(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 231 685 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
18.10.2017 Bulletin 2017/42

(51) Int Cl.:
B61G 7/00 *(2006.01)*

(21) Application number: **16000818.1**

(22) Date of filing: **11.04.2016**

(84) 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 MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(71) Applicant: **Dellner Couplers AB**
791 95 Falun (SE)

(72) Inventors:
- **SHUTTLEWORTH, Gary**
  Alton, Staffordshire St10 eBH (GB)
- **BAILEY, Nigel**
  Lichfield, Staffordshire WS14 9YW (GB)

(74) Representative: **Tilmann, Max Wilhelm et al**
König-Szynka-Tilmann-von Renesse
Patentanwälte Partnerschaft mbB
Mönchenwerther Straße 11
40545 Düsseldorf (DE)

(54) **PAD SUITABLE TO REDUCE THE ACCUMULATION OF SNOW ON A SURFACE OF A COUPLER-HEAD OF A TRAIN**

(57) The invention relates to a pad suitable to reduce the accumulation of snow on a surface of or in a recess of a coupler-head of a train, when the pad is attached to the coupler-head having an inflatable chamber.

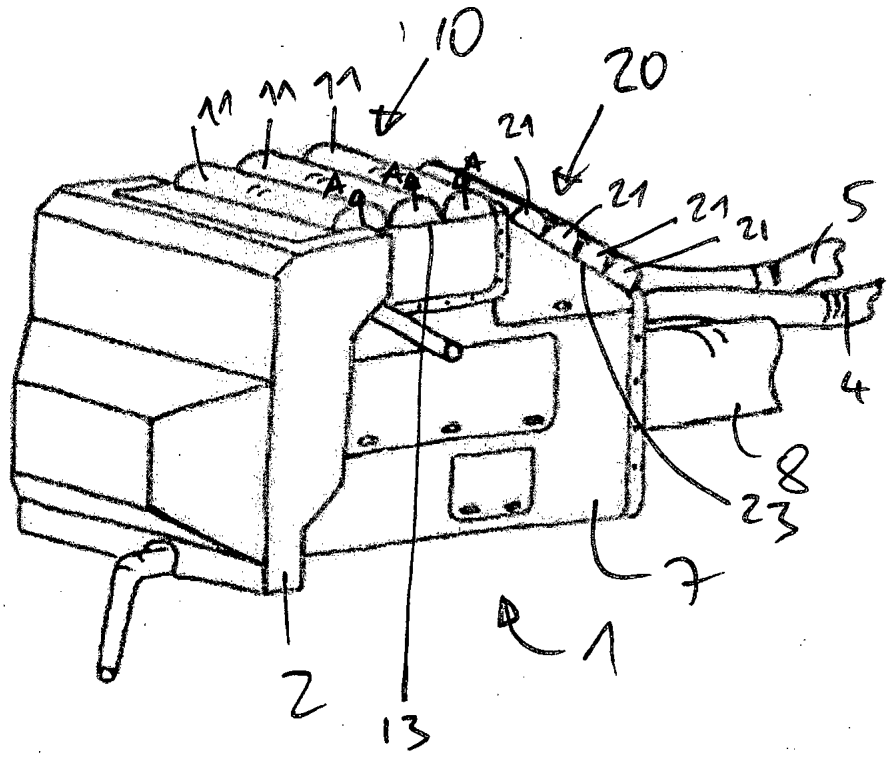

Fig. 3

EP 3 231 685 A1

Description

[0001] The invention relates to a pad suitable to reduce the accumulation of snow on a surface of or in a recess of a coupler-head of a train, when the pad is attached to the coupler-head. The invention also relates to a system to reduce the accumulation of snow on a surface of or in a recess of a coupler-head of a train. The invention also relates to a coupler-head of a train and to a method for reducing the accumulation of snow on a surface of or in a recess of a coupler-head of a train. The invention also relates to a pad suitable to reduce the accumulation of snow on a surface or in a recess of a car of a multi-car vehicle and to a car of a multi-car vehicle.

[0002] Trains are often designed to allow the connection between a first car of the train and a second car of the train by way of a coupler-head. This allows the cars to be connected to each other in order to form a train comprising these two cars. This does, however also allow the connection to be disconnected in order to create a train that only has one of the two cars that were previously connected. This allows the train operator to adapt the length of the train and the composition of the train (for example, if the cars are different purpose cars) liberally.

[0003] In the context of this application and the description of the invention below, a coupler-head is understood to be an assembly of parts that is attached to a car of a multi-car vehicle and that contains those parts that are necessary to make a detachable, mechanically reliable connection with a corresponding coupler-head of a neighboring car of the multi-car vehicle, the connection being suitable to allow the transfer of pulling forces from the one car to the neighboring car necessary to tow the one car behind the neighboring car. Coupler-heads sometimes include accessories to those parts that are necessary to make a detachable, mechanically reliable connection. These accessories can be parts of a pneumatic coupling, parts of hydraulic coupling and/or parts of an electric coupling. The accessories can also be housing parts that are used to house those parts that are necessary to make a detachable, mechanically reliable connection. The accessories can also be moveable covers that in a first position cover certain parts of those parts that are necessary to make a detachable, mechanically reliable connection and in a second position do not cover those parts. The Coupler-head can also have a drive mechanism to move the cover from one position to another. In a preferred embodiment, the assembly of parts that forms the coupler-head is arranged at one end of a coupler rod, the other end of the coupler rod being attached to the car. A typical example of a coupler-head is a central buffer coupling (referred to in German as Mittelpufferkupplung).

[0004] In countries, where trains run the risk of coming into contact with snow or ice, the risk exists that snow or ice accumulates on a surface of the coupler-head. Coupler-heads of trains may have surfaces where the accumulation of snow or ice is not troublesome for the operation of the coupler-head. But coupler-heads can also have surfaces where the operability of the coupler-head would be reduced, if snow or ice accumulates on this surface. Coupler-heads are often provided with covers at their front-facing surfaces. These covers are often provided with drive mechanisms that can drive the cover from a covering position into a retracted position that sets free the front-facing surface of the coupler-head. Such covers are for example described in EP 2 308 738 B1 (the cover being called a protective shroud in EP 2 308 738 B1) or EP 1 350 703 B1. Working with such retractable covers has shown the problem that if a surface of the coupler-head close to the position that is taken up by the cover in the retracted position is accumulated with snow or ice, the cover will not be able to fully retract and set free the front-facing surface of the coupler-head. There therefore is the need for means to reduce the accumulation of snow on a surface of or in a recess of a coupler-head of a train.

[0005] From EP 2 524 850 B1 an inflatable cushion is suggested for sealing an opening provided in the frontal area of a railway-bound vehicle, whereby the coupling shaft of a central buffer coupling connected to the vehicle extends when the vehicle is in the coupled or coupling-ready state through this opening. The cushion in the inflated states covers the opening, but leaves the surfaces of the coupler-head free as can be seen from Fig. 2 and 3 of EP 2 524 850 B1 and hence is not suitable to reduce the accumulation of snow on a surface of or in a recess of a coupler-head of a train. Indeed, it is to be expected that substantial amounts of snow accumulate in the trough that the cushion leaves behind the coupler-head.

[0006] Given this background, the problem to be solved is to suggest means that can reliably reduce the accumulation of snow on a surface of or in a recess of a coupler-head of a train.

[0007] This object is solved by the pad according to claim 1, the system according to claim 8, the coupler-head according to claim 10, the methods according to claim 11 and claim 12, the pad according to claim 13, the car according to claim 15 and the method according to claim 16 or 17. Preferred embodiments are described in the subordinate claims and in the description following here below.

