisierung des gewickelten Faserverbundmaterials [FVM], - Durchtrennen [240] zumindest des Faserverbundmaterials [FVM] zwischen Ende [110] und Mittelteilauflage [120] mittels eines geeigneten Trennprozesses zur Herstellung einer Polkappenverstärkungsschicht [32]; - Ablösen [250] der Polkappenverstärkungsschicht [32] vom ersten Wickelkörper [100] und Aufsetzen [260] der abgelösten Polkappenverstärkungsschicht [32] auf die jeweilige Liner-Unterlage [2] der Polkappe [12] des späteren Druckbehälters [1]; - Aufbringen des Faserverbundmaterials [FVM] mittels eines Wickelprozesses auf den mit den separat gefertigten Polkappenverstärkungsschichten [32] belegten Liner [2]; und - Vernetzen der Polkappenverstärkungsschicht [32] und des Weiteren Faserverbundmaterials [FVM]. 

34. [2884778](#) RECIPIENTE A PRESIÓN REFORZADO CON TAPAS POLARES

ES - 13.12.2021

Int.Class [F17C 1/06](#) Appl.No 18723474 Applicant NPROXX B.V. Inventor SONNEN, Michael

Un procedimiento [200] para fabricar un recipiente a presión reforzado [1] con una sección central cilíndrica [11] y tapas polares [12] que cierran la sección central [11] en ambos lados, que comprende una base de revestimiento [2] y un material compuesto de fibras [FVM] aplicado sobre la base de revestimiento [2] como una capa de refuerzo del recipiente a presión [3], que comprende los pasos de facilitación [210] de un primer cuerpo de enrollamiento [100] que comprende al menos un extremo en forma de cúpula [110] correspondiente a una forma de la base de revestimiento [2] de las tapas polares [12] y un soporte de parte central cilíndrico [120] adyacente al extremo [110]; aplicación [220] del material compuesto de fibras [FVM] por medio de un proceso de enrollamiento al menos sobre el extremo [110] y el soporte de parte central [120] del primer cuerpo de enrollamiento [100]; uso de un proceso de endurecimiento intermedio [230] adecuado para estabilizar la forma del material compuesto de fibras enrollado [FVM]; separación [240] de al menos el material compuesto de fibras [FVM] entre el extremo [110] y el soporte de parte central [120] por medio de un proceso de separación adecuado para fabricar una capa de refuerzo de tapa polar [32]; desprendimiento [250] de la capa de refuerzo de tapa polar [31] del primer cuerpo de enrollamiento [100] y

colocación [260] de la capa de refuerzo de tapa polar desprendida [32] sobre la respectiva base de revestimiento [2] de la tapa polar [12] del recipiente a presión posterior [1]; aplicación del material compuesto de fibras (FVM) por medio de un proceso de enrollamiento sobre el revestimiento [2] cubierto con las capas de refuerzo de tapa polar [32] elaboradas por separado; y reticulación de la capa de refuerzo de tapa polar [32] y de otro material compuesto de fibras (FVM).

35. [112019024421](#) MÉTODO PARA UMA FABRICAÇÃO DE UM RECIPIENTE DE PRESSÃO REFORÇADO E RECIPIENTE DE PRESSÃO BR - 16.06.2020

Int.Class [F17C 1](#) Appl.No 112019024421 Applicant NPROXX B.V. Inventor CHRISTIAN MIDDENDORF

a invenção refere-se a um método [100] para produzir um recipiente de pressão reforçado com fibras [1] que tem tampas polares reforçadas com fibra [12] e um recipiente de pressão [1] correspondente que compreende as ditas tampas polares [12]. o método compreende as etapas de aplicar [220] material compósito de fibra (fvm) em um corpo de enrolamento [100] fornecido no formato das tampas polares por meio de um processo de enrolamento em pelo menos um das extremidades [110]; curar temporariamente [230] o material compósito de fibra (fvm) a fim de estabilizar o formato, sendo que o dito material compósito de fibra (fvm) permanece, então, quimicamente ativo para processo de reticulação posterior; e separar [240] o material compósito de fibra a fim de produzir uma camada de reforço da tampa polar [32] que é liberada [250] do corpo de enrolamento e posicionada [260] em um apoio de revestimento do recipiente de pressão [1]. a camada de reforço da tampa polar [32] é, então, com o material compósito de fibra do recipiente de pressão a fim de produzir a camada de reforço de recipiente de pressão [3].

