



(12)

EUROPEAN PATENT APPLICATION

- (43)

Date of publication:
22.05.2024 Bulletin 2024/21
- (51)

International Patent Classification (IPC):
B61G 3/16 (2006.01)
- (21)

Application number: 22207797.6
- (52)

Cooperative Patent Classification (CPC):
B61G 3/16
- (22)

Date of filing: 16.11.2022

- | | |
|--|--|
| <div>(84)</div> <div>Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN</div> | <div>(72)</div> <div>Inventor: JANÉRS, Anders
79195 Falun (SE)</div> <div>(74)</div> <div>Representative: Klunker IP
Patentanwälte PartG mbB
Destouchesstraße 68
80796 München (DE)</div> <div>Remarks:
Amended claims in accordance with Rule 137(2)
EPC.</div> |
| <div>(71)</div> <div>Applicant: Dellner Couplers AB
791 95 Falun (SE)</div> | |

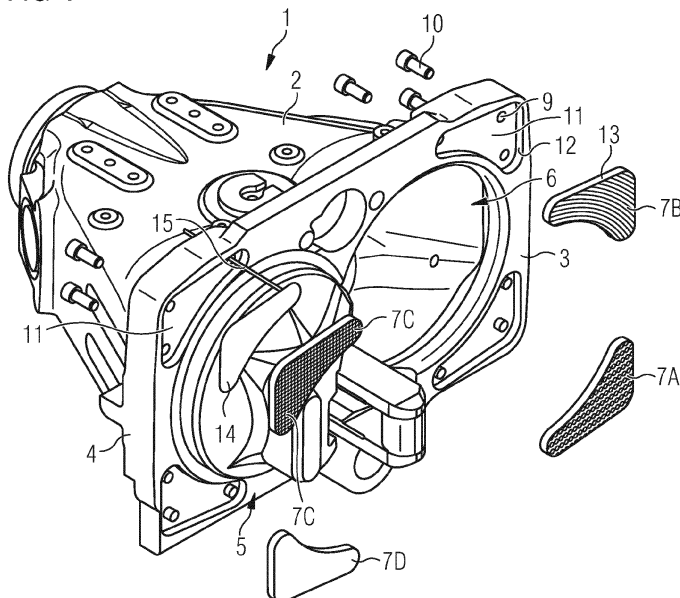
(54)

COUPLER HEAD FRONT FACE

- (57)

A coupler face (3) of a coupler head (1) for a rail vehicle, comprising a plurality of contact surface segments which are distributed over the coupler face (3) and elevated with respect to regions of the coupler face (3) adjacent to the contact surface segments, characterized
- in that the plurality of contact surface segments is formed as a plurality of pads (7A-7D) which are removably attached to the coupler face (3) so as to be replaceable upon maintenance or repair services.

FIG 1



Description

FIELD OF THE INVENTION

[0001] This invention generally relates to a coupler head for a rail vehicle, in particular to the design of a coupler face thereof. More specifically, the invention relates to a coupler face, a front plate for a coupler head having such a coupler face, a corresponding coupler head with the coupler face or front plate, a pad as well as a set of pads for the coupler face, and a method of maintaining or repairing a coupler head.

BACKGROUND OF THE INVENTION

[0002] The present invention is useful in any type of couplings of rail vehicles, particularly in connection with Scharfenberg-type couplings, which have a generally flat coupler face surrounding a cup-and-cone coupling structure and is likewise useful, particularly for other couplings having a cup-and-cone structure.

[0003] Within the coupling process, the coupler faces of two coupler heads contact each other with their front surfaces. The contacting front surfaces are provided to bear the loads during coupling. The loads are relatively low with up to 2,000 KN. Problems may arise in winter when snow and ice build up on the coupler faces. This may render the coupling process difficult.

[0004] While the coupler faces are typically overall flat, it is proposed in EP 3 713 806 A1 to structure the coupler face of a coupler head such that it comprises a number of contact surface segments distributed over the coupler face, the contact surface segments being elevated with respect to the adjacent regions of the coupler face. Between the contact surface segments, there are provided cut-out regions which are open to the circumference of the coupler face in order to allow ice and snow to be pushed outward from between the two coupler faces during the coupling process.

SUMMARY OF THE INVENTION

[0005] It is an object of the present invention to improve the coupler heads.

[0006] According to one aspect of the present disclosure, there is provided a coupler face of a coupler head for a rail vehicle, comprising a plurality of contact surface segments which are distributed over the coupler face and elevated with respect to regions of the coupler face adjacent to the contact surface segments. According to a preferred aspect of the present disclosure, the plurality of contact surface segments is formed as a plurality of pads which are removably attached to the coupler face so as to be replaceable upon maintenance or repair services.

[0007] The pads forming the elevated contact surface segments of the coupler face provide certain advantages over the prior art contact surface segments that form an

integral part of the coupler face. The main advantage is that they can be easily replaced when they are worn or damaged. Another advantage is that one type of pad can be exchanged against another type of pad with different properties, such as a different material and/or a different surface relief, depending on the current needs. Thus, only the pads need to be exchanged. This may substantially reduce costs.

[0008] Preferably, the pads each comprise at least one hole which is adapted to cooperate with a screw in order to releasably connect the pads to the coupler face by means of screws. For instance, the hole may be a stepped, unthreaded through-hole through which the shaft of a screw may pass, with the screw head resting on the step so that it does not extend beyond the front surface of the pad. The screw is then screwed into a threaded hole of the coupler head, thereby attaching the pad to the front of the coupler face.

[0009] However, in a more preferred embodiment, the pads each comprise at least one threaded hole and the coupler face comprises corresponding through-holes through which the screws can reach into the threaded holes of the pads from a rear side of the pad in order to releasably connect the pads to the coupler face by means of the screws. This way, any damage to the coupler face will not affect the screws. Even more preferably, when the threaded hole or holes in the pads are provided as blind holes on a rear side of the pads, then the threaded connection is protected against dirt and water ingress, which may increase lifetime and render maintenance and repair services easier.

[0010] According to another aspect of the present disclosure, the pads are arranged in one or more recesses provided in the coupler face. For instance, some or all of the pads may be arranged at appropriate locations in one single recess or the number of recesses may correspond to the number of pads. The depth of the recess is preferably in the range of 3 - 25 mm, preferably about 15 mm. One advantage of the recesses is that only the ground of the recess needs to be machined in order to mate with the rear side of the corresponding pad, whereas the remaining surface of the coupler face may largely remain unfinished or semifinished. Another advantage is that the workers doing maintenance or repair services on the coupler head can easily identify the locations where the new pads need to be positioned.

[0011] In this regard, according to a preferred embodiment, an inward-facing wall of the recesses and at least a portion of a circumferential surface of the respective pad are designed with respect to each other so that the pad is centered relative to the coupler face when it is placed in the recess. Such centering of the plate aids the workers in positioning the plate relative to the corresponding screw hole(s) in the coupler face prior to inserting the screw(s) into the screw hole(s) and fixing the pad to the coupler face by tightening the screw(s).