[0008] The invention makes use of the general concept to reduce the accumulation of snow on a surface of or in a recess of a coupler-head of a train by use of an inflatable chamber. Such an inflatable chamber can be kept deflated at first and hence might lead to the accumulation of snow or ice on an outward facing surface of the inflatable chamber. However, as soon as the inflatable chamber is inflated, it has been realized that the change of shape of the inflatable chamber will lead to snow being moved off the outward facing surface or for snow and/or ice having frozen into a solid structure on the outward facing surface being cracked into smaller parts and/or being detached from the outward facing surface. The inflation of the chamber and hence the change of shape of the chamber

itself can already create a force that ejects the accumulated snow from the outward facing surface. The invention will, however, also reduce the accumulation of snow on a surface of or in a recess of a coupler-head of a train in simply loosening the accumulated snow and/or ice on the surface as will happen, when the inflatable chamber is inflated due to the change of shape of the inflatable chamber, because such loosening of the snow and/or ice on a coupler-head of a train, which typically vibrates and/or moves as the train is driven, will already provide a way to do away with at least some of the accumulated snow. In a preferred embodiment of this general concept of the invention, it is suggested to repeatedly inflate and deflate the inflatable chamber. This will lead to a repeated change of shape of the inflatable chamber, which will increase the positive effect of the concept according to the invention and will reduce the accumulation of snow on a surface of or in a recess of a coupler-head of a train over a longer time period.

[0009] Putting this basic concept of the invention into practice, a pad is suggested that is suitable to reduce the accumulation of snow on a surface of or in a recess of a coupler-head of a train, when the pad is attached to the coupler-head, whereby the pad according to the invention has at least one inflatable chamber.

[0010] In order to obtain the advantages of the invention it is already sufficient, if a pad is provided that basically consists of an inflatable chamber plus in an preferred embodiment elements like valves and/or connections for hoses necessary for the inflating and/or deflating of the chamber and/or elements necessary to attached the pad to the coupler-head.

[0011] Such a pad can for example in the inflated state of the inflatable chamber have the shape of a hose with two closed ends or the shape of a ball-shaped balloon or any other three-dimensional shape. This has to do with the fact that a coupler-head of a train, especially a coupler-head of a central buffer coupling for a train can have a multitude of pockets and/or recesses on the top or at the bottom or at the sides of the coupler-head. Coupler-heads of trains are often designed with a specific forward-facing geometry, but can sometimes be designed very liberally on their top, at their bottom or at their sides. This has to do with the fact that usually in order to allow a coupling only the front-facing geometry has to be of a specific design, namely the design that allows the coupling with a counterpart coupler-head. For the design of the top, the bottom or the sides of a coupler-head of a train, there often is only the limitation of a three-dimensional room, into which all parts of the coupler-head have to fit and should not stick out of this three-dimensional room. This leads to the circumstance that for example the sides of coupler-heads are complex three-dimensional surfaces that are created by the outer surfaces of the elements arranged behind the front-facing geometry, for example springs, cable strands, hydraulic cylinders, pneumatic pipes etc. Fig. 3 of EP 2 524 850 B1 gives a good example of the complex three-dimensional shape of the outward facing surfaces of the side of a coupler-head. The pockets and recesses of such a complex three-dimensional shape can be filled or at least partially filled by a suitably designed inflatable chamber of a pad. Or several pads are provided, the sum of the inflatable chambers of these pads filling the space or at least partially filling the space left free or one pad is provided with several inflatable chambers, the sum of the inflated chambers filling or at least partially filling the space left free on the top and/or a side and/or all sides and/or the bottom of a coupler-head. This shows that the advantages of the invention can already be realized, if the pad basically consists of the inflatable chamber, whereby the inflatable chamber can have a complex three-dimensional shape that depends on the area of the coupler-head of the train that it has to fill in its inflated state in order to reduce the accumulation of snow on this surface or in the respective recess of the coupler-head of the train.

[0012] As stated above, the advantageous of the invention can be realized with pads that consist of an inflatable chamber that might even have a complex three-dimensional shape depending on the area of the coupler head of the train that it has to fill in its inflated state. In a preferred embodiment, the inflatable chamber in its inflated state has a longitudinal extent, for example can be hose-shaped and has a circular or elliptical or square or triangular cross section in a plane, especially preferred in the majority of planes and especially preferred in all planes perpendicular to the longitudinal extent of the chamber. In a simple geometric shape, the inflatable chamber in its inflated state has a linear longitudinal extent, which means that the inflatable chamber in the inflated state extends along a straight line. The inflatable chamber in such an embodiment can, for example have the approximate shape of a cigar or a sausage. If the inflatable chamber is of such a design, the above statement about the geometric shape of the cross section is especially true in relation to a cross-section or cross sections, respectively, in planes perpendicular to the straight line along which the inflatable chamber extends. In more complex geometric shapes, an inflatable chamber that in its inflated state has a longitudinal shape and have the shape of a bend sausage or an S-shaped sausage.

[0013] In a preferred embodiment, the pad has the shape of a parallelogram or a trapezoid or is triangular or of circular shape. Typically, the shape of the pad will be adapted to the surface or the recess it is to be attached too. In a preferred embodiment, the pad will have a material that is provided in excess to the material necessary to a form the inflatable chamber. This excess material can be used to allow for the room necessary for attachment mechanisms to attach the pad to a coupler-head. The use of excess material can also be advantageous to adapted the geometric shape of the pad to a specific geometry, if on the other hand a geometry of the inflatable chamber is desired, that does not fully match with the desired overall geometrical shape of the pad. In preferred embodiments, inflatable chambers with a generally lon-

gitudinal extent, especially inflatable chambers that extend along a straight line are preferred because of their deflation and inflation properties. It is expected that such inflatable chambers can be inflated more easily and hence more rapidly than inflatable chambers with complex geometric shapes. For this reason, it might be, that for a pad it is preferred to have an inflatable chamber as part of the pad that generally extends along a longitudinal direction, while the pad is to be adopted to be attached to and to cover a surface of a coupler-head that is of a triangular shape or a different shape. In those circumstances, the use of excess material allows to adapt the pad to a desired geometric shape, even if the inflatable chamber is not of that geometric shape.

[0014] In a preferred embodiment, the pad can be attached to (and connected to) or forms part of a uni-piece cover of a coupler-head. Suggestions have been made to cover coupler-heads with covers made from flexible polymeric sheeting, especially textile material, for example a textile reinforced rubber laminate sheet or a rubber coated textile. Also a rubber sheet could be used. Such a cover can, for example, hang down on the sides of a coupler-head. The pad according to the invention can be used as part of such an overall cover in the way that it is placed at or provided for in those regions of the cover, where the cover is to cover horizontal surfaces or surface angled to the horizontal that are not steep enough for snow or ice to slide off easily.