36. [3786513](#) FIBRE-REINFORCED PRESSURE VESSEL EP - 03.03.2021

Int.Class [F17C 1/06](#) Appl.No 19194606 Applicant NPROXX B V Inventor TARNOWSKI BENJAMIN

Die Erfindung betrifft einen faserverstärkten Druckbehälter [1] und ein Verfahren [100] zum Herstellen eines solchen mit einem Innenbehälter [2] aus einem thermoplastischen Material zur Aufnahme eines Füllmediums mit einer Außenseite und einem um die Außenseite herum angeordneten Faserverbundschicht [3] zur Bereitstellung einer Druckfestigkeit des Druckbehälters und mindestens einem mit Innenbehälter und Faserverbundschicht verbundenen Ventilanschluss [4], wobei zusätzlich ein thermoplastisches Band [5] zumindest bereichsweise auf die Außenseite des Innenbehälters aufgebracht ist, wobei das thermoplastische Band einen Wärmeausdehnungskoeffizienten besitzt, der gering genug ist, um einen durch thermischen Schrumpf eventuell entstehenden Spalt [6] zwischen Faserverbundschicht und Innenbehälter durch seinen Wärmeausdehnungskoeffizienten geringer zu halten als es ohne Anwesenheit des thermoplastischen Bandes der Fall wäre.

37. [3625497](#) POLAR CAP-REINFORCED PRESSURE CONTAINER EP - 25.03.2020

Int.Class [F17C 1/06](#) Appl.No 18723474 Applicant NPROXX B V Inventor SONNEN MICHAEL

The invention relates to a method [100] for producing a fiber-reinforced pressure container [1] with fiber-reinforced polar caps [12] and a corresponding pressure container [1] comprising said polar caps [12]. The method has the steps of applying [220] fiber composite material (FCM) onto a provided winding body [100] in the shape of the polar caps by means of a winding process at at least one of the ends [110]; temporarily curing [230] the fiber composite material (FCM) in order to stabilize the shape, said material then remaining chemically active for a crosslinking process later; and separating [240] the fiber composite material in order to produce a polar cap reinforcement layer [32] which is released [250] from the winding body and positioned [260] on a liner support of the pressure container [1]. The polar cap reinforcement layer [32] is then crosslinked with the fiber composite material of the pressure container in order to produce the pressure container reinforcement layer [3].

38. [3062410](#) POLAR-CAP-REINFORCED PRESSURE VESSEL CA - 26.11.2019

Int.Class [F17C 1/06](#) Appl.No 3062410 Applicant NPROXX B.V. Inventor SONNEN, MICHAEL

The invention relates to a method [100] for manufacturing a fibre-reinforced pressure vessel [1] having fibre-reinforced polar caps [12] as well as a corresponding pressure vessel [1] having these polar caps [12]. Therein, the method comprises the steps of applying [220] fibre composite material (FVM) onto a provided winding body [100] having the shape of the polar caps at at least one of the ends [110], using a winding process; of intermediately curing [230] the fibre composite material (FVM) for dimensional stabilisation, said fibre composite material (FVM), however, subsequently still remaining chemically active for later cross-linking; of severing [240] the fibre composite material for producing a polar cap reinforcing layer [32] which is detached [250] from the winding body and placed [260] onto a liner underlay of the pressure vessel [1]. Subsequently, the polar cap reinforcing layer [32] is cross-linked with the fibre composite material of the pressure vessel for producing the pressure vessel reinforcing layer [3].

39. [202017055027](#) SELF-SEALING VALVE CONNECTION FOR PRESSURE VESSELS IN - 05.03.2021

Int.Class [F17C /](#) Appl.No 202017055027 Applicant NPROXX B.V. Inventor KRONHOLZ, Stephan

The invention relates to a pressure vessel [1], comprising an inner container [2] made of an inner container material, and an outer layer [3] arranged thereon, and a valve connection piece [4] having a two-part sealing canus [41] and an outer piece [42]. The sealing canus [41] is positioned on an inner side [23i] of a bulge [23] of the inner container, and the outer piece [42] is positioned between the two-part sealing canus [41], the bulge [23], and the outer piece [42] on an outer side [23a] of the bulge [23] for generating a sealing pressure (AD). Towards the bulge [23], the outer piece [42] is provided with a suitably shaped groove [421] having a first and second edge [421a, 421b] for receiving a sealing ring [6] that seals off under sealing pressure (AD). The groove [421] and the sealing ring [6] are dimensioned in such a way,