[0012] According to an even more preferred embodiment, the inner circumferential contour of the recess cor-

responds to an outer circumferential contour of the pad both in shape and size. Thus, the pad fits exactly into the recess so that a gap between the respective circumferences is preferably less than 1 mm along the entire circumference, more preferably less than 0.5 mm. This has the advantage that lateral forces acting on the pad will be borne by the inward-facing wall of the recess and will not have any impact on the screw connection.

[0013] Since the coupler face and, thus, the plurality of pads do not have to bear a load of more than 2,000 kN, the same material may be used for the pads as is usually used for the coupler face, namely typically non-hardened steel.

[0014] However, since the pads are not formed integrally with the coupler face, it is possible to provide pads made of a material which has better characteristics, for only little more costs. For instance, the pads may be made of a suitable alloy and/or a low-cost material, such as even a suitable plastic material.

[0015] Thus, the pads may preferably be made of steel, such as according to EN 10025-6, of cemented carbide, such as Tungsten carbide comprising at least 70 wt% Tungsten, or of any other material which preferably has a yield strength of at least 600 MPa.

[0016] Alternatively or in addition, the pads may be coated with a suitable coating. Should the coating be worn or a better coating be developed, the pad can easily be replaced with a corresponding new one. In particular, the pads may be coated with a hydrophobic material to provide water repellency and/or to reduce ice formation, such as a polytetrafluoroethylene (PTFE) material.

[0017] According to a further aspect of the present disclosure, the pads each have a surface relief on its front surface. The surface relief provides small cavities. The purpose of such cavities is to facilitate removal of ice and snow during the coupling process. That is, when opposing coupler faces are mating with each other during the coupling process, the pressure increase between the two coupler faces creates melting of snow and ice in those cavities, thereby creating a water film which reduces friction so that the ice and snow move away more easily. This effect is known from ice skate blades. One preferred surface relief comprises a pattern of erected polyhedrons, such as polyhedrons having the form of pyramids or truncated pyramids. Another preferred embodiment of the surface relief comprises grooves arranged in parallel to one another. The grooves may be many, such as more than 10 or even more than 20, and they may be, e.g., straight or curved or interrupted or a combination of all. Different surface relief patterns may be combined, such as the surface relief being partly composed of the erected polyhedrons and partially of the aforementioned grooves.

[0018] According to an even further aspect of the present disclosure, the pads are each provided with a separate heating element. Accordingly, rather than heating the entire coupler face, only the relevant sections thereof, namely the pads, are heated, which reduces both manufacturing and operational costs. In one embodi-

ment, the heating element is provided as a flat sheet placed underneath the corresponding pad. This facilitates the assembly of the coupler face and pads, with the flat heating elements interposed between them. The sheet-like heating element should have one or more corresponding through-holes for the attachment of screws passing therethrough. In another embodiment, the heating element comprises a wire which is positioned underneath the pad in a depression which is sized corresponding to the size of the wire, wherein such depression may be provided on either or both of the coupler face and the rear side of the pad. The advantage of this embodiment lies in the fact that there is no heat-transfer loss as the wire may directly contact the rear side of the pad. Preferably, the coupler face is provided with a heat-insulating layer or coating at least in the area of the wire or the wire is provided with a heat insulation on the side facing away from the pad so that the heat from the wire mainly dissipates toward the pad.

[0019] In general, the pads may be elevated with respect to the regions of the coupler face adjacent to the pads preferably by between 4 mm and 6 mm, more preferably by 5 mm.

[0020] Since the load to be borne by those pads is relatively low with 2,000 kN, only a small part of the overall surface of the coupler face needs to be provided with the aforementioned pads. Preferably, four pads are provided and arranged in opposing corner areas of the coupler face. More preferably, some or all of the pads are identical in shape so as to facilitate maintenance and repair services and reduce storage costs. In this regard, at least two of the pads may have a shape mirroring each other, i.e. the contour of one of the two pads as seen from a rear side thereof may correspond to the contour of the respective other one of the two pads as seen from a front side thereof. For instance, the pads in the upper right and upper left corners of the coupler face may mirror each other and the pads in the lower right and lower left corners of the coupler face may mirror each other, in which case it is further preferred that the pads in diagonally opposing corners are identical.

[0021] The coupler face may be integral with a housing of the coupler head, except for the removable pads, or may form part of a front plate to be attached to the coupler head housing.

[0022] Furthermore, the coupler head may be a coupler head comprising a coupling profile with a cone and a cup, such as in the Scharfenberg-type couplings, which allows the cone of the coupler head to be guided into and centered in the cup of an identical opposing coupler head during a coupling process, thereby aligning the two coupler heads. In this case, the coupler face surrounds the cup and cone, and the pads are arranged between an outer circumference of the coupler face, on the one hand, and the cup and cone, on the other hand.

[0023] A corresponding method of maintaining or repairing the coupler head of a rail vehicle comprises the steps of removing one or all of the plurality of pads from

the coupler head's coupler face and replacing each of the removed pads by attaching one or more new pads at the corresponding position(s) on the coupler face. In this process, a pad with a different surface relief than the replaced pad may advantageously be selected as the new pad.

[0024] Where heating elements are provided underneath the pads, the method may further comprise the step of placing the old heating element or even a new heating element under the new pad or, in cases where only the heating element needs to be replaced, even under the old pad.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] The foregoing summary as well as the following detailed description of preferred embodiments will be better understood when read in conjunction with the appended drawings. For the purpose of illustrating the present disclosure, reference is made to the drawings. The scope of the disclosure, however, is not limited to the specific embodiments disclosed in the drawings. In the drawings:

Fig. 1 is a perspective view of a coupler head,

Figs. 2A and 2B are perspective front and rear views, respectively, of the pads of the coupler head shown in Fig. 1, and

Figs. 3A and 3B show a pad with a heating element and a partial cross-section thereof, respectively.

DETAILED DESCRIPTION

[0026] Fig. 1 is a perspective view of a coupler head 1, more specifically a Scharfenberg Type 10 coupler head.