[0015] In a preferred embodiment, the pad in the deflated state of the inflatable chamber is a slim object, preferably with a thickness of less than 100 mm, preferably with a thickness of less than 50 mm and even more preferred with a thickness of less than 10 mm and even more preferred with a thickness of less than 5 mm. In an preferred embodiment, the overall non-inflated section (the section that surrounds the inflatable chamber) can be in the region of 2 to 5 mm in thickness, while the inflatable chamber in the uninflated state could be <10mm, rising to > 10mm, possible even 50mm inflated. This can help to reduce the weight of the pad. The necessary thickness of the pad is determined by the amount of material that needs to be provided to give the inflatable chamber the shape that it is to take up in the inflated state. Additionally, the amount of material is determined by the shape that the pad is to have in the deflated state. If it is acceptable for the pad to sag in the deflated state, for example if the pad is supported by a flat surface of the coupler-head or if for other reasons it is acceptable that the pad in the deflated state of the inflatable chamber sags, the thickness of the pad and the material used can be chosen depending on the forces that will act on the pad, for example the air resistance that will act on the pad as the car moves, that carries the coupler-head that carries the pad. If, on the other hand, the pad is to be self-supporting and is to have a specific geometric shape in the deflated state of the inflatable chamber, the thickness and the type of material used is to be chosen according to other constrains. This second embodiment might lead to a thicker pad in its deflated state than the first embodiment described, where the pad is allowed to sag.

[0016] In a preferred embodiment, the inflatable chamber has an inflation direction, which is the direction in which the change of size of the inflatable chamber is the largest between the deflated and the inflated state of the inflatable chamber. In this preferred embodiment, the cross-section of the pad in at least one plane perpendicular to the inflation direction is a parallelogram or trapezoid or is triangular or is of circular shape. In a preferred embodiment, the two major extension directions of the pad are in a plane that is perpendicular to the inflation direction. In a preferred embodiment, the inflation direction is in the width direction of the pad.

[0017] In a preferred embodiment, the cross-section of the chamber in at least one plane perpendicular to the inflation direction is a parallelogram or a trapezoid.

[0018] In a preferred embodiment, the inflatable chamber in its inflated state has a longitudinal extend that is larger than its width or its height.

[0019] In a preferred embodiment, the pad has at least two inflatable chambers, preferably three inflatable chambers and even more preferred more than three inflatable chambers and even more preferred four inflatable chambers, and especially preferred more than four inflatable chambers. In a preferred embodiment, the inflatable chambers of a pad are arranged next to each other, especially preferred immediately neighboring each other. In a preferred embodiment, the general geometric shape (straight shape, arc shape, s-shape, etc.) of all inflatable chambers of the pad is the same, while in a first alternative, the actual size of the inflatable chambers might vary, for example the length of a first straight, inflatable chamber compared to the length of a second, neighboring straight inflatable chamber might be different to adapt for certain overall geometries of the pad, while in a second alternative, all inflatable chambers of the pad are of same general geometry and of the same size.

[0020] In a preferred embodiment, the pad has a frame and an elastic material attached to the frame, whereby the inflatable chamber is provided in the elastic material. Such a design allows for easy manufacture and provides a basically rigid design of the pad. In addition, or as an alternative reinforcements may be provided for in the elastic material, which either support the rigidness provided by a frame, if a frame is present, or by themselves already provided for a certain rigidness of the pad.

[0021] In a preferred embodiment, a valve is provided in an opening of the inflatable chamber or in a channel that leads to an opening of the inflatable chamber. Such a valve can be used to control the inflation state of the chamber.

[0022] In a preferred embodiment, the pad has a guide wall or a spoiler that can guide the air flowing over the pad and can improve the aerodynamics of the coupler-head.

[0023] In a preferred embodiment, the pad has a heat-

er, especially preferred an electric wire heater. The use of a heater can assist in the reduction of the accumulation of snow on a surface of or in a recess of a coupler head or in a recess of a train.

[0024] The pad can have the general structure that it has an outer envelope piece, for example a rubber envelope and an internal piece or internal pieces arranged inside the envelope piece, which internal piece (s) aid in creating the inflatable chamber. This divide between an outer envelope and an internal piece gives design freedom to adapt the respective piece to the purpose it is used for. The envelope piece, for example can be adapted in shape to the overall environment that the pad is to be used in. The envelope piece can have the necessary elements for the pad to be attached to a certain part, can for example have holes for hooks to pass through or can have parts of a Velcro connection for the pad to be connected to other parts of an overall coupler-cover. Also the material of the envelope piece can be chosen in view of the strains that will be applied to the pad. The internal piece on the other hand can be designed in view of the needs of inflation.

[0025] For the internal pieces it is possible to create several bags (sacks) of a first material, for example of a coated textile, for example of a rubber reinforced textile or of a textile reinforced rubber. These bags can be connected to each other by tubes. The tubes can for example be short length flat tubes that expand open with air. The assembly of such bags can then be placed in an un-vulcanized rubber envelope and the un-vulcanized rubber envelope can then be vulcanized to create the pad.

[0026] For the pad itself (that would then be without the design of an envelope piece with internal piece(s)) or the internal pieces it is also feasible to take two sheets, place them on top of each other and sew or glue them together in lines that then form the chambers in between them. This technique is often used for inflatable mattresses or air-beds and can be applied to the manufacturing of the internal piece. To interconnect the individual chambers thus formed, either the sewed or glued lines are left out at certain places to create channels/opening between the individual chambers. Or the sewing can be done sufficiently loosely to allow for air to pass from one chamber to the other through the sewing. The two sheets used can be un-vulcanized sheets with separating layers (interleaves) placed in the places where the chambers are to be and where the channels/openings between the chambers are to be. If the sheets are then vulcanized, they will stick together in those places, where no interleaves are present and will not stick together where the interleaves are. If desired, the thus formed arrangement can be used as internal pieces that are then additionally placed in an envelope piece, for example an un-vulcanized rubber envelope that is vulcanized to create the pad. The interleave used can for example be textile sheets, paper or even chalk. The two sheets used could also be PVC-coated cloths.

[0027] For the chambers, the air inlets can be placed to the ends of the bag to allow air flow through the length. Preferably a minimum of two air inlets are used for redundancy and more even inflation. The chambers can terminate in a moulded/formed suitable feature, either an inflated flat area into which the connector is inserted, or a vulcanized tube into which a pipe is inserted.

[0028] A valve will preferably be arranged remote from the bag. In a preferred embodiment, the air flow is governed by relay controlled solenoids.

[0029] In a preferred embodiment, the envelope piece and/or the internal piece can be made from textile reinforced rubber. This will allow the pad to handle the necessary pressures and to make the part more robust (ice, impacts - track ballast etc.). It will also aid manufacture. The rubber might be fire resistant silicone or a robust chloroprene.

[0030] The system according to the invention, which is suitable to reduce the accumulation of snow on a surface or in a recess of a coupler-head of a train has a pad according to the invention and a pump that pumps fluid. Suitable means, for example hoses are provided to connect the pump to the inflatable chamber, especially preferred via a valve that can control the inflation state of the inflatable chamber. Such a pump can be of a shape that makes it suitable to attach the pump to the coupler head. The pump would thus be carried on the coupler head in a preferred embodiment. In many applications of the present invention pumps that pump fluid are already provided as part of the car, to which the coupler head is connected. For example such cars typically have a hydraulic system or a pneumatic system. In those embodiments, the pumps already provided can be used to inflate the chamber. In a preferred embodiment, the pump can reverse its pumping direction, in order to deflate the inflatable chamber. In a preferred embodiment, the fluid is air.

[0031] In a preferred embodiment, a drive circuit that drives the pump is provided as part of the system. The drive circuit drives the pump in a manner to inflate the chamber with a frequency of more than one inflation per hour, especially preferred more than one inflation per 10 minutes, especially preferred one inflation per minute, especially preferred one inflation per second. In a preferred embodiment, between each inflation of the inflatable chamber, the pump is reversed in order to deflate the inflatable chamber.

[0032] The system can have thermally activated relay controlled solenoids and a vacuum generator or equivalent to enable inflation/deflation cycle or inflation. These items can be packed into box affixed to head.