40. [112262279](#) FLUSHABLE PRESSURE VESSEL CN - 22.01.2021

Int.Class [F17C 5/06](#) Appl.No 201980039231.4 Applicant NPROXX B.V. Inventor KRONHOLZ STEPHAN

The invention relates to a pressure vessel [1] having a flushing lance [5], to a transport container [10] containing pressure vessels [1], and to a method [100, 200] for filling said pressure vessel [1] and for producing the pressure vessel [1]. Said pressure vessel comprises an inner vessel [2], an outer layer [3] applied to the inner vessel [2], a valve connection piece [4] arranged on one of the pole caps [22a] of the inner vessel [1], and a hollow, outwardly open flushing lance [5], which passes through the valve connection piece [4] and is held sealingly therein. The flushing lance [5] protrudes into the storage volume [SV] and is provided with a perforation [51] along the entire length [L5] thereof as far as a first end [52] of the flushing lance [5] facing the pole cap [22b] opposite the valve connection piece [4] in the storage volume [SV], for gas exchange with the storage volume. The flushing lance [5] extends so far to the pole cap [22b] opposite the valve connection piece [4] that the gas exchange extends as far as the opposite pole cap [22b].

41. [20210123568](#) SELF-SEALING VALVE CONNECTION FOR PRESSURE VESSELS US - 29.04.2021

Int.Class [F17C 13/04](#) Appl.No 17254626 Applicant NPROXX B.V. Inventor Stephan Kronholz

A pressure vessel is disclosed having an inner vessel made of an inner-vessel material and an outer layer applied thereon as well as a valve-connection piece with a two-part sealing cone and outer piece, the sealing cone being positioned on an inner face of a protrusion of the inner vessel and the outer piece for generating a sealing pressure being positioned between the two-part sealing cone, the protrusion and the outer piece on an outer face of the protrusion. The outer piece includes a suitably shaped groove having a first and a second edge for receiving a sealing ring that seals under the sealing pressure, wherein the groove and the sealing ring are dimensioned such that, under the sealing pressure and due to the plastic deformability, first and second sealing beads project at least into two gaps between the sealing ring and form the first and second edge.

42. **3587895** SELF-SEALING VALVE CONNECTION FOR PRESSURE VESSEL

EP - 01.01.2020

Int.Class F17C 13/04 Appl.No 18179194 Applicant NPROXX B V Inventor KRONHOLZ STEPHAN

Die Erfindung betrifft einen Druckbehälter [1] mit einem Innenbehälter [2] aus einem Innenbehältermaterial und einer darauf angeordneten Außenschicht [3] sowie einem Ventilanschlussstück [4] mit zweiteiligem Dichtkonus [41] und Außenstück [42], wobei der Dichtkonus [41] an einer Innenseite [23i] einer Auswölbung [23] des Innenbehälters und das Außenstück [42] zur Erzeugung eines Abdichtdrucks (AD) zwischen zweiteiligem Dichtkonus [41], Auswölbung [23] und Außenstück [42] auf einer Außenseite [23a] der Auswölbung [23] positioniert ist, wobei das Außenstück [42] zur Auswölbung [23] hin eine geeignet geformte Nut [421] mit einer ersten und zweiten Kante [421a, 421b] zur Aufnahme eines unter Abdichtdruck (AD) abdichtenden Dichtungsring [6] aufweist, wobei Nut [421] und Dichtungsring [6] so dimensioniert sind und das Innenbehältermaterial dazu vorgesehen ist, unter dem Abdichtdruck (AD) aufgrund seiner plastischen Verformbarkeit zumindest in beiden Lücken [L1, L2] zwischen Dichtungsring [6] und erster sowie zweiter Kante [421a, 421b] hineinragende erste und zweite Dichtungswülste [24a, 24b] auszubilden.

