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- 1 -

Rail vehicle with snow protection assembly for a coupling region of the rail vehicle

The invention relates to a rail vehicle which operates in areas with snow.

Depending on the direction of travel, speed, snowfall, snow conditions etc. deposits or accumulations of snow may appear on the rail vehicle. A critical region for such snow deposits is the area around the coupling at the front side of the rail vehicle. The coupling arranged there is designed for coupling further rail vehicles (e.g. for coupling with a locomotive of a further rail vehicle unit) and is used accordingly.

Depending on the vehicle overhang, on the length of the vehicle and on the bogie spacing, couplings have to be able to pivot horizontally and vertically in certain areas in order to enable the coupling process and to be able to travel round curves and points regions.

Funnel-shaped openings arise from this around the coupling which are almost predestined to become filled with snow.

In extreme conditions this filling up with snow leads to the coupling no longer being able to move. This can lead to operationally critical and in rare cases even to safety-related limitations during operation of the rail vehicle.

Figs. 5 and 6 each show a rail vehicle SFZ6, SFZ7 with couplings KUP6, KUP7 as well as with coupling regions KUPB6, KUPB7 which are completely snowed in or iced up. It can be assumed that these rail vehicles SFZ6, SFZ7 are no longer operational.

Configurations are known with which this icing or snow problem in the coupling region is counteracted.

- 2 -

Fig. 7 shows a first configuration with an American locomotive as the rail vehicle SFZ8. This is designed in the coupling region KUPB8 in such a way that the associated coupling KUP8 has a very short configuration. In addition the pivot angles of the coupling KUPB8 required by the concept are minimized. The decisive parameters for such a vehicle concept are the length, bogie spacing and vehicle overhang of the rail vehicle SFZ8. If these parameters are expediently selected then the coupling KUP8 can be formed with a short length and with small pivot angles in the horizontal and vertical direction.

Fig. 8 shows a second configuration in a German Intercity ICE as the rail vehicle SFZ9. The rail vehicle SFZ9 is designed in the coupling region KUPB9 with a short coupling (here concealed) and with a small front opening FROE9. This configuration is complicated since a design with front flaps FKL9 is required in order to reduce or completely prevent the penetration of snow in the coupling region KUPB9. This configuration is used in particular in high-speed trains since here the front flap structure offers advantages regarding the snow and in addition regarding the aerodynamics.

Fig. 9 shows a third configuration in a tractive vehicle or rail vehicle SFZ10 of a German urban railway. The rail vehicle SFZ10 has in the coupling region KUPB10 a manually removable snow protection system which is configured here as a hood cover AH10. The hood cover AH10 is inverted over the coupling KUP10 and covers this at least in part. A hood cover AH10 of this kind is made for example of a strong, i.e. mechanically loadable tarpaulin material as is also used in the area of goods lorries for covering loads.

A snow protection system of this kind is very cost-effective but requires time and the manual labour of operating personnel during the coupling process for mounting and dismantling.

- 3 -

Furthermore such a snow protection measure does not always prevent snow from penetrating into the pivotal area of the coupling.

Fig. 10 and Fig. 11 show details of a coupling situation on a further rail vehicle SFZ11.

Fig 10 shows a coupling region KUPB11 in detail which can be filled with snow and thus become clogged. A coupling joint KUPG11 is further shown which is arranged in the coupling region KUPB11 and interacts with the coupling KUP11 of Fig. 11.

The coupling KUP11 as well as the coupling joint KUPG11 are correspondingly shown in Fig. 11.

The printed specification DE 10 2015 214 606 A1 discloses a front cover module for a vehicle. The front cover module proposes a coupling shaft, a coupling device received in the coupling shaft, and at least one front cover which is movable by using front cover kinematics and can cover the coupling shaft at least in part. In order to protect the coupling shaft and the coupling device against environmental influences when the front cover is open, in the front cover module a cover device arranged on the coupling shaft is provided with a casing which is releasably attached to the coupling shaft on one side and to the coupling device on the other side.

The object of the present invention is to provide an advantageous snow protection arrangement for coupling regions of a rail vehicle.

This is achieved by the features of Claim 1. Advantageous further developments are indicated in the dependent claims.

The invention relates to a rail vehicle having the features of Claim 1.

The coupling is configured in such a way that the rail vehicle can be connected by the coupling to a correspondingly configured coupling of a further rail vehicle.

The coupling is preferably mounted in movable manner inside the recess so that for the purpose of the coupling process or the purpose of travelling over curves and points areas with the further rail vehicle the coupling is able to pivot horizontally and vertically within a predefined angular range.

The coupling thus has respective angular positions for the coupling process and during operation of the connected rail vehicles.