[0033] The coupler head of a car of a multi-car vehicle according to the invention has a pad according to the invention attached to it.

[0034] The method for reducing the combination of snow on a surface or in a recess of a coupler-head of a train provides for the inflatable chamber of the pad according to the invention to be inflated. Already inflating the inflatable chamber of a pad can help in reducing the

accumulation of snow on a surface or in a recess of a coupler-head. In a preferred embodiment, it is provided, however, that after the inflatable chamber of the pad is inflated, it is deflated again and in especially preferred embodiment, the cycle of inflating and deflating the inflatable chamber is repeated, especially preferred with a frequency of more than one inflation per hour, especially preferred more than one inflation per 10 minutes, especially preferred one inflation per minute, especially preferred one inflation per second. In a preferred embodiment, between each inflation of the inflatable chamber, the pump is reversed in order to deflate the inflatable chamber. If the inflatable chamber is only inflated once, the advantages of the invention might be realized, if a parked multi-car vehicle is to be uncovered from snow, while it is expected that no further snow will accumulate on the surface of a coupler-head or in a recess of a coupler-head in the following use of the multi-car vehicle thereafter. It is expected, however, that in most circumstances, snow or ice will also accumulate on the surface of or in a recess of a coupler-head of a multi-car vehicle while it travels or is in use. Hence there is a need for continuously reducing or preventing the accumulation of snow on a surface of or in a recess of a coupler head. This is best achieved, if the inflatable chamber is constantly inflated and deflated while the multi-car vehicle is being used.

[0035] As part of the method, especially if several inflatable chamber are present or if several pads are used, it can be advantageous to have certain chambers be inflated and deflated to reduce the accumulation of snow, while other chamber stay inflated, for example to cover voids in a coupler to prevent entry of snow into these voids.

[0036] It has been found that the advantages achieved with the pad according to the invention, which reduces the accumulation of snow on a surface or in a recess of a coupler-head of a multi-car vehicle or train can also be obtained when using such a pad on other surfaces or recesses of a car of a multi-car vehicle. For example the accumulation of snow below the car of the multi-car vehicle can be prevented with such a pad. In a preferred embodiment, the pad is arranged on the underside of the car of the multi-car vehicle.

[0037] In a preferred embodiment, the pad is not arranged in an opening of the frontal area of the car through which a coupling shaft or essential buffer coupling reaches.

[0038] In a preferred embodiment, the pad suitable to reduce the accumulation of snow on a surface or in a recess of a car of a multi-car vehicle according to the invention has one or several of the features of the pad suitable to reduce the accumulation of snow on a surface or in a recess of a coupler-head of a train according to the invention and especially has one or more of the features described in the subordinate claims 2 to 7.

[0039] The method for reducing the accumulation of snow on a surface or in a recess of a car of a multi-car vehicle according to the invention provides for the inflatable chamber of the pad to be inflated. In addition or as an alternative a method for reducing the accumulation of snow on a surface or in a recess of a car of a multi-car vehicle is suggested that has a cover that at least partially covers a surface of the car and has an inflatable chamber, preferably provided by a pad according to the invention being attached to the car, whereby the inflatable chamber is repeatedly inflated and deflated.

[0040] In the following the Invention will be described with reference to Fig. that only show embodiments of the invention. In the Fig. the following is shown:

- Fig. 1 a perspective, schematic view onto a coupler head of a train covered by snow;
- Fig. 2 a perspective, schematic view a coupler head of a train that has a cover and is covered by snow;
- Fig. 3 a perspective, schematic view of two pads according to the invention arranged on a coupler head that is also covered by a cover and that has a moveable front cover that in the view of figure 3 is in its lower position;
- Fig. 4 a perspective, schematic view of the pads and the coupler head as is shown in Fig. 3 with the front cover stored on top;
- Fig. 5 a close up of the pads shown in Fig. 3 and 4 taken from a different view angle;
- Fig. 6 a perspective, schematic view of two pads according to the invention arranged on a coupler head that is also covered by a cover and that has a moveable front cover that in the view of figure 6 is in its lower position;
- Fig. 7 a close up of the pads shown in Fig. 6 taken from a different view angle;
- Fig. 8 a perspective, schematic view on a further embodiment of a pad according to the invention;
- Fig. 9 a perspective, schematic view on a further embodiment of a pad according to the invention;
- Fig. 10 a perspective, schematic view on a further embodiment of a pad according to the invention;
- Fig. 11 a schematic side view onto a pad according to the invention with inflated inflatable chambers and
- Fig. 12 the side view of Fig. 11 with deflated inflatable chambers.

[0041] Fig. 1 shows a coupler head 1 of a train. The coupler head is understood to be the assembly of parts that is attached to a car of the train and contains those parts that are necessary to make a detachable, mechanically reliable connection with a corresponding coupler-head of a neighboring car. As can be seen from Fig. 4 that shows the front cover 2 stored on top, the coupler-head 1 has a front facing plate 3 that contains the typical elements necessary for coupler-heads of the shown central buffer coupling type to be coupled to the appropriate coupler-head of a neighboring car. Fig. 1 also shows that

the coupler-head has accessories, like the front cover and the mechanism for moving the front cover from a lower position (Fig. 1, 2, 3, 5, 6, 7) to a position stored on top (Fig. 4). Fig. 1 also shows that an electrical cable 4 and a pneumatic hose 5 are lead to the coupler-head 1. Fig. 4 shows a (closed) electrical coupling 6 that can be used for an easy connection of the electrical cable 4 leading to the coupler-head 1 to be connected to cables on the neighboring coupler-head. Fig. 1 shows that the coupler-head 1 is open at its sides and at its bottom. In comparison to Fig. 1, Fig. 2 shows an embodiment, where the sides and the bottom of the coupler-head have been covered by a cover 7. Fig. 1 also shows that the coupler-head 1 is attached to a coupler rod 8. The coupler rod 8 at its other end is connected to a car of a train (not shown).

[0042] Fig. 1 and 2 show the state of the respective coupler-head, when it is covered by snow. It is clearly apparent from Fig. 1 and 2 that the presence of snow will - among other things - block the movement of the front cover 2 from the lowered position shown in Fig. 1 and 2 to the position stored on top as shown in Fig. 4.

[0043] Fig. 3 shows a first pad 10 according to the invention arranged on the top of the coupler-head 1. Fig. 3 also shows a second pad 20 according to the invention that is arranged to bridge the room left between a top surface of the coupler-head 1 and a back plate 9 (shown in Fig. 1) of the coupler-head 1.

[0044] The pad 10 is suitable to reduce the accumulation of snow on the surface of the coupler-head 1. For this purpose, the pad 10 has three inflatable chambers 11 arranged next to each other. The pad 20 is suitable to reduce the accumulation of snow on the surfaces of the coupler-head 1 that it covers. For this purpose the pad 20 has four inflatable chambers 21 arranged neighboring each other. The inflatable chambers 11, 21 are shown in their inflated state in Fig. 3, 5, 6, 7. As can be seen in these Fig. the inflatable chambers 11, 21 have a longitudinal extend perpendicular to the longitudinal axis of the coupler rod 8. The inflatable chambers 11, 21 have the approximate shape of cigars or sausages. They each extend along a straight line.

[0045] As can best be seen from Fig. 5 and Fig. 7, access material 12, 22 is provided to form the pads. As can best be seen from Fig. 5 and Fig. 7, the pad 10, 20 has a generally square shape. At its borders 13, 23, the rectangular shaped pad 10, 20 continues into the cover 7 and is formed as one piece with parts of the cover 7.