43. **112352126** SELF-SEALING VALVE CONNECTION FOR PRESSURE VESSELS

CN - 09.02.2021

Int.Class F17C 13/04 Appl.No 201980041927.0 Applicant NPROXX B.V. Inventor KRONHOLZ STEPHAN

The invention relates to a pressure vessel [1], comprising an inner container [2] made of an inner container material, and an outer layer [3] arranged thereon, and a valve connection piece [4] having a two-part sealing canus [41] and an outer piece [42]. The sealing canus [41] is positioned on an inner side [23i] of a bulge [23] of the inner container, and the outer piece [42] is positioned between the two-part sealing canus [41], the bulge [23], and the outer piece [42] on an outer side [23a] of the bulge [23] for generating a sealing pressure (AD). Towards the bulge [23], the outer piece [42] is provided with a suitably shaped groove [421] having a first and second edge [421a, 421b] for receiving a sealing ring [6] that seals off under sealing pressure (AD). The groove [421] and the sealing ring [6] are dimensioned in such a way, and the purpose of the inner container material is such that at the sealing pressure (AD) on account of its plastic deformability, first and second sealingbeads [24a, 24b] projecting at least into both gaps [L1, L2] between the sealing ring [6] and the first and second edges [421a, 421b] are formed.

44. **20210247024** FLUSHABLE PRESSURE VESSEL

US - 12.08.2021

Int.Class F17C 1/02 Appl.No 17251090 Applicant NPROXX B.V. Inventor Stephan Kronholz

A pressure vessel with a flushing lance, a transport container with pressure vessels and methods of filling and producing this pressure vessel are disclosed which comprises an inner vessel, an outer layer applied on the inner vessel, a valve connection piece arranged on one of the terminal caps of the inner vessel and a hollow flushing lance that is open to the outside and is guided through the valve connection piece and held therein in a sealing manner, wherein the flushing lance protrudes into the storage volume and is provided with a perforation along its entire length up to a first end of the flushing lance facing the terminal cap that lies opposite the valve connection piece in the storage volume for a gas exchange with the storage volume, wherein the flushing lance extends to the terminal cap which lies opposite the valve connection piece.

45. **3667153** FLUSHABLE PRESSURE VESSEL

EP - 17.06.2020

Int.Class F17C 5/06 Appl.No 20150019 Applicant NPROXX B V Inventor KRONHOLZ STEPHAN

Die Erfindung betrifft einen Druckbehälter [1] mit Spüllanze [5], einen Transportcontainer [10] mit Druckbehältern [1], sowie Verfahren [100, 200] zur Befüllung dieses Druckbehälters [1] und zur Herstellung des Druckbehälters [1], der einen Innenbehälter [2], eine auf den Innenbehälter [2] aufgebrachte Außenschicht [3], ein Ventilanschlussstück [4] angeordnet auf einer der Polkappen [22a] des Innenbehälters [1] und eine hohlförmige nach außen offene Spüllanze [5] umfasst, die durch das Ventilanschlussstück [4] hindurchgeführt und darin abdichtend gehalten ist, wobei die Spüllanze [5] in das Speichervolumen [SV] hineinragt und entlang ihrer gesamten Länge [L5] bis zu einem ersten Ende [52] der Spüllanze [5] zugewandt zu der dem Ventilanschlussstück [4] gegenüberliegenden Polkappe [22b] im Speichervolumen [SV] für einen Gasaustausch mit dem Speichervolumen mit einer Perforation [51] versehen ist, wobei sich die Spüllanze [5] soweit zu der dem Ventilanschlussstück [4] gegenüberliegenden Polkappe [22b] erstreckt, dass sich der Gasaustausch bis zur gegenüberliegenden Polkappe [22b] erstreckt.

46. **3103516** SELF-SEALING VALVE CONNECTION FOR PRESSURE VESSELS

CA - 26.12.2019

Int.Class F17C 13/04 Appl.No 3103516 Applicant NPROXX B.V. Inventor KRONHOLZ, STEPHAN

The invention relates to a pressure vessel [1], comprising an inner container [2] made of an inner container material, and an outer layer [3] arranged thereon, and a valve connection piece [4] having a two-part sealing canus [41] and an outer piece [42]. The sealing canus [41] is positioned on an inner side [23i] of a bulge [23] of the inner container, and the outer piece [42] is positioned between the two-part sealing canus [41], the bulge [23], and the outer piece [42] on an outer side [23a] of the bulge [23] for generating a sealing pressure (AD). Towards the bulge [23], the outer piece [42] is provided with a suitably shaped groove [421] having a first and second edge [421a, 421b] for receiving a sealing ring [6] that seals off under sealing pressure (AD). The groove [421] and the sealing ring [6] are dimensioned in such a way, and the purpose of the inner container material is such that at the sealing pressure (AD) on account of its plastic deformability, first and second sealing beads [24a, 24b] projecting at least into both gaps [L1, L2] between the sealing ring [6] and the first and second edges [421a, 421b] are formed.