The recess is enclosed at least in part by a fixed housing. The coupling is protected in the region of the recess via the fixed housing. The opening of the fixed housing is fixedly connected in peripheral manner to a sealing element, the first sealing element, so that the sealing element is likewise fixed or rigid via the connection.

The first sealing element has a snow-tight transition to the housing.

The first sealing element is preferably made of a flexible rubber as the sealing element of the housing.

The sealing element of the housing is preferably configured as a hollow-chamber profile or as a bead.

The coupling is connected to a second sealing element which surrounds the coupling at least in part.

The second sealing element has a snow-tight transition to the coupling.

- 5 -

The second sealing element is connected as the sealing element of the coupling in rotatable manner to the coupling wherein this connection is preferably configured as a swivel joint.

The rotation of the second sealing element as well as the positions and forms of the two sealing elements mean that with different angular positions of the coupling the sealing element of the coupling is always coupled to the sealing element of the housing through pressure.

The second sealing element is preferably configured as a hollow-chamber profile or as a bead.

The two sealing elements overlap one another at least in part and bear movably against one another. The two sealing elements are pressed onto one another as a result of their respective positions.

A friction lock is preferably formed between the two sealing elements.

The second sealing element is preferably made from a flexible rubber.

The hollow chambers or beads provide an additional flexibility in the sealing elements and support the desired friction lock.

In a preferred further development the second sealing element has flexible sleeves which are arranged in the area around the coupling and additionally seal off this area.

The flexible sleeves are preferably made of rubber.

- 6 -

The two sealing elements provide a seal to shut off the opening against snow which functions reliably during any movement of the coupling.

Translational movements of the coupled rail vehicles are absorbed in the direction of the longitudinal axis of the rail vehicles by way of pressing-in of the hollow-chamber profiles or beads with simultaneous sealing.

In the case of lateral movements transversely to the longitudinal axis, the hollow-chamber profiles or beads slide on one another and thus absorb these movements with simultaneous sealing.

During angular movements (rolling, yawing, swaying) of the connected rail vehicles relative to one another the hollow-chamber profiles or beads are pressed in to a different extent. All relative movements occurring are thereby absorbed with simultaneous sealing.

The arrangement according to the invention can be both achieved and also retrofitted at a commercially viable low expense.

Through the arrangement according to the invention it is ensured that the operational readiness of rail vehicles is increased in the severe winter months without the need for manual interventions.

The coupling times of rail vehicles required up to now in the event of a snowfall which arose owing to manual work by railway employees, are reduced.

Through the arrangement according to the invention the breakdown times of rail vehicles caused by snow-blocked couplings are reduced.

- 7 -

The present invention will now be explained in further detail below by way of example with reference to the drawings in which:

Fig. 1 shows a first detailed view of the arrangement according to the invention;

Fig. 2 shows a second detailed view of the arrangement according to the invention;

Fig. 3 shows an overall view of the arrangement according to the invention;

Fig. 4 shows an advantageous further development of the arrangement according to the invention;

Figs. 5 to 11 show the configurations of known snow protection arrangements already described in the introduction.

Fig 1 shows a first detailed view of the arrangement according to the invention. A coupling region KUPB of a rail vehicle SFZ is illustrated.

The rail vehicle SFZ has on its end side a recess EINB to be protected from snow and in which a coupling KUP of the rail vehicle SFZ is arranged at least in part.

A fixed housing EINH surrounds the recess EINB at least in part. The housing EINH has, as seen in the direction of travel of the rail vehicle SFZ, an opening OFF from which the coupling KUP projects in part in a predefined angular position in order to enable a coupling process with a further rail vehicle.

The opening OFF of the fixed housing EINH is fixedly connected in peripheral manner to a first sealing element DIE1.

- 8 -

In this example the first sealing element DIE1 is configured as a flexible hollow-chamber profile.

The size of the opening OFF is dimensioned so that the coupling KUP can carry out all movements which arise during operation.

The housing EINH is fixedly connected to the front of the rail vehicle SFZ and cannot move relative to the rail vehicle.

The opening OFF is also dimensioned together with the surrounding sealing element DIE1 so that the coupling KUP can carry out all the necessary movements during operation.

Fig. 2 shows with a partial reference to Fig. 1 a second detailed view of the arrangement according to the invention.

A second sealing element DIE2 is connected in rotatable manner to the coupling KUP. The second sealing element DIE2 encloses the coupling KUP at least in part.

In this example the second sealing element DIE2 is configured as a flexible hollow-chamber profile.

The second sealing element DIE2 is connected to the coupling KUP by way of a swivel joint DRG.

In addition the second sealing element DIE2 has flexible sleeves FMS which are arranged in the region around the coupling KUP and in addition seal the transition to the coupling KUP.