[0046] If the coupler-heads as shown in Fig. 3, 4, 5, 6, 7 are covered with snow similar to the situation shown in Fig. 1, Fig. 2 and if this snow solidifies or forms ice, inflating the inflatable chambers 11, 21 from a deflated state to an inflated state makes the inflatable chambers 11 inflate into an inflation direction A. This inflation of the inflatable chambers 11, 21 will crack any solidified snow or ice into pieces. These pieces will be carried away by the transport vibrations of the coupler-head 1, if the train continues its travel. Indeed, it is to be expected that if the inflatable chambers are regularly inflated and deflated that a situation as shown in Fig. 1 and 2 will be prevented. It is to be expected that it will be prevented that as much snow as shown in Fig. 1 and 2 accumulates on coupler-heads 1 provided with the pads according to the invention, if they are regularly inflated and deflated.

[0047] As can be seen in Fig. 4, the front cover 2 can move to the position, where it is stored on top. If snow is present and has been accumulated, this snow might be pushed aside by the front cover 2 being moved up. As can be seen when comparing Fig. 3 and 4, the inflatable chambers 21 of the pad 20 have been allowed to deflate, which allows the pad 22 sag and thereby creates additional room for parts of the front cover as it is stored on top.

[0048] The embodiment shown in Fig. 3, 4 and 5 differs from the embodiment shown in Fig. 6 and 7 in that the cover 7 of the embodiment shown in figures 3, 4 and 5 is a full covering cover that covers the sides and the bottom of the coupler head, while the cover 7 shown in Fig. 6 and 7 is only a short cover.

[0049] Fig. 8 to 10 show different schematic shapes that the pad 30, 40, 50 according to the invention can take. The actual shape that the pad will take depends very much on the area it is to cover. The comparison of Fig. 8 and 9 show that by adapting the length of the inflatable chambers 31 it can be accommodated for that the pad 30 of Fig. 8 is rectangular, while the pad 40 of Fig. 9 is trapezoidal. Fig. 10 shows that the inflatable chambers 51 do not necessarily need to extend along a straight line, but can also be bent to accommodate for a bend-shaped pad 50. The reference signs 32, 42 and 52 refer to the excess material of the pad provided around the inflatable chambers 31, 41, 51 to make up the respective pad 30, 40, 50.

[0050] Fig. 11 and 12 in a side view show the different appearance of the pad once in the state with inflated inflatable chambers 61 (Fig. 11) and once in the state with deflated inflatable chambers 61 (Fig. 12). Fig. 11 and 12 also show the axis material 62 arranged around the pads.

Claims

1. Pad (10, 20) suitable to reduce the accumulation of snow on a surface or in a recess of a coupler-head (1) of a train, **characterized by** an inflatable chamber (11,21).

2. Pad (10, 20) according to claim 1, **characterized in that** the inflatable chamber (11, 21) has an inflation direction (A), which is the direction in which the change of size of the inflatable chamber is the largest between the deflated and the inflated state of the inflatable chamber (11, 21), and **in that** the cross section of the pad (10, 20) in at least one plane perpendicular to the inflation direction (A) is a parallelogram or trapezoid.

3. Pad (10, 20) according to claim 1 or 2, **characterized**

in that at the cross section of the inflatable chamber (11, 21) in at least one plane perpendicular to the inflation direction is a parallelogram or trapezoid.

4. Pad (10, 20) according to any one of claims 1 to 3, **characterized in that** the inflatable chamber (11, 21) in its inflated state has a longitudinal extend that is larger than its width or its height.

5. Pad (10, 20) according to any one of claims 1 to 4, **characterized in that** the pad (10, 20) has at least two inflatable chambers (11, 21).

6. Pad (10, 20) according to any one of claims 1 to 5, **characterized by** a frame and an elastic material attached to the frame, whereby the inflatable chamber (11, 21) is provided in the elastic material.

7. Pad (10, 20) according to any one of claims 1 to 6, **characterized in that** a valve is provided in opening of the inflatable chamber (11, 21) or in a channel that leads to an opening of the inflatable chamber (11, 21).

8. System suitable to reduce the accumulation of snow on a surface or in a recess of a coupler-head (1) of a train **characterized by** a pad (10, 20) according to any one of claims 1 to 7 and a pump that pumps fluid.

9. System according to claim 8, **characterized by** a drive circuit that drives the pump in a manner to inflate the chamber with a frequency of one or less than one inflation per hour.

10. Coupler head (1) of a car of a multi-car vehicle, **characterized by** a pad (10, 20) according to any one of claims 1 to 7 being attached to it.

11. Method for reducing the accumulation of snow on a surface or in a recess of a coupler-head (1) of a train according to claim 10 **characterized in that** the inflatable chamber (11, 21) of the pad (10, 20) is inflated.

12. Method for reducing the accumulation of snow on a surface or in a recess of a coupler-head (1) of a train, preferably according to claim 11, **characterized by** a cover that at least partially covers a surface of the coupler-head (1) and has an inflatable chamber (11, 21), preferably by a pad (10, 20) according to any one of claims 1 to 7 being attached to the coupler-head (1), whereby the inflatable chamber (11, 21) is repeatedly inflated and deflated.

13. Pad suitable to reduce the accumulation of snow on a surface or in a recess of a car of a multi-car vehicle, **characterized by** an inflatable chamber.

14. Car of a multi-car vehicle **characterized by** a pad according to claim 13 being attached to it.

15. Car according to claim 14, **characterized in that** the pad is not arranged in an opening of the frontal area of the car through which a coupling shaft of a central buffer coupling reaches.

16. Method for reducing the accumulation of snow on a surface or in a recess of a car of a multi-car vehicle according to claim 14 or 15, **characterized in that** the inflatable chamber of the pad is inflated.

17. Method for reducing the accumulation of snow on a surface or in a recess of a car of a multi-car vehicle, preferably according to claim 16, **characterized by** a cover that at least partially covers a surface of the car and has an inflatable chamber, preferably by a pad according to any one of claims 1 to 7 or 13 being attached to the car, whereby the inflatable chamber is repeatedly inflated and deflated.