47. **3581843** FLUSHABLE PRESSURE VESSEL

EP - 18.12.2019

Int.Class [F17C 5/06](#) Appl.No 18177400 Applicant NPROXX BV Inventor KRONHOLZ STEPHAN

Die Erfindung betrifft einen Druckbehälter [1] mit Spüllanze [5], einen Transportcontainer [10] mit Druckbehältern [1], sowie Verfahren [100, 200] zur Befüllung dieses Druckbehälters [1] und zur Herstellung des Druckbehälters [1], der einen Innenbehälter [2], eine auf den Innenbehälter [2] aufgebrachte Außenschicht [3], ein Ventilanschlussstück [4] angeordnet auf einer der Polkappen [22a] des Innenbehälters [1] und eine hohlförmige nach außen offene Spüllanze [5] umfasst, die durch das Ventilanschlussstück [4] hindurchgeführt und darin abdichtend gehalten ist, wobei die Spüllanze [5] in das Speichervolumen [SV] hineinragt und entlang ihrer gesamten Länge [L5] bis zu einem ersten Ende [52] der Spüllanze [5] zugewandt zu der dem Ventilanschlussstück [4] gegenüberliegenden Polkappe [22b] im Speichervolumen [SV] für einen Gasaustausch mit dem Speichervolumen mit einer Perforation [51] versehen ist, wobei sich die Spüllanze [5] soweit zu der dem Ventilanschlussstück [4] gegenüberliegenden Polkappe [22b] erstreckt, dass sich der Gasaustausch bis zur gegenüberliegenden Polkappe [22b] erstreckt.

48. [2020012761](#) CONEXION DE VALVULA AUTOSELLANTE PARA RECIPIENTES A PRESION.

MX - 15.02.2021

Int.Class [F17C 13/04](#) Appl.No 2020012761 Applicant NPROXX B.V. Inventor Stephan KRONHOLZ

The invention relates to a pressure vessel [1], comprising an inner container [2] made of an inner container material, and an outer layer [3] arranged thereon, and a valve connection piece [4] having a two-part sealing canus [41] and an outer piece [42]. The sealing canus [41] is positioned on an inner side [23i] of a bulge [23] of the inner container, and the outer piece [42] is positioned between the two-part sealing canus [41], the bulge [23], and the outer piece [42] on an outer side [23a] of the bulge [23] for generating a sealing pressure [AD]. Towards the bulge [23], the outer piece [42] is provided with a suitably shaped groove [421] having a first and second edge [421a, 421b] for receiving a sealing ring [6] that seals off under sealing pressure [AD]. The groove [421] and the sealing ring [6] are dimensioned in such a way, and the purpose of the inner container material is such that at the sealing pressure [AD] on account of its plastic deformability, first and second sealing beads [24a, 24b] projecting at least into both gaps [L1, L2] between the sealing ring [6] and the first and second edges [421a, 421b] are formed.

49. [20220325851](#) PRESSURE VESSEL

US - 13.10.2022

Int.Class [F17C 1/06](#) Appl.No 17638180 Applicant NPROXX B.V. Inventor Michael SONNEN

The invention relates to a hybrid pressure vessel with a fiber-composite component and a metallic component. Furthermore, the invention relates to a manufacturing method for such a hybrid pressure vessel. The hybrid pressure vessel according to the invention has a liner having an inner face and an outer face, with an outer diameter DL, and a metallic boss with an outer diameter DB, the metallic boss being adapted to accommodate a valve, the hybrid pressure vessel having a storage volume on the inside, the liner being pipe-shaped and the outer diameter DB of the boss being at least as large as the outer diameter DL of the liner.