[0027] In general, the coupler head of a Scharfenberg coupling has a coupling profile with a cone (also known as "male cone") and a cup (also known as "female cone"), the cone of one coupler head being guided into and centered in the cup of an identical opposing coupler head during the coupling process, thereby aligning the two coupler heads. Each coupler head contains a rotating metal disc, generally referred to as a "hook plate", which constitutes the heart of the coupler head. Attached to one circumferential side of the hook plate is a plunger, generally referred to as a "coupling link" (also known as a "hoop"). On the opposing side there is a "notch" in the hook plate. The rotatable hook plate is urged into a position by a tension spring, in which position the notch is drawn into and the coupling link urged outward of the coupler head. In a ready-to-couple position of the coupler head, a release bar holds the hook plate in a position in which the coupling link is drawn into the coupler head and the notch is accessible from the outside. During coupling, when the cone of one coupler head enters into the cup of an identical opposing coupler head, the cone re-

leases the release bar of the opposing coupler head and, at the same time, the coupling link of the one coupler head presses against the hook plate of the opposing coupler head, thereby causing rotation of its own hook plate. Since the coupler heads are identical, such rotation of the hook plate occurs on both coupler heads simultaneously until the coupling links of both coupler heads couple with the notch in the hook plate of the respective other coupler head. The hook plates are held in this position, i.e. in the coupled position, due to the spring force so that the coupling process is complete. This way, half of the tensile force is transmitted by each of the two coupling links. Uncoupling of the coupler heads requires an external force in order to turn the hook plate of one of the coupler heads against the spring force into its uncoupling position until the coupling link of the coupler head slides out of the notch in the hook plate of the other coupler head and, simultaneously, the release bar moves into its uncoupled or ready-to-couple position. Since the hook plate of the other coupler head follows such movement, actuating the release mechanism of one coupler head simultaneously unlocks both coupler heads and both coupler heads move into their ready-to-couple position.

[0028] The coupler head 1 shown in Fig. 1 comprises a coupler head housing 2 with a coupler face 3. The coupler face 3 makes part of a front plate 4 which, in this embodiment, is integrally formed with or integrally connected to the coupler head housing 2. Alternatively, the front plate 4 with the coupler face 3 may be detachably connected to the coupler head housing 2.

[0029] The coupler head 1 has, on the one hand, a cone 5 extending from the front plate 4 and, on the other hand, next to the cone 5 a cup 6 extending through the plate 4 into the coupler head housing 2 so as to accommodate therein a corresponding cone of an identical opposing coupler head when two of those coupler heads 1 are coupled together. Pads 7A-7D are shown at a distance from the front plate 4 for being attached to the coupler face 3. The pads 7A-7D are shaped to fit between an outer circumference of the coupler face 3, on the one hand, and the cup 6 and cone 5, on the other hand. The coupler face 3 may be overall flat, if one disregards the cup 6 and cone 5, and the pads 7A-7D cover only a portion of the flat surface of the front plate, preferably 50% thereof or less.

[0030] Fig. 2B illustrates the pads 7A-7D perspectively from their rear sides 7'. The pads 7A-7D are each provided with three holes 8, which are threaded holes. There may be provided more or less than the three holes 8. As shown in Fig. 1, the coupler face 3, more specifically the front plate 4, comprises corresponding through-holes 9 through which screws 10 can reach into the threaded holes 8 of the pads 7A-7D, respectively, from the rear side 7' of the pads 7A-7D in order to releasably connect the pads 7A-7D to the coupler face 3 by means of the screws 10. In the embodiment shown, the holes 8 in the pads 7A-7D are blind holes, i.e. they do not extend all

the way through the pads 7A-7D.

[0031] In the embodiment shown in Fig. 1, the flat part of the coupler face 3 is provided with recesses 11 into which the pads 7A-7D are fitted when they are attached to the coupler face 3. The recesses 11 have a depth of 15 mm, but the depth may be different within the range of between 3 and 25 mm, and the pads 7A-7D have a thickness sufficiently large so that the pads 7A-7D extend out from the recesses 11 when they are mounted in the recesses 11. In this regard, the base of the recesses 11 may be flat and even and the rear sides 7' of the pads 7A-7D are likewise flat and even. In any case, the respective two surfaces should mate so as to provide full contact in order that loads acting on the pads 7A-7D are properly transmitted to the coupler head 1. The depth of the recesses 11 and the thickness of the pads 7A-7D are designed so that the pads 7A-7D are elevated with respect to those regions of the coupler face 3 which are located adjacent to the pads 7A-7D, preferably by between 4 mm and 6 mm, more preferably by 5 mm.

[0032] The recesses 11 have an inward-facing wall 12 and the pads 7A-7D each have a circumferential surface 13, wherein the inward-facing wall 12 and the circumferential surface 13 are designed with respect to each other such that the pads 7A-7D are centered relative to the coupler face 3 when they are placed into the recesses 11. More specifically, the inner circumferential contours of the recesses 11 correspond to the outer circumferential contours of the pads 7A-7D in shape and size. In other words, the pads 7A-7D fit exactly in the recesses 11. This has the advantage that lateral forces acting on the pads 7A-7D are counteracted by the inward-facing wall 12 of the recesses 11. This way, the danger of breakage of the screws 10 is limited because the screws 10 do not have to bear such lateral forces. A further advantage of the matching contours is that a single screw 10 may be sufficient for each pad 7A-7D in order to fix it in a corresponding recess 11.

[0033] As mentioned before, the pads may be made of different materials, such as non-hardened steel, an alloy or even a plastic material. Furthermore, the pads may be coated, in particular coated with a hydrophobic material which may provide water repellency and/or with a hydrogel which may reduce ice formation on the pads 7A-7D.

[0034] While the pads 7A-7D preferably have the same surface structure, Fig. 1 shows the pads 7A-7D as having four different surface structures, which is for illustrative purpose only. In the simplest case, the surface structure is overall flat, as shown on the pad 7D. However, more preferably the surface structure of the pads 7A-7D comprises a surface relief, e.g. one of those surface reliefs as shown on the pads 7B-7D.

[0035] Fig. 2A shows the surface structures of the pads 7A-7D somewhat enlarged. Accordingly, the pad 7A has on its front side a regular pattern of circular depressions. The pad 7B has on its front side a regular pattern of grooves arranged in parallel to one another. And pad 7C

has on its front side a regular pattern of erected polyhedrons, the polyhedrons in this particular embodiment having the form of truncated pyramids. These and other surface structures may be combined.

[0036] Turning back to Fig. 1, a heating element 14 is shown to be placed between the pad 7C and the corresponding recess 11. Electric energy for heating the heating element 14 is provided by electric wiring 15. In the embodiment shown, the heating element 14 is formed as a flat sheet to be placed underneath the pad 7C. Corresponding heating elements 14 may be provided underneath the other pads 7A, 7B and 7D. An insulating material (not shown) may be provided on the bottom of the recess 11 and/or on the rear side of the heating element 14 (not shown).

[0037] According to another embodiment, the heating element 14 has the form of a wire which is positioned underneath each of the pads 7A-7D in a correspondingly sized depression on the coupler face 3 and a correspondingly sized depression on the rear side 7' of the pads 7A-7D (not shown). For instance, the coupler face 3 may be provided with a depression having a rectangular cross-section and a depth corresponding to half of the width of the heating element 14 (or somewhat more than this) and the pad 7 may be provided with a depression on its rear side 7' having a semi-circular cross-section (or somewhat less than semi-circular) to match with the surface of the heating element 14.