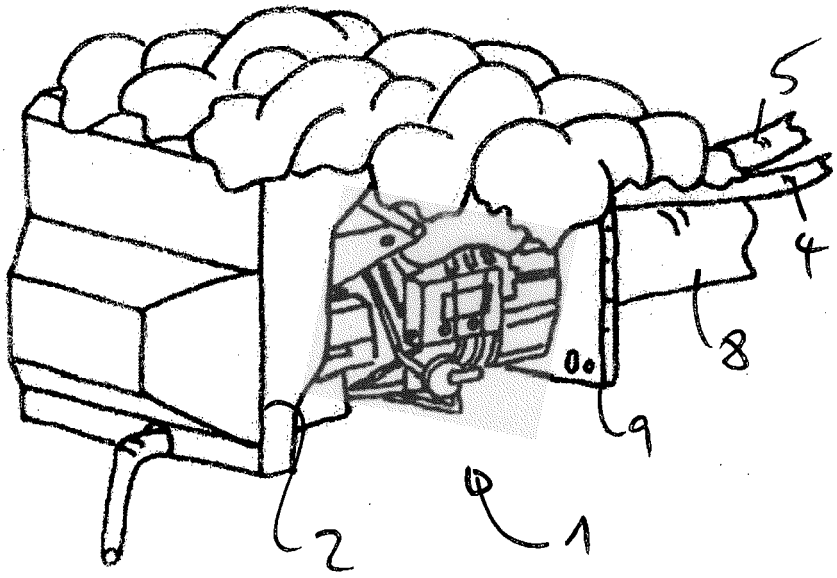

Fig. 1

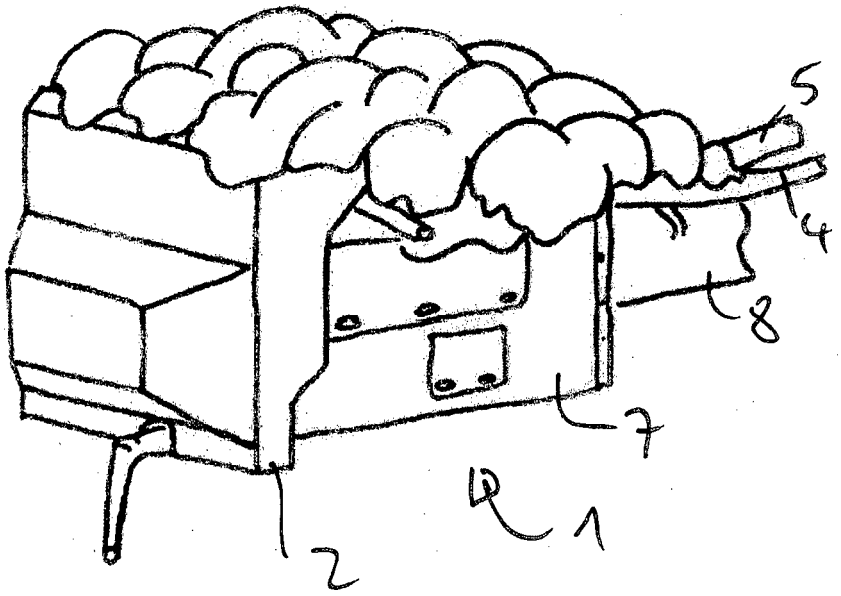

Fig. 2

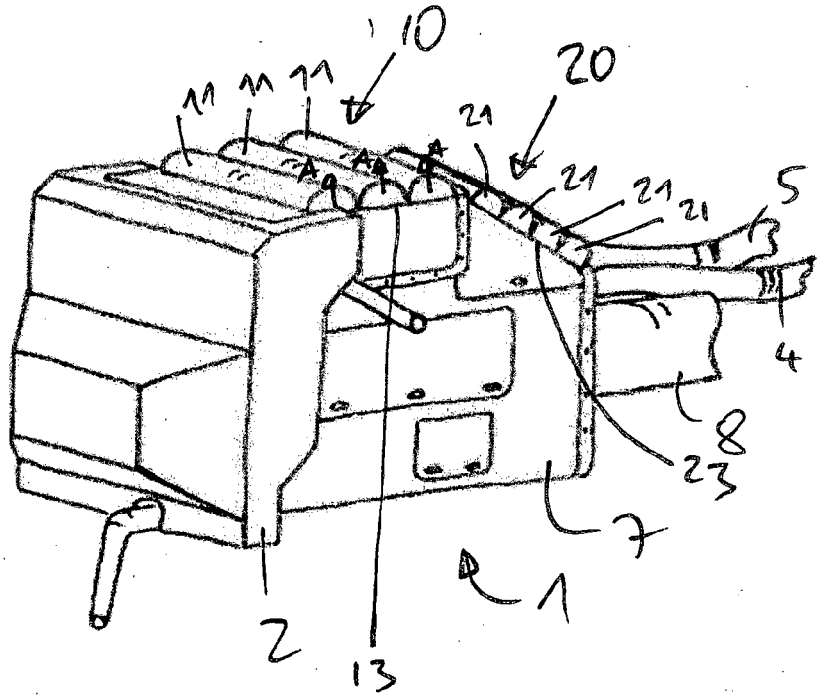

Fig. 3

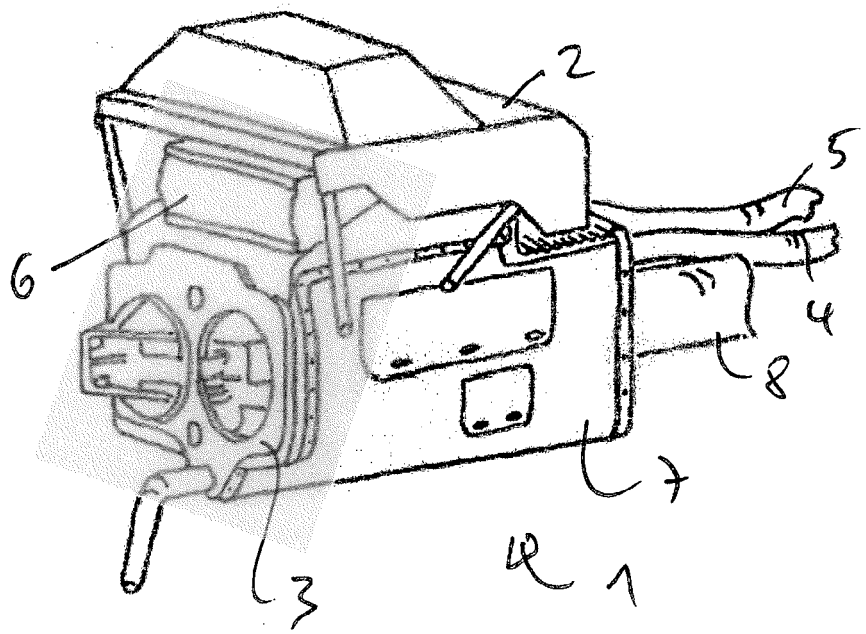

Fig. 4