50. [2909886](#) TAPA POLAR CON ELEMENTO DE CONEXIÓN A PRESIÓN PARA RECIPIENTE A PRESIÓN

ES - 10.05.2022

Int.Class [F17C 1/00](#) Appl.No 17157536 Applicant NPROXX B.V. Inventor Bäumer, Thomas

Una tapa polar [1] para el cierre estanco a presión de un recipiente a presión [100], donde la tapa polar [1] comprende un lado interior [11] para el cierre posterior del recipiente a presión [100], un lado exterior [12] para el sobre enrollado con un material compuesto de fibras [3] después del cierre del recipiente a presión [100] y un paso abierto en forma de cuello [13] que sobresale hacia fuera del lado exterior con un contorno interior [13i], respectivamente de material plástico, y un elemento de conexión a presión [2] conectado al paso [13] para el cierre del paso [13], donde el elemento de conexión a presión [2] comprende un cono de sellado [21] de metal con una primera sección [21 a] que sobresale hacia fuera a través del paso [13] y con una segunda sección [21b], que se estrecha cónicamente en la dirección de la primera sección [21 a] al menos en la zona del paso [13] y que se mantiene en un ajuste de apriete estanco a presión en el contorno interior [13i] por medio de un medio de fijación [22] dispuesto desde fuera sobre la primera sección [21 a], donde el contorno interior [13i] se estrecha cónicamente hacia fuera a lo largo del paso [13] al menos en una zona del paso [13], donde el contorno interior cónico [13i] está adaptado con exactitud a la segunda sección cónica [21b], caracterizada porque el contorno interior cónico [13i] del paso [13] se extiende desde el lado interior [11] hasta el extremo de cuello [13h] en el lado exterior [12].

51. [2019009905](#) TAPON POLAR CON UN ELEMENTO DE ORIFICIO DE PRESION PARA RECIPIENTES A PRESION.

MX - 21.11.2019

Int.Class [F17C 1/00](#) Appl.No 2019009905 Applicant NPROXX B.V. Inventor Thomas BÄUMER

The invention relates to a pole cap [1] made from a plastic material for the pressure tight closure of a pressure vessel [100], a pressure vessel [100] having a pole cap [1] of this kind and a method [200, 300] for producing a pole cap [1] of this kind and for producing a pressure vessel [100] of this kind. The pole cap [1] comprises an inner face [11] for the later closure of the pressure vessel [100], an outer face [12] to be wound with a fibre composite material [3] after closure of the pressure vessel [100], a neck-shaped open through-hole [13] projecting from the outer face outwards having an inner contour [13i], each made from a plastic material, and a pressure connection element [2] connected to the through-hole [13] to close the through-hole [13], wherein the pressure connection element [2] comprises a metal sealing taper [21] having a first section [21a] projecting outwards through the through-hole [13] and having a second section [21b] tapering conically at least in the region of the through-hole [13] in the direction of the first section [21a], which second section is retained by means of a fixing means [22] arranged from the outside on the first section [21a] in a pressure tight pressed fit in the inner contour [13i].

52. [112019017365](#) TAMPA DE POLO PARA O FECHAMENTO BEM VEDADO DE UM VASO DE PRESSÃO, VASO DE PRESSÃO REFORÇADO POR FIBRA, MÉTODO PARA PRODUIR UMA TAMPA DE POLO E MÉTODO PARA PRODUIR UM VASO DE PRESSÃO REFORÇADO POR FIBRA

BR - 31.03.2020

Int.Class [F17C 1](#) Appl.No 112019017365 Applicant NPROXX B.V. Inventor CLAUS CASTENHOLZ

a invenção se refere a uma tampa de polo [1] feita de um material plástico para o fechamento bem vedado de um vaso de pressão [100], um vaso de pressão [100] com tal tampa de polo [1] bem como a métodos [200, 300] para produzir tal tampa de polo [1] bem como tal vaso de pressão [100]. a tampa de polo [1] compreende um lado interno [11] para o fechamento posterior do vaso de pressão [100], um lado externo [12] para o superenrolamento com um material compósito de fibra [3] após o fechamento do vaso de pressão [100] e um duto aberto em formato de gargalo [13], o qual se projeta para fora do lado externo e tem um contorno interno [13i], cada um feito de material plástico, e compreende um elemento de porta de pressão [2] conectado ao duto [13] para o fechamento do duto [13], em que o elemento de porta de pressão [2] compreende um cone de vedação [21] feito de metal com uma primeira seção [21a] que se projeta para fora através do duto [13] e uma segunda seção [21b] que se afunila pelo menos na área do duto [13] de maneira em formato de cone na direção da primeira seção [21a], que é mantida por meio de um meio de fixação [22], disposto na primeira seção [21a] do lado de fora de um encaixe por pressão bem vedado no contorno interno [13i].