[0038] Alternatively, the depression may be provided only on the rear side 7' of the pad 7, an example of which being shown in Figs. 3A and 3B. That is, Fig. 3A illustrates a pad 7 from the rear side 7' thereof, with a depression 7" provided in the rear side 7'. The heating element 14 in the form of a wire is placed in the depression 7". Fig. 3B shows a partial cross-section thereof. As can be seen, the depression 7" has a semi-cylindrical bottom so as to match the shape of the cylindrical heating element 14 and, thus, provide optimum heating transfer between the heating element 14 and the pad 7. The depth of the depression 7" coincides with the diameter of the heating element 14 so that, when the pad 7 is mounted on the coupler face 3, the heating element 14 is securely held in contact with the semi-cylindrical bottom of the depression 7".

[0039] Turning back to Fig. 1 again, the four pads 7A-7D are arranged at opposing corner areas of the coupler face 3. Those pads 7A, 7C and 7B, 7D arranged in mutually opposing corners of the coupler face 3 are identical in shape. This way, the number of different spare parts to be held available on stock can be reduced to only two different types of pads. A number of different pads can even be reduced further to only one type by designing all pads 7A-7D so as to be identical in shape. As can be seen from Fig. 1, this is a realistic option.

[0040] During maintenance or repair services of a corresponding coupler head, one or all of the pads 7A-7D may be removed from the coupler face 3 and either replaced or, if only the heating element 14 needs to be

replaced, subsequently reattached to the face plate 3. In particular, the new pads to be attached to the face plate 3 may be chosen to have a different surface relief than the replaced pads. In the case where the heating element 14 comprises a wire to be positioned underneath a respective pad, such as the cylindrical heating element 14, this may be positioned e.g. in the depression 7" on the rear side 7' of the pad 7.

[0041] Preferred examples of the present disclosure are specified in the following paragraphs:

1. A coupler face (3) of a coupler head (1) for a rail vehicle, comprising a plurality of contact surface segments which are distributed over the coupler face (3) and elevated with respect to regions of the coupler face (3) adjacent to the contact surface segments, characterized in that the plurality of contact surface segments is formed as a plurality of pads (7A-7D) which are removably attached to the coupler face (3) so as to be replaceable upon maintenance or repair services.

2. The coupler face (3) according to paragraph 1, wherein the pads (7A-7D) each comprise at least one hole (8) which is adapted to cooperate with a screw (10) in order to releasably connect the pads (7A-7D) to the coupler face (3) by means of screws.

3. The coupler face (3) according to paragraph 1 or 2, wherein the pads (7A-7D) each comprise at least one threaded hole (8) and wherein the coupler face (3) comprises corresponding through-holes (9) through which screws (10) can reach into the at least one threaded hole (8) of the pads (7A-7D) from a rear side (7') of the pads (7A-7D) in order to releasably connect the pads (7A-7D) to the coupler face (3) by means of screws.

4. The coupler face (3) according to paragraph 3, wherein the threaded hole (8) is a blind hole on a rear side (7') of the respective pad.

5. The coupler face (3) according to any one of the preceding paragraphs, wherein the pads (7A-7D) are each arranged in one or more recesses (11) provided in the coupler face (3).

6. The coupler face (3) according to paragraph 5, wherein an inward-facing wall (12) of the one or more recesses (11) and at least a portion of a circumferential surface (13) of each of the pads (7A-7D) are designed with respect to each other so that the pads (7A-7D) are centered relative to the coupler face (3) when placed in the one or more recesses (11).

7. The coupler face (3) according to paragraph 5 or 6, wherein an inner circumferential contour of each of the recesses (11) corresponds to an outer circum-

ferential contour of a corresponding one of the plurality of pads (7A-7D) in shape and size.

8. The coupler face (3) according to any one of the preceding paragraphs, wherein the pads (7A-7D) are made of non-hardened steel.

9. The coupler face (3) according to any one of paragraphs 1 to 8, wherein the pads (7A-7D) are made of a material having a yield strength of at least 600 MPa.

10. The coupler face (3) according to any one of paragraphs 1 to 9, wherein the pads (7A-7D) and the coupler face are made of the same material.

11. The coupler face (3) according to any one of the preceding paragraphs, wherein the pads (7A-7D) are coated.

12. The coupler face (3) according to paragraph 11, wherein the pads (7A-7D) are coated with a hydrophobic material.

13. The coupler face (3) according to paragraph 11 or 12, wherein the pads (7A-7D) are coated with a polytetrafluoroethylene material (PTFE).

14. The coupler face (3) according to any one of the preceding paragraphs, wherein the pads (7A-7D) each have a surface relief.

15. The coupler face (3) according to paragraph 14, wherein the surface relief comprises a pattern of erected polyhedrons.

16. The coupler face (3) according to paragraph 15, wherein the polyhedrons have the form of pyramids or truncated pyramids.

17. The coupler face (3) according to any one of paragraphs 14 to 16, wherein the surface relief comprises pattern of grooves which are arranged in parallel to one another.

18. The coupler face (3) according to any one of the preceding paragraphs, wherein the pads (7A-7D) are each provided with a separate heating element (14).

19. The coupler face (3) according to paragraph 18, wherein the heating element (14) is a flat sheet placed underneath the respective pad.

20. The coupler face (3) according to paragraph 18, wherein the heating element (14) comprises a wire which is positioned underneath the respective pad in a correspondingly sized depression on the coupler

face (3) and/or in a correspondingly sized depression (7") on a rear side (7') of the respective pad (7).

21. The coupler face (3) according to paragraph 20, wherein one or both of the depression on the coupler face (3) and a side of the wire facing away from the pad is provided with a heat insulation. 5

22. The coupler face (3) according to any one of the preceding paragraphs, wherein the pads (7A-7D) are elevated with respect to regions of the coupler face (3) adjacent to the pads (7A-7D) by between 4 mm and 6 mm, preferably 5 mm. 10

23. The coupler face (3) according to any one of the preceding paragraphs, wherein four pads (7A-7D) of the plurality of pads (7A-7D) are arranged in opposing corner areas of the coupler face. 15

24. The coupler face (3) according to any one of the preceding paragraphs, wherein all pads (7A-7D) or at least two pads (7A, 7C; 7B, 7D) of the plurality of pads (7A-7D) are identical in shape. 20

25. The coupler face (3) according to any one of the preceding paragraphs, wherein at least two pads (7A, 7B; 7C, 7D) of the plurality of pads (7A-7D) have a shape mirroring each other, i.e. the contour of one (7A; 7C) of the two pads (7A, 7B; 7C, 7D) as seen from a rear side (7') thereof corresponds to the contour of the respective other one (7B; 7D) of the two pads (7A, 7B; 7C, 7D) as seen from a front side thereof. 25 30

26. A front plate (4) for a coupler head (1) with a coupler face (3) according to any one of the preceding paragraphs. 35

27. A coupler head (1) having a coupler face (3) or a front plate (4) with a coupler face (3) according to any one of the preceding paragraphs. 40

28. The coupler head according to paragraph 27, comprising a coupling profile with a cone (5) and a cup (6) which allows the cone (5) of the coupler head (1) to be guided into and centered in the cup (6) of an identical opposing coupler head (1) during a coupling process, thereby aligning the two coupler heads (1). 45

29. A pad (7) for a coupler face (3) of a coupler head (1) for a rail vehicle comprising at least one threaded hole (8). 50

30. The pad according to paragraph 29, wherein the threaded hole (8) is a blind hole on a rear side (7') of the pad (7). 55

31. The pad according to paragraph 29 or 30, wherein the pad (7) is made of non-hardened steel.

32. The pad according to paragraph 29 or 30, wherein the pad (7) is made from a cemented carbide material.

33. The pad according to paragraph 29 or 30, wherein the pad (7) is made of a material having a yield strength of at least 600 MPa.