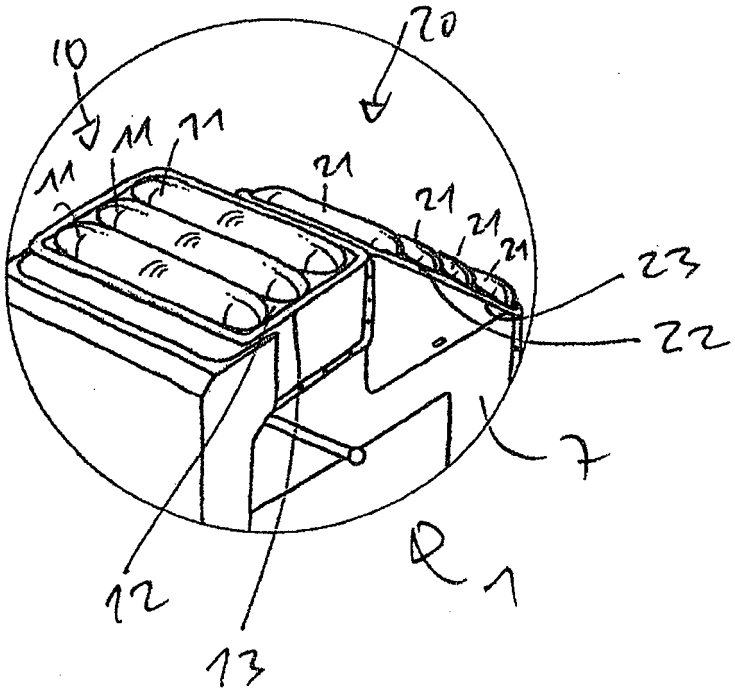

Fig. 5

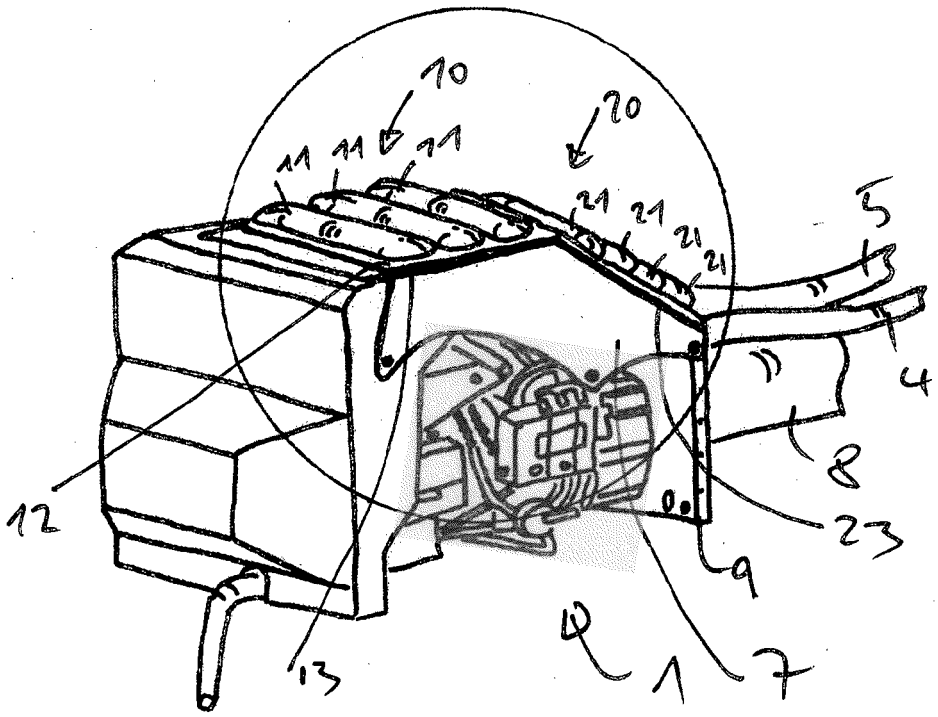
10
20
11
11
11
21
21
21
21
5
4
8
12
23
9
13
1
7

Fig. 6

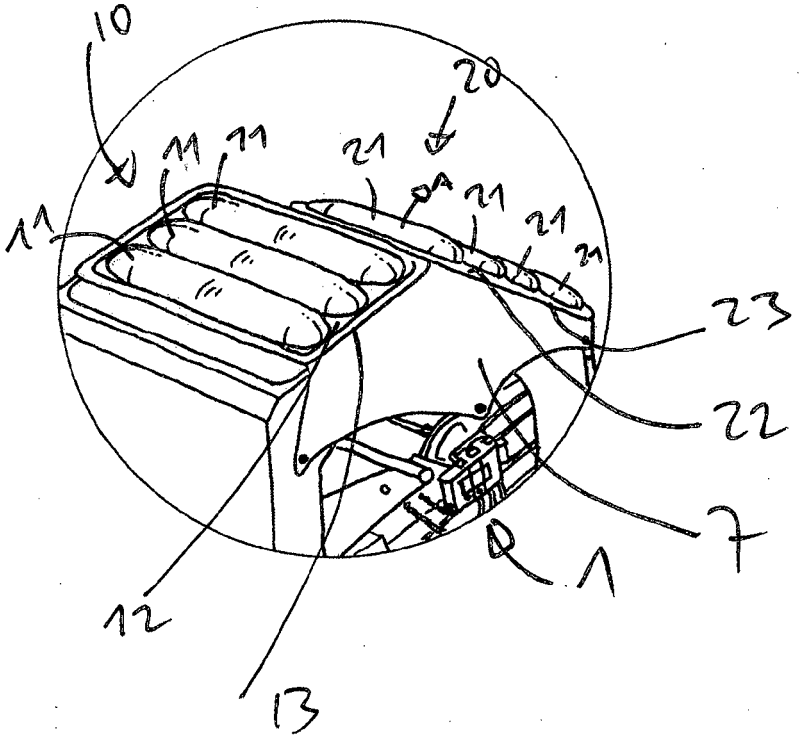
10
20
11
11
11
21
21
21
21
21
23
22
7
1
12
13