53. [201917038230](#) POLE CAP WITH PRESSURE CONNECTION ELEMENT FOR PRESSURE VESSELS

IN - 06.12.2019

Int.Class [F17C 1/00F](#) Appl.No 201917038230 Applicant NPROXX B.V. Inventor BÄUMER, Thomas

The invention relates to a pole cap [1] made from a plastic material for the pressure tight closure of a pressure vessel [100] a pressure vessel [100] having a pole cap [1] of this kind and a method [200 300] for producing a pole cap [1] of this kind and for producing a pressure vessel [100] of this kind. The pole cap [1] comprises an inner face [11] for the later closure of the pressure vessel [100] an outer face [12] to be wound with a fibre composite material [3] after closure of the pressure vessel [100] a neck-shaped open through-hole [13] projecting from the outer face outwards having an inner contour [13i] each made from a plastic material and a pressure connection element [2] connected to the through-hole [13] to close the through-hole [13] wherein the pressure connection element [2] comprises a metal sealing taper [21] having a first section [21a] projecting outwards through the through-hole [13] and having a second section [21b] tapering conically at least in the region of the through-hole [13] in the direction of the first section [21a] which second section is retained by means of a fixing means [22] arranged from the outside on the first section [21a] in a pressure tight pressed fit in the inner contour [13i].

54. [20200088299](#) POLE CAP WITH PRESSURE CONNECTION ELEMENT FOR PRESSURE VESSELS

US - 19.03.2020

Int.Class [F16J 13/12](#) Appl.No 16488394 Applicant NPROXX B.V. Inventor Thomas Bäumer

A pole cap is presented made of a plastic material for the pressure-tight closure of a pressure vessel. The pole cap comprises an inner side for the later closure of the pressure vessel, an outer side for the superwinding with a fiber composite material after closure of the pressure vessel and a neck-shaped open duct, which protrudes outwardly from the outer side and has an inner contour, each made of plastic material, and comprises a pressure port element connected to the duct for the closure of the duct, wherein the pressure port element comprises a seal cone made of metal with a first section protruding outwardly through the duct and a second section tapering at least in the area of the duct in a cone-shaped manner in the direction of the first section.

55. [202217009971](#) PRESSURE VESSEL

IN - 22.04.2022

Int.Class [F17C /](#) Appl.No 202217009971 Applicant NPROXX B.V. Inventor SONNEN, Michael

The invention relates to a hybrid pressure vessel having a fiber composite component and a metal component. The invention furthermore relates to a method for producing such a hybrid pressure vessel. The hybrid pressure vessel according to the invention has a liner having an inner side and an outer side and having an outside diameter DL and a metal boss having an outside diameter DB, wherein the metal boss is designed to receive a valve, the hybrid pressure vessel having a storage volume in the interior thereof, the liner being tubular and wherein the outside diameter DB of the boss is at least exactly as large as the outside diameter DL of the liner.

56. [3149336](#) PRESSURE VESSEL

CA - 04.03.2021

Int.Class [F17C 1/06](#) Appl.No 3149336 Applicant NPROXX B.V. Inventor SONNEN, MICHAEL

The invention relates to a hybrid pressure vessel having a fiber composite component and a metal component. The invention furthermore relates to a method for producing such a hybrid pressure vessel. The hybrid pressure vessel according to the invention has a liner having an inner side and an outer side and having an outside diameter DL and a metal boss having an outside diameter DB, wherein the metal boss is designed to receive a valve, the hybrid pressure vessel having a storage volume in the interior thereof, the liner being tubular and wherein the outside diameter DB of the boss is at least exactly as large as the outside diameter DL of the liner.

57. [2018226208](#) POLE CAP WITH PRESSURE CONNECTION ELEMENT FOR PRESSURE VESSELS

AU - 30.08.2018

Int.Class [F17C 1/00](#) Appl.No 2018226208 Applicant NPROXX B.V. Inventor Bäumer, Thomas

The invention relates to a pole cap [1] made from a plastic material for the pressure tight closure of a pressure vessel [100], a pressure vessel [100] having a pole cap [1] of this kind and a method [200, 300] for producing a pole cap [1] of this kind and for producing a pressure vessel [100] of this kind. The pole cap [1] comprises an inner face [11] for the later closure of the pressure vessel [100], an outer face [12] to be wound with a fibre composite material [3] after closure of the pressure vessel [100], a neck-shaped open through-hole [13] projecting from the outer face outwards having an inner contour [13i], each made from a plastic material, and a pressure connection element [2] connected to the through-hole [13] to close the through-hole [13], wherein the pressure connection element [2] comprises a metal sealing taper [21] having a first section [21a] projecting outwards through the through-hole [13] and having a second section [21b] tapering conically at least in the region of the through-hole [13] in the direction of the first section [21a], which second section is retained by means of a fixing means [22] arranged from the outside on the first section [21a] in a pressure tight pressed fit in the inner contour [13i].