34. The pad according to any one of paragraphs 29 to 33, wherein the pad (7) is coated.

35. The pad according to paragraph 34, wherein the pad (7) is coated with a hydrophobic material.

36. The pad according to paragraph 34 or 35, wherein the pad (7) is coated with a polytetrafluoroethylene (PTFE) material.

37. The pad according to any one of paragraphs 29 to 36, wherein the pad (7) has a surface relief.

38. The pad according to paragraph 37, wherein the surface relief comprises a pattern of erected polyhedrons.

39. The pad according to paragraph 38, wherein the polyhedrons have the form of pyramids or truncated pyramids.

40. The pad according to any one of paragraphs 37 to 39, wherein the surface relief comprises a pattern of grooves which are arranged in parallel to one another.

41. A set of pads (7A-7D) according to any one of paragraphs 29 to 40, wherein all pads (7A-7D) or at least two pads (7A, 7C; 7B, 7D) are identical in shape.

42. A method of maintaining or repairing a coupler head (1) of a rail vehicle, the coupler head (1) having a coupler face (3) according to any one of paragraphs 1 to 25 or a front plate (4) according to paragraph 26, the method comprising the steps of removing one or all of the plurality of pads (7A-7D) from the coupler face (3) and replacing the removed one or more pads (7A-7D) by attaching respective new pads or reattaching the removed one or more pads (7A-7D).

43. The method according to paragraph 42, comprising the step of selecting a pad as the new pad which has a different surface relief than the replaced pad.

44. The method according to paragraph 42 or 43,

comprising the step of placing a heating element (14) underneath the new or reattached pad.

45. The method according to paragraph 44, wherein the step of placing the heating element (14) underneath the new or reattached pad includes positioning a wire in one or both of a correspondingly sized depression on the coupler face (3) and a correspondingly sized depression on a rear side (7') of the pad (7).

Claims

1. A coupler face (3) of a coupler head (1) for a rail vehicle, comprising a plurality of contact surface segments which are distributed over the coupler face (3) and elevated with respect to regions of the coupler face (3) adjacent to the contact surface segments, **characterized in that** the plurality of contact surface segments is formed as a plurality of pads (7A-7D) which are removably attached to the coupler face (3) so as to be replaceable upon maintenance or repair services.
2. The coupler face (3) according to claim 1, wherein the pads (7A-7D) each comprise at least one hole (8) which is adapted to cooperate with a screw (10) in order to releasably connect the pads (7A-7D) to the coupler face (3) by means of screws, wherein **preferably** the pads (7A-7D) each comprise at least one threaded hole (8) and the coupler face (3) comprises corresponding through-holes (9) through which screws (10) can reach into the at least one threaded hole (8) of the pads (7A-7D) from a rear side (7') of the pads (7A-7D) in order to releasably connect the pads (7A-7D) to the coupler face (3) by means of screws, wherein **more preferably** the threaded hole (8) is a blind hole on a rear side (7') of the respective pad.
3. The coupler face (3) according to any one of the preceding claims, wherein the pads (7A-7D) are each arranged in one or more recesses (11) provided in the coupler face (3), wherein **preferably** an inward-facing wall (12) of the one or more recesses (11) and at least a portion of a circumferential surface (13) of each of the pads (7A-7D) are designed with respect to each other so that the pads (7A-7D) are centered relative to the coupler face (3) when placed in the one or more recesses (11), wherein **more preferably** an inner circumferential contour of each of the recesses (11) corresponds to an outer circumferential contour of a corresponding one of the plurality of pads (7A-7D) in shape and size.
4. The coupler face (3) according to any one of the preceding claims, wherein the pads (7A-7D) are made

of non-hardened steel, an alloy, a cemented carbide material or a plastic material, wherein the pads (7A-7D) are **preferably** made of a material having a yield strength of at least 600 MPa.

5. The coupler face (3) according to any one of the preceding claims, wherein the pads (7A-7D) are coated, **preferably** coated with a hydrophobic material, **such as** a polytetrafluoroethylene (PTFE) material.
6. The coupler face (3) according to any one of the preceding claims, wherein the pads (7A-7D) each have a surface relief, wherein **preferably** the surface relief comprises one or both of: a pattern of erected polyhedrons, **more preferably** pyramids or truncated pyramids, and a pattern of grooves which are arranged in parallel to one another.
7. The coupler face (3) according to any one of the preceding claims, wherein the pads (7A-7D) are each provided with a separate heating element (14), wherein **preferably either** the heating element (14) is a flat sheet placed underneath the respective pad **or** the heating element (14) comprises a wire which is positioned underneath the respective pad in a correspondingly sized depression on the coupler face (3) and/or in a correspondingly sized depression (7'') on a rear side (7') of the respective pad (7), wherein **more preferably** one or both of the depression on the coupler face (3) and a side of the wire facing away from the pad is provided with a heat insulation.
8. The coupler face (3) according to any one of the preceding claims, wherein the pads (7A-7D) are elevated with respect to regions of the coupler face (3) adjacent to the pads (7A-7D) by between 4 mm and 6 mm, **preferably** 5 mm.
9. The coupler face (3) according to any one of the preceding claims, wherein all pads (7A-7D) or at least two pads (7A, 7C; 7B, 7D) of the plurality of pads (7A-7D) are identical in shape, **or** wherein at least two pads (7A, 7B; 7C, 7D) of the plurality of pads (7A-7D) have a shape mirroring each other, i.e. the contour of one (7A; 7C) of the two pads (7A, 7B; 7C, 7D) as seen from a rear side (7') thereof corresponds to the contour of the respective other one (7B; 7D) of the two pads (7A, 7B; 7C, 7D) as seen from a front side thereof.
10. A front plate (4) for a coupler head (1) with a coupler face (3) according to any one of the preceding claims.
11. A coupler head (1) having a coupler face (3) or a front plate (4) with a coupler face (3) according to any one of the preceding claims, **preferably** comprising a coupling profile with a cone (5) and a cup (6) which allows the cone (5) of the coupler head (1)

to be guided into and centered in the cup (6) of an identical opposing coupler head (1) during a coupling process, thereby aligning the two coupler heads (1).