The flexible sleeves FMS have in a peripheral manner a frame FMSR via which they are connected to the hollow-chamber profile.

A coupling joint KUPG is likewise shown via which the coupling KUP is fixed in the recess EINB of the rail vehicle SFZ via a joint. Via this joint (see here also the coupling joint KUPG11

- 9 -

of Fig. 10) it is possible for the coupling KUP to occupy different angular positions for carrying out the coupling process and during travel of the connected rail vehicles.

The rotatably movable second sealing element DIE2 has the effect that it is always aligned on the first sealing element DIE1 during rotation of the coupling KUP about a vertical axis.

Fig. 3 shows with reference to Fig. 1 and Fig. 2 an overall view of the arrangement according to the invention.

The two sealing elements DIE1, DIE2 overlap one another at least in part in the region of the opening OFF in the case of different angular positions of the coupling KUP. The two sealing elements DIE1, DIE2 are coupled to one another by pressure and thereby protect the opening OFF against the ingress of snow.

The rotatably movable second sealing element DIE2 has the effect that it is always aligned on the first sealing element DIE1 during rotation of the coupling KUP about a vertical axis wherein the capacity for sealing remains at the same time.

Fig. 4 shows with reference to Fig. 1 to Fig. 3 an advantageous further development of the arrangement according to the invention.

This configuration addresses the case that two rail vehicles which are within a narrow track curve are coupled to one another.

In order to carry out the coupling process operating personnel had to shift the two sealing elements DIE1, DIE2 by applying force. If the two sealing elements DIE1, DIE2, are made of rubber for example, it may have happened that the required force could not be applied by the operating personnel.

- 10 -

In order to solve this problem the swivel joint DRG is mounted displaceable along the longitudinal axis of the coupling KUP.

A compression or traction spring FED holds the swivel joint DRG in position and limits the pressing or contact pressure force of the two sealing elements DIE1, DIE2.

The two sealing elements DIE1, DIE2 are in particular coupled to one another in the resiliently pressed-in state of the second sealing element DIE2.

Patentkrav

- 5 **1.** Skinnekøretøj (SFZ) med et snebeskyttelsesarrangement til et koblingsområde (KUPB) af skinnekøretøjet (SFZ),
- hvor skinnekøretøjet (SFZ) ved en endeflade har en fordybning (EINB), som skal beskyttes mod sne,
- hvor en kobling (KUP) til skinnekøretøjet (SFZ) i det mindste delvist er anbragt i fordybningen (EINB),
- 10 - hvor en fast indkapsling (EINH) i det mindste delvist omslutter fordybningen (EINB),
- hvor indkapslingen (EINH) har en åbning (OFF) i skinnekøretøjets (SFZ) køreretning, hvorfra koblingen (KUP) delvist rager ud i en forudbestemt vinkelposition for at muliggøre en koblingsproces med et andet skinnekøretøj,
- hvor åbningen (OFF) i den faste indkapsling (EINH) er fastgjort i omkredsen
- 15 til et første tætningselement (DIE1),
- hvor et andet tætningselement (DIE2) er drejeligt forbundet med koblingen (KUP), og hvor det andet tætningselement (DIE2) i det mindste delvist omgiver koblingen,
- hvor de to tætningselementer (DIE1, DIE2) i det mindste delvist overlapper
- 20 hinanden i området omkring åbningen (OFF) med forskellige vinkelpositioner af koblingen (KUP),
- hvor de to tætningselementer (DIE1, DIE2) er koblet sammen af tryk for at beskytte åbningen (OFF) mod indtrængen af sne.
- 25 **2.** Skinnekøretøj (SFZ) ifølge krav 1, hvor mindst et tætningselement (DIE1, DIE2) er fleksibelt udformet.
- 3.** Skinnekøretøj (SFZ) ifølge krav 1 eller 2, hvor det første tætningselement (DIE1) er udformet som et fleksibelt hulkammerprofil og/eller som en fleksibel
- 30 vulst.