58. [3366975](#) POLE CAP WITH PRESSURE CONNECTION ELEMENT FOR PRESSURE VESSELS

EP - 29.08.2018

Int.Class [F17C 1/00](#) Appl.No 17157536 Applicant NPROXX B V Inventor BÄUMER THOMAS

Die Erfindung betrifft eine Polkappe [1] aus einem Kunststoffmaterial zum druckdichten Verschluss eines Druckbehälters [100], einen Druckbehälter [100] mit einer solchen Polkappe [1] sowie Verfahren [200, 300] zur Herstellung einer solchen Polkappe [1] sowie eines solchen Druckbehälters [100]. Die Polkappe [1] umfasst dabei eine Innenseite [11] zum späteren Verschluss des Druckbehälters [100], eine Außenseite [12] zur Überwicklung mit einem Faserverbundmaterial [3] nach Verschluss des Druckbehälters [100] und eine halsförmige aus der Außenseite nach außen herausragende offene Durchführung [13] mit einer Innenkontur [13i], jeweils aus Kunststoffmaterial, und ein an die Durchführung [13] zum Verschluss der Durchführung [13] angeschlossenes Druckanschlusselement [2] umfasst, wobei das Druckanschlusselement [2] einen Dichtkonus [21] aus Metall mit einem durch die Durchführung [13] nach außen herausragenden ersten Abschnitt [21 a] und mit einem sich zumindest im Bereich der Durchführung [13] konusförmig in Richtung des ersten Abschnitts [21 a] verjüngenden zweiten Abschnitt [21 b] umfasst, der mittels eines von außen auf dem ersten Abschnitt [21a] angeordneten Fixierungsmittels [22] in einem druckdichten Presssitz in der Innenkontur [13i] gehalten wird.

59. [3053051](#) POLE CAP WITH A PRESSURE PORT ELEMENT FOR PRESSURE VESSELS

CA - 30.08.2018

Int.Class [F17C 1/00](#) Appl.No 3053051 Applicant NPROXX B.V. Inventor BAUMER, THOMAS

The invention relates to a pole cap [1] made from a plastic material for the pressure tight closure of a pressure vessel [100], a pressure vessel [100] having a pole cap [1] of this kind and a method [200, 300] for producing a pole cap [1] of this kind and for producing a pressure vessel [100] of this kind. The pole cap [1] comprises an inner face [11] for the later closure of the pressure vessel [100], an outer face [12] to be wound with a fibre composite material [3] after closure of the pressure vessel [100], a neck-shaped open through-hole [13] projecting from the outer face outwards having an inner contour [13i], each made from a plastic material, and a pressure connection element [2] connected to the through-hole [13] to close the through-hole [13], wherein the pressure connection element [2] comprises a metal sealing taper [21] having a first section [21a] projecting outwards through the through-hole [13] and having a second section [21b] tapering conically at least in the region of the through-hole [13] in the direction of the first section [21a], which second section is retained by means of a fixing means [22] arranged from the outside on the first section [21a] in a pressure tight pressed fit in the inner contour [13i].

60. **3786511** PRESSURE VESSEL

EP - 03.03.2021

Int.Class F17C 1/06 Appl.No 19194565 Applicant NPROXX B V Inventor SONNEN MICHAEL

Die Erfindung betrifft einen Hybriddruckbehälter mit einem Faserverbundbauteil und einem metallischen Bauteil. Weiterhin betrifft die Erfindung ein Herstellungsverfahren für einen solchen Hybriddruckbehälter. Der erfindungsgemäße Hybriddruckbehälter weist eine Innenseite und eine Außenseite aufweisenden Liner mit einem Außendurchmesser DL und einen metallischen Boss mit einem Außendurchmesser DB auf, wobei der metallische Boss dazu eingerichtet ist, ein Ventil aufzunehmen, wobei der Hybriddruckbehälter in seinem Inneren ein Speichervolumen aufweist, wobei der Liner rohrförmig ausgeführt ist und wobei der Außendurchmesser DB des Boss mindestens genauso groß ist wie der Außendurchmesser DL des Liners.

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