12. A pad (7) for a coupler face (3) of a coupler head (1) for a rail vehicle comprising at least one threaded hole (8), wherein **preferably** the threaded hole (8) is a blind hole on a rear side (7') of the pad (7). 5
13. The pad according to claim 12, wherein the pad (7) has a surface relief, wherein **preferably** the surface relief comprises one or both of: a pattern of erected polyhedrons, **more preferably** pyramids or truncated pyramids, and a pattern of grooves which are arranged in parallel to one another. 10
14. A set of pads (7A-7D) according to claim 12 or 13, wherein all pads (7A-7D) or at least two pads (7A, 7C; 7B, 7D) are identical in shape. 15
15. A method of maintaining or repairing a coupler head (1) of a rail vehicle, the coupler head (1) having a coupler face (3) according to any one of claims 1 to 10 or a front plate (4) according to claim 11, the method comprising the steps of removing one or all of the plurality of pads (7A-7D) from the coupler face (3) and replacing the removed one or more pads (7A-7D) by attaching respective new pads or reattaching the removed one or more pads (7A-7D), wherein **preferably** the method comprises the step of selecting a pad as the new pad which has a different surface relief than the replaced pad. 20
16. The method according to claim 15, comprising the step of placing a heating element (14) underneath the new or reattached pad, wherein **preferably** the step of placing the heating element (14) underneath the new or reattached pad includes positioning a wire in one or both of a correspondingly sized depression on the coupler face (3) and a correspondingly sized depression on a rear side (7') of the pad (7). 25

Amended claims in accordance with Rule 137(2) EPC. 30

1. A coupler face (3) of a coupler head (1) for a rail vehicle, comprising a plurality of contact surface segments which are distributed over the coupler face (3) and elevated with respect to regions of the coupler face (3) adjacent to the contact surface segments, **characterized in that** the plurality of contact surface segments is formed as a plurality of pads (7A-7D) which are removably attached to the coupler face (3) so as to be replaceable upon maintenance or repair services. 35
2. The coupler face (3) according to claim 1, wherein 40

the pads (7A-7D) each comprise at least one hole (8) which is adapted to cooperate with a screw (10) in order to releasably connect the pads (7A-7D) to the coupler face (3) by means of screws, wherein **preferably** the pads (7A-7D) each comprise at least one threaded hole (8) and the coupler face (3) comprises corresponding through-holes (9) through which screws (10) can reach into the at least one threaded hole (8) of the pads (7A-7D) from a rear side (7') of the pads (7A-7D) in order to releasably connect the pads (7A-7D) to the coupler face (3) by means of screws, wherein **more preferably** the threaded hole (8) is a blind hole on a rear side (7') of the respective pad. 45

3. The coupler face (3) according to any one of the preceding claims, wherein the pads (7A-7D) are each arranged in one or more recesses (11) provided in the coupler face (3), wherein **preferably** an inward-facing wall (12) of the one or more recesses (11) and at least a portion of a circumferential surface (13) of each of the pads (7A-7D) are designed with respect to each other so that the pads (7A-7D) are centered relative to the coupler face (3) when placed in the one or more recesses (11), wherein **more preferably** an inner circumferential contour of each of the recesses (11) corresponds to an outer circumferential contour of a corresponding one of the plurality of pads (7A-7D) in shape and size. 50
4. The coupler face (3) according to any one of the preceding claims, wherein the pads (7A-7D) are made of non-hardened steel, an alloy, a cemented carbide material or a plastic material, wherein the pads (7A-7D) are **preferably** made of a material having a yield strength of at least 600 MPa. 55
5. The coupler face (3) according to any one of the preceding claims, wherein the pads (7A-7D) are coated, **preferably** coated with a hydrophobic material, **such as** a polytetrafluoroethylene (PTFE) material.
6. The coupler face (3) according to any one of the preceding claims, wherein the pads (7A-7D) each have a surface relief, wherein **preferably** the surface relief comprises one or both of: a pattern of erected polyhedrons, **more preferably** pyramids or truncated pyramids, and a pattern of grooves which are arranged in parallel to one another.
7. The coupler face (3) according to any one of the preceding claims, wherein the pads (7A-7D) are each provided with a separate heating element (14), wherein **preferably either** the heating element (14) is a flat sheet placed underneath the respective pad or the heating element (14) comprises a wire which is positioned underneath the respective pad in a correspondingly sized depression on the coupler face 55

- (3) and/or in a correspondingly sized depression (7") on a rear side (7') of the respective pad (7), wherein more **preferably** one or both of the depression on the coupler face (3) and a side of the wire facing away from the pad is provided with a heat insulation. 5
8. The coupler face (3) according to any one of the preceding claims, wherein the pads (7A-7D) are elevated with respect to regions of the coupler face (3) adjacent to the pads (7A-7D) by between 4 mm and 6 mm, **preferably** 5 mm. 10
9. The coupler face (3) according to any one of the preceding claims, wherein all pads (7A-7D) or at least two pads (7A, 7C; 7B, 7D) of the plurality of pads (7A-7D) are identical in shape, **or** wherein at least two pads (7A, 7B; 7C, 7D) of the plurality of pads (7A-7D) have a shape mirroring each other, i.e. the contour of one (7A; 7C) of the two pads (7A, 7B; 7C, 7D) as seen from a rear side (7') thereof corresponds to the contour of the respective other one (7B; 7D) of the two pads (7A, 7B; 7C, 7D) as seen from a front side thereof. 15 20
10. A front plate (4) for a coupler head (1) with a coupler face (3) according to any one of the preceding claims. 25
11. A coupler head (1) having a coupler face (3) or a front plate (4) with a coupler face (3) according to any one of the preceding claims, **preferably** comprising a coupling profile with a cone (5) and a cup (6) which allows the cone (5) of the coupler head (1) to be guided into and centered in the cup (6) of an identical opposing coupler head (1) during a coupling process, thereby aligning the two coupler heads (1). 30 35
12. Use of a pad (7) on a coupler face (3) of a coupler head (1) for a rail vehicle, the pad (7) comprising at least one threaded hole (8) for attaching the pad (7) to the coupler face (3), wherein **preferably** the threaded hole (8) is a blind hole on a rear side (7') of the pad (7). 40
13. The use according to claim 12, wherein the pad (7) has a surface relief, wherein **preferably** the surface relief comprises one or both of: a pattern of erected polyhedrons, **more preferably** pyramids or truncated pyramids, and a pattern of grooves which are arranged in parallel to one another. 45 50
14. The use according to claim 12 or 13, wherein the pad makes part of a set of pads (7A-7D), wherein all pads (7A-7D) of the set of pads or at least two pads (7A, 7C; 7B, 7D) of the set of pads are identical in shape. 55
15. A method of maintaining or repairing a coupler head (1) of a rail vehicle, the coupler head (1) having a coupler face (3) according to any one of claims 1 to 10 or a front plate (4) according to claim 11, the method comprising the steps of removing one or all of the plurality of pads (7A-7D) from the coupler face (3) and replacing the removed one or more pads (7A-7D) by attaching respective new pads or reattaching the removed one or more pads (7A-7D), wherein **preferably** the method comprises the step of selecting a pad as the new pad which has a different surface relief than the replaced pad.
16. The method according to claim 15, comprising the step of placing a heating element (14) underneath the new or reattached pad, wherein **preferably** the step of placing the heating element (14) underneath the new or reattached pad includes positioning a wire in one or both of a correspondingly sized depression on the coupler face (3) and a correspondingly sized depression on a rear side (7') of the pad (7).