Fig. 7

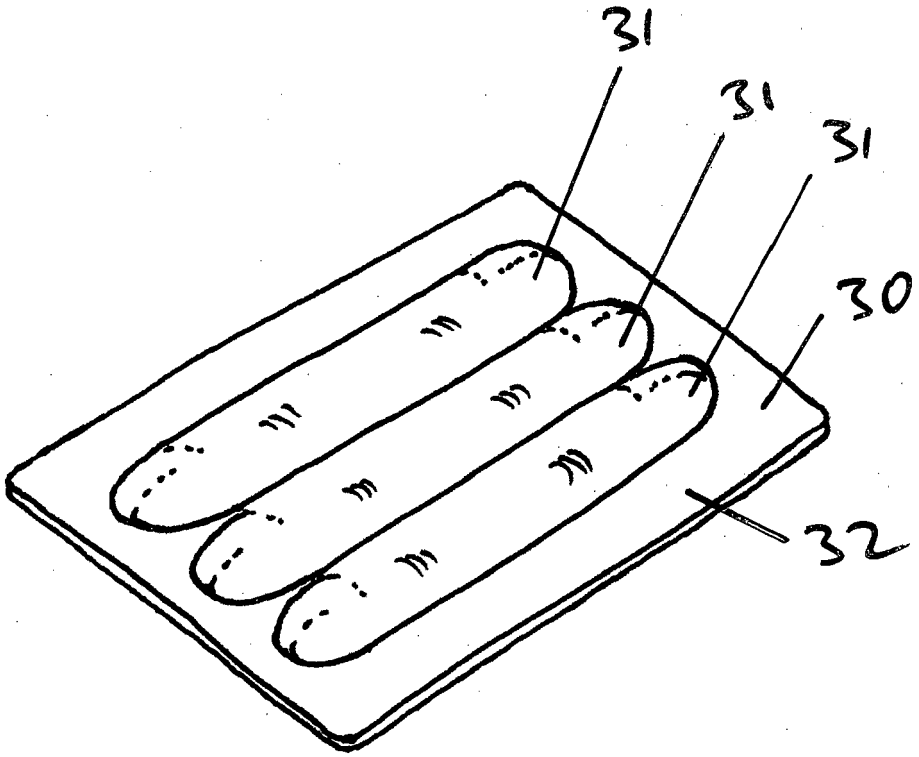

Fig. 8

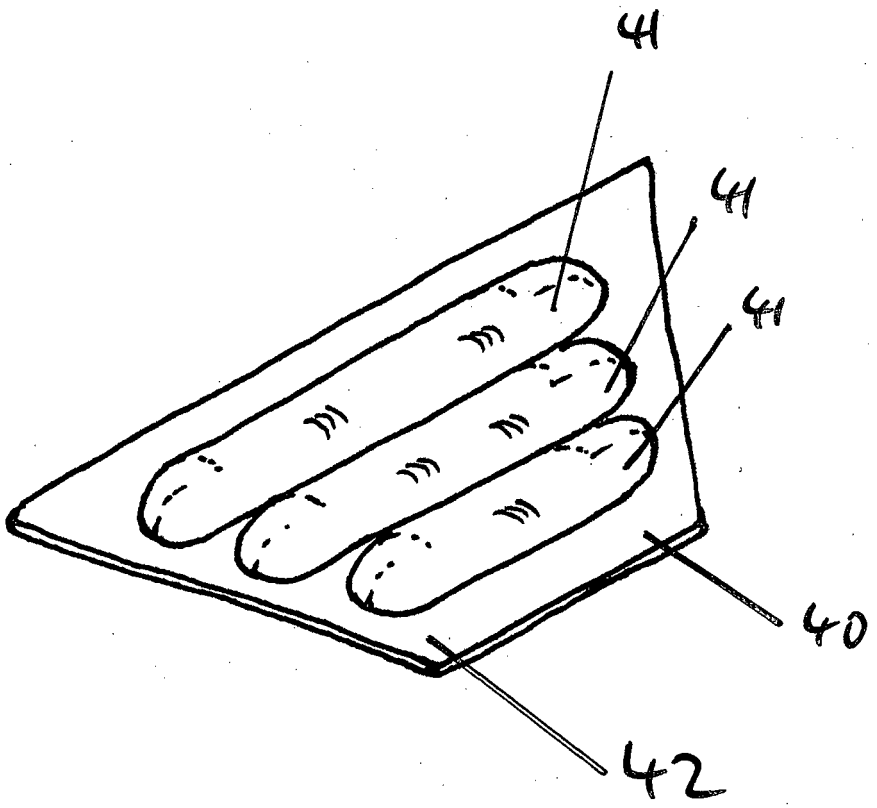

Fig. 9

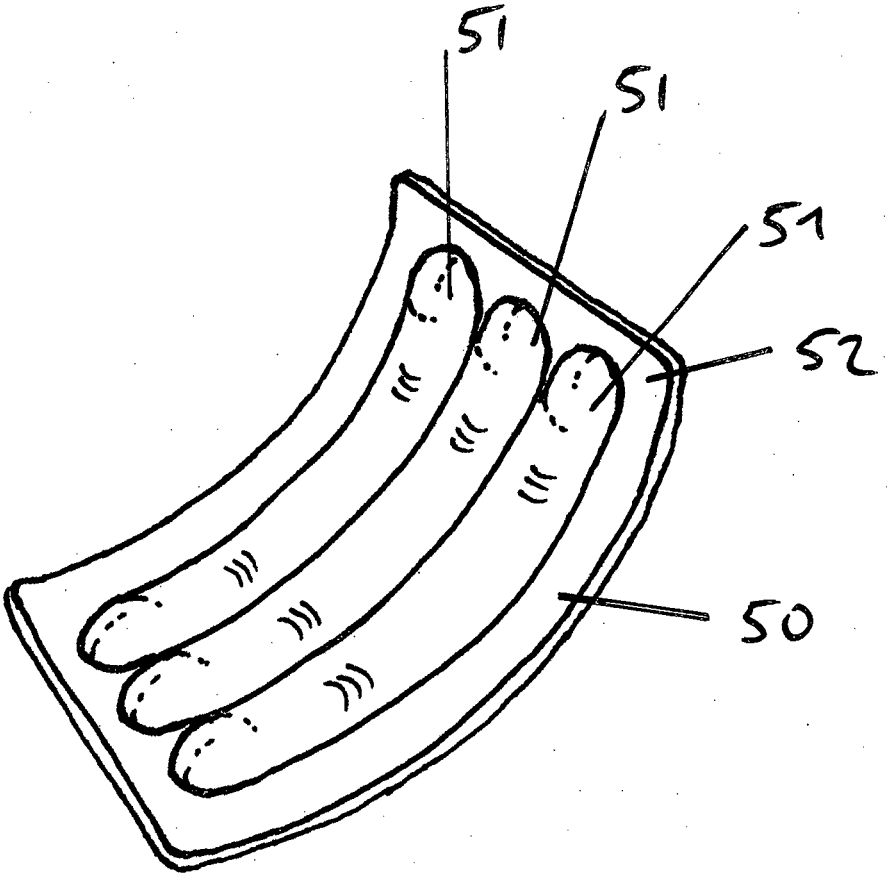

Fig. 10

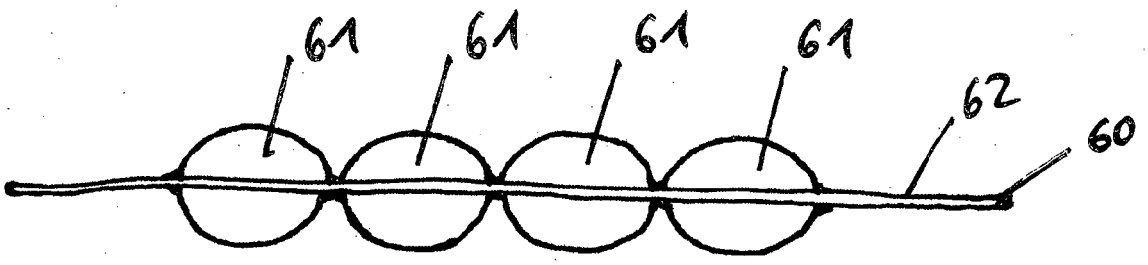

Fig. 11

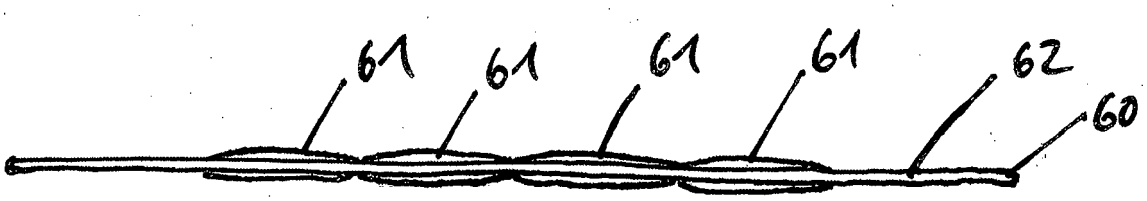

Fig.12

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 16 00 0818

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X,D	EP 2 524 850 B1 (VOITH PATENT GMBH [DE]) 5 March 2014 (2014-03-05) * the whole document *	1-17	INV. B61G7/00
X	FR 2 420 456 A1 (TURUNEN PEKKA [FI]) 19 October 1979 (1979-10-19) * the whole document *	1-10, 13-15	
A	US 2001/007316 A1 (PAYNE THOMAS S [US] ET AL) 12 July 2001 (2001-07-12) * the whole document *	1-17	
A,D	EP 2 308 738 B1 (DELLNER COUPLERS AB [SE]) 3 July 2013 (2013-07-03) * the whole document *	1-17	
A	DE 42 16 025 A1 (SCHNAEBELE WERNER [DE]) 18 November 1993 (1993-11-18) * the whole document *	1-17	

TECHNICAL FIELDS SEARCHED (IPC)

B61G
B61F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	12 October 2016	Awad, Philippe

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 16 00 0818

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.

12-10-2016

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2524850 B1	05-03-2014	CA 2773763 A1	20-11-2012
		CN 102785675 A	21-11-2012
		EP 2524850 A1	21-11-2012
		HK 1178133 A1	13-06-2014
		RU 2012118835 A	10-11-2013
FR 2420456 A1	19-10-1979	DE 2910481 A1	27-09-1979
		FI 55632 B	31-05-1979
		FR 2420456 A1	19-10-1979
		GB 2020234 A	14-11-1979
US 2001007316 A1	12-07-2001	US 2001007316 A1	12-07-2001
		US 2003024894 A1	06-02-2003
EP 2308738 B1	03-07-2013	NONE	
DE 4216025 A1	18-11-1993	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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 2308738 B1 **[0004]**
- EP 1350703 B1 **[0004]**
- EP 2524850 B1 **[0005] [0011]**