FIG 1

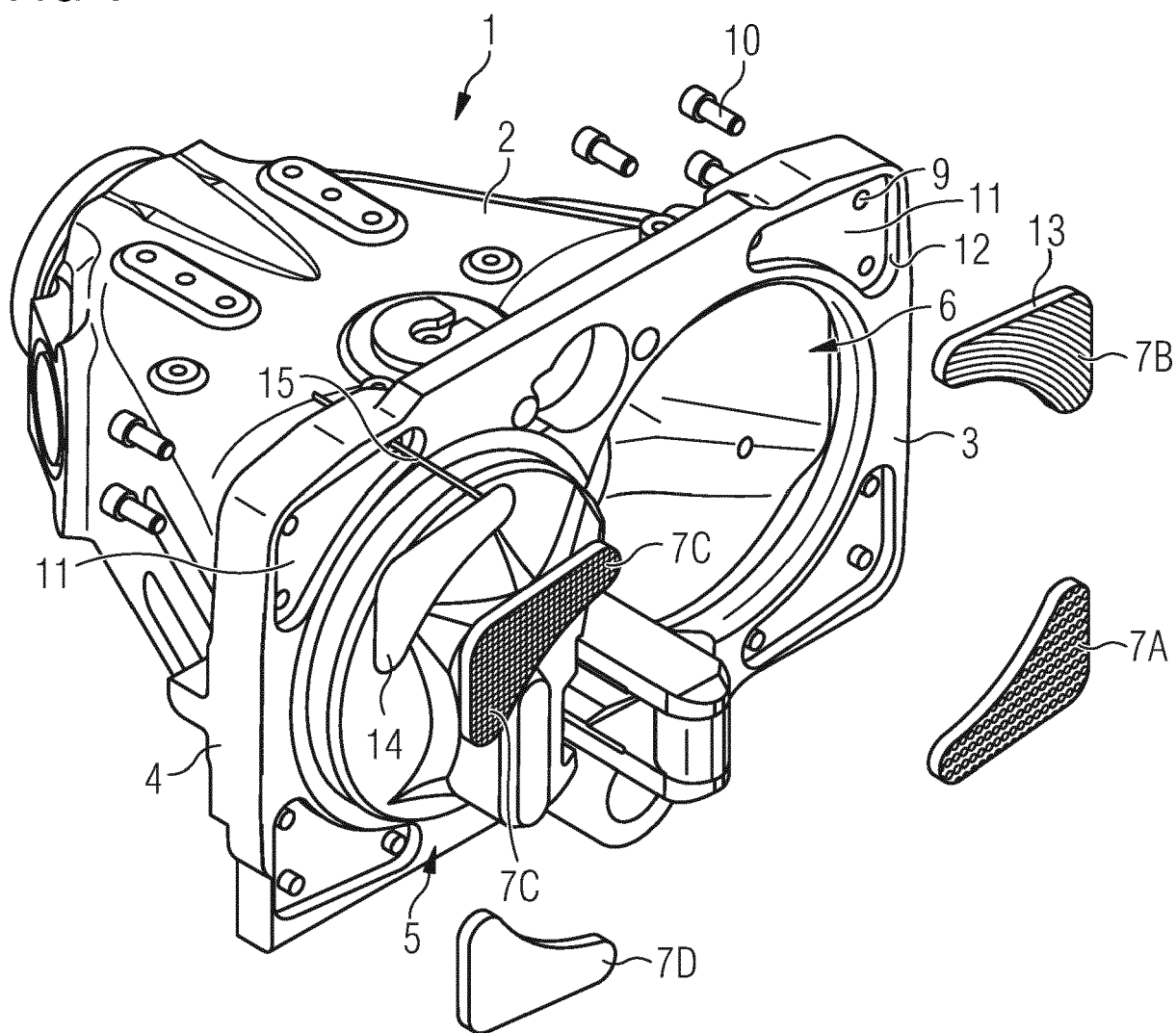


FIG 2A

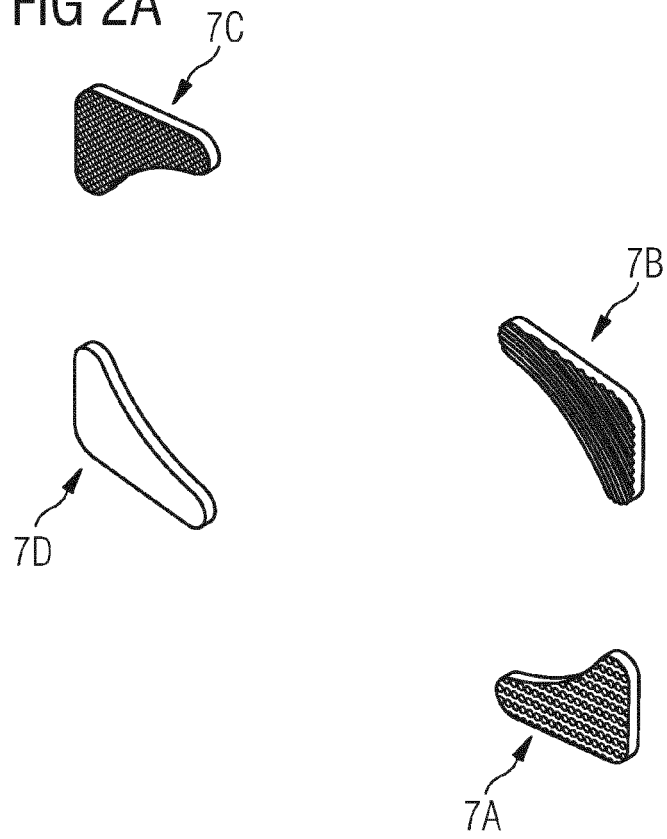


FIG 2B

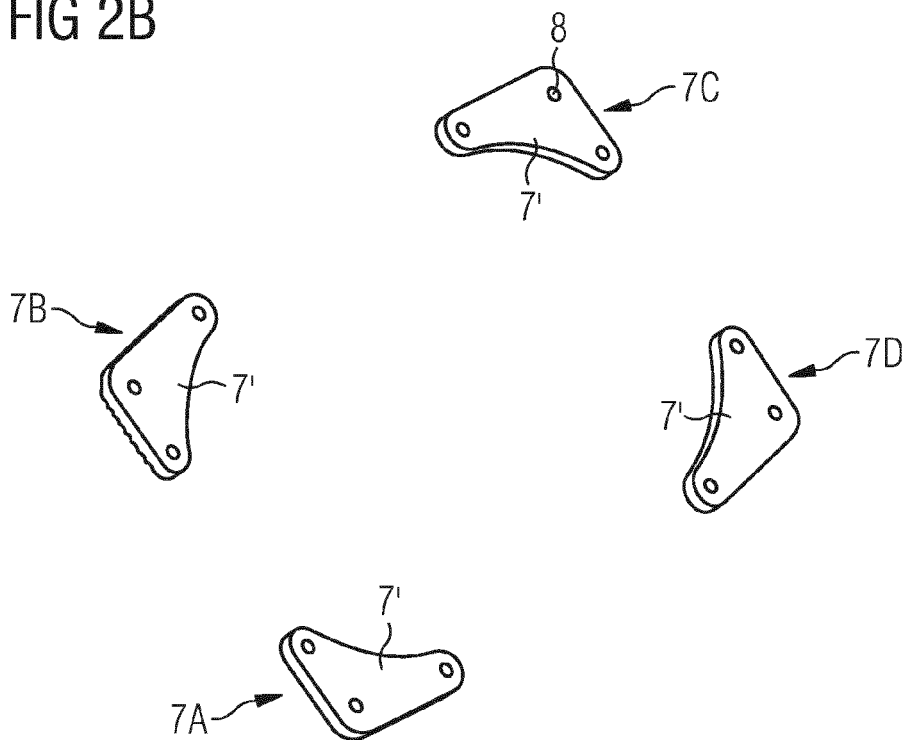


FIG 3A

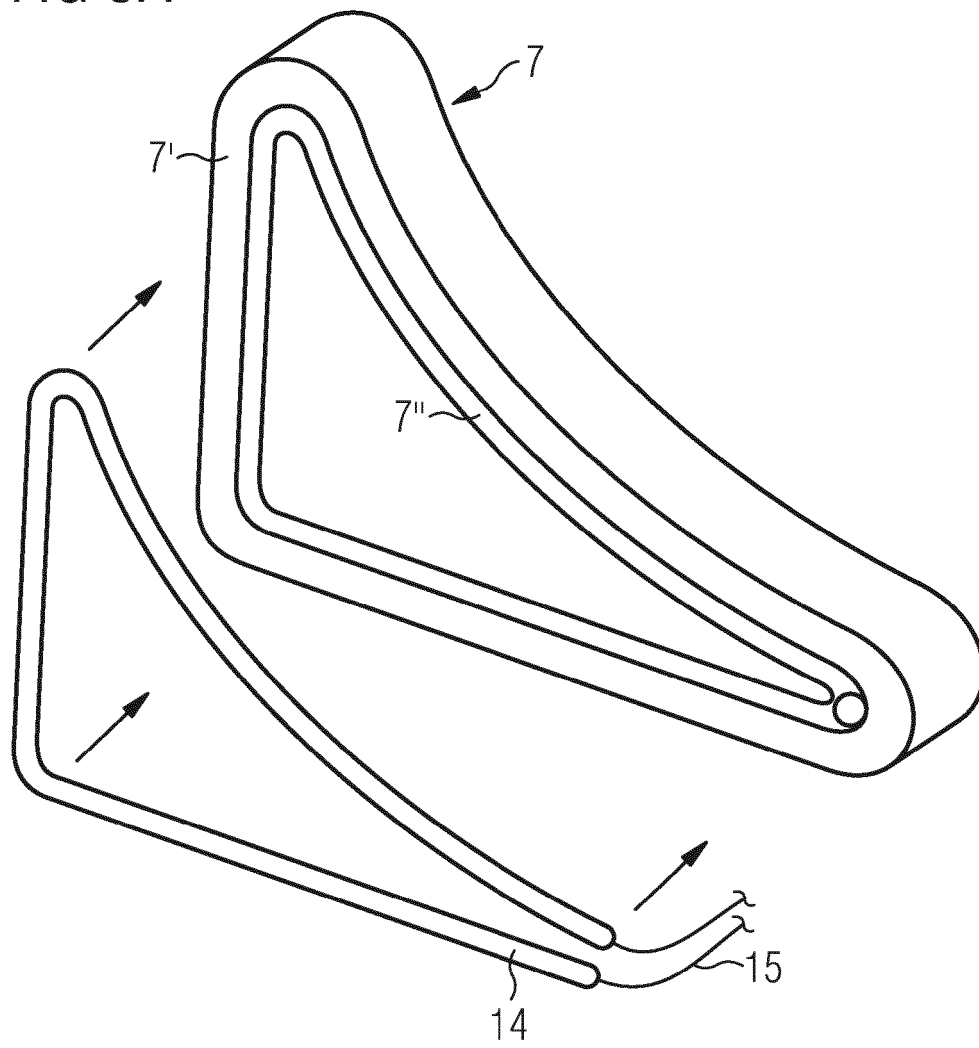
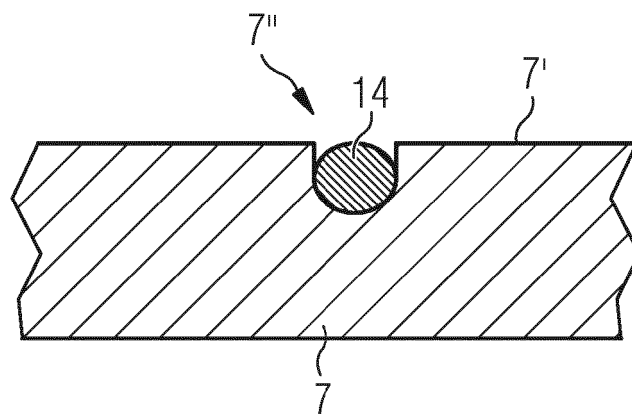


FIG 3B





EUROPEAN SEARCH REPORT

Application Number

EP 22 20 7797

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	DE 10 2017 127552 A1 (VOITH PATENT GMBH [DE]) 23 May 2019 (2019-05-23) * the whole document * -----	1, 15	INV. B61G3/16
A	DE 871 464 C (SCHARFENBERGKUPPLUNG AG) 23 March 1953 (1953-03-23) * the whole document * -----	1, 15	

TECHNICAL FIELDS SEARCHED (IPC)

B61G

The present search report has been drawn up for all claims

1

Place of search

Munich

Date of completion of the search

9 March 2023

Examiner

Lorandi, Lorenzo

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
 Y : particularly relevant if combined with another document of the same category
 A : technological background
 O : non-written disclosure
 P : intermediate document

T : theory or principle underlying the invention
 E : earlier patent document, but published on, or after the filing date
 D : document cited in the application
 L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 22 20 7797

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

09-03-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102017127552 A1	23-05-2019	CN 111356623 A	30-06-2020
		CN 113799843 A	17-12-2021
		DE 102017127552 A1	23-05-2019
		EP 3713806 A1	30-09-2020
		EP 4035967 A1	03-08-2022
		ES 2915578 T3	23-06-2022
		PL 3713806 T3	27-06-2022
		WO 2019101552 A1	31-05-2019

DE 871464 C	23-03-1953	NONE	

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 3713806 A1 [0004]