4. Skinnekøretøj (SFZ) ifølge krav 1 eller 2, hvor det andet tætningselement (DIE2) er udformet som et fleksibelt hulkammerprofil og/eller som en fleksibel vulst.
- 5 5. Skinnekøretøj (SFZ) ifølge krav 2, hvor det første tætningselement (DIE1) og/eller det andet tætningselement (DIE2) er/er fremstillet af et fleksibelt gummi.
- 10 6. Skinnekøretøj (SFZ) ifølge krav 1, hvor det andet tætningselement (DIE2) er forbundet med koblingen (KUP) ved hjælp af et drejeled (DRG).
- 15 7. Skinnekøretøj (SFZ) ifølge krav 1, hvor det andet tætningselement (DIE2) har fleksible manchetter (FMS), som er anbragt i området omkring koblingen (KUP), og som yderligere tætner overgangen til koblingen (KUP).
- 20 8. Skinnekøretøj (SFZ) ifølge krav 7, hvor de fleksible manchetter (FMS) er fremstillet af gummi.
- 25 9. Skinnekøretøj (SFZ) ifølge krav 3 eller 4, hvor hulkammerprofilerne eller vulsterne er udformet således, at translationsbevægelser af sammenkoblede skinnekøretøjer i retning af skinnekøretøjernes længdeakse optages ved indpresning af hulkammerprofilerne eller vulsterne med samtidig tætning.
- 30 10. Skinnekøretøj (SFZ) ifølge krav 3 eller 4, hvor hulkammerprofilerne eller vulsterne er udformet på en sådan måde, at hulkammerprofilerne eller vulsterne ved sideværts bevægelser af de sammenkoblede skinnekøretøjer på tværs af længdeaksen glider på hinanden og således optager disse bevægelser med samtidig tætning.

5 **11.** Skinnekøretøj (SFZ) ifølge krav 3 eller 4, hvor hulkammerprofilerne eller vulsterne er udformet således, at hulkammerprofilerne eller vulsterne ved vinkelbevægelser af de sammenkoblede skinnekøretøjer i forhold til hinanden presses ind i forskellig udstrækning for at optage de opståede relative bevægelser med samtidig tætning.

10 **12.** Skinnekøretøj (SFZ) ifølge krav 1, hvor koblingen (KUP) er udformet på en sådan måde, at skinnekøretøjet via koblingen (KUP) kan forbindes med en tilsvarende udformet kobling af det andet skinnekøretøj.

13. Skinnekøretøj (SFZ) ifølge krav 1, hvor koblingen (KUP) er monteret bevægeligt i fordybningen (EINB), således at koblingen kan drejes vandret og lodret i et forudbestemt vinkelområde med henblik på koblingsoperationen med det andet skinnekøretøj.

FIG 1

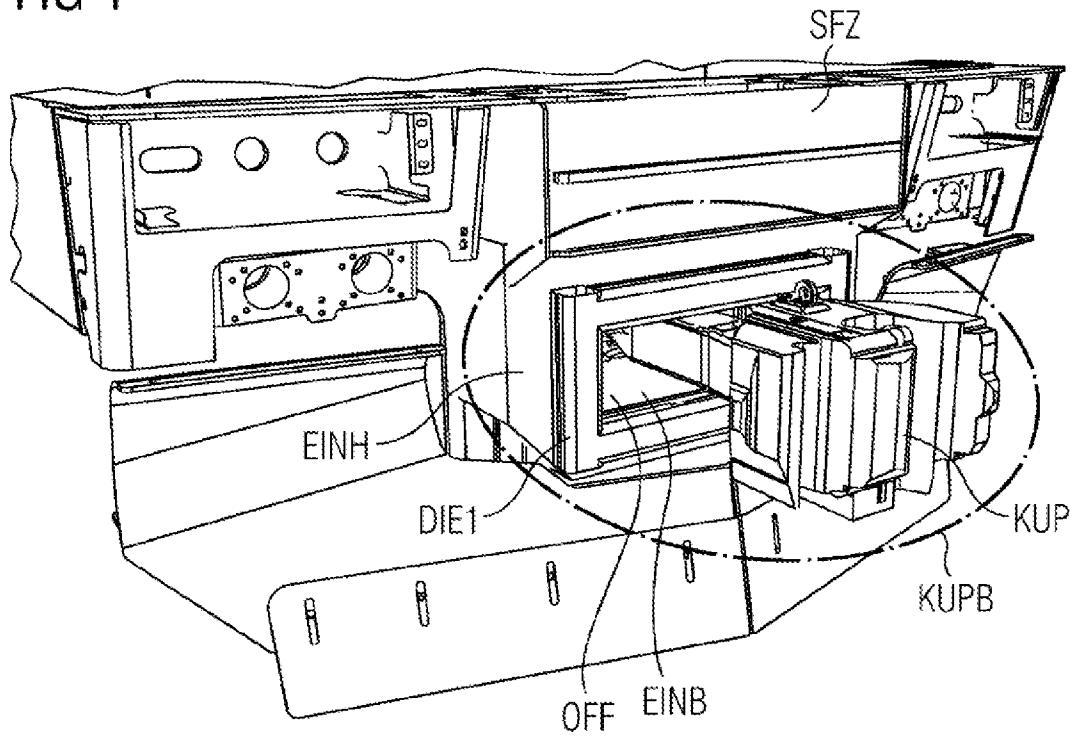


FIG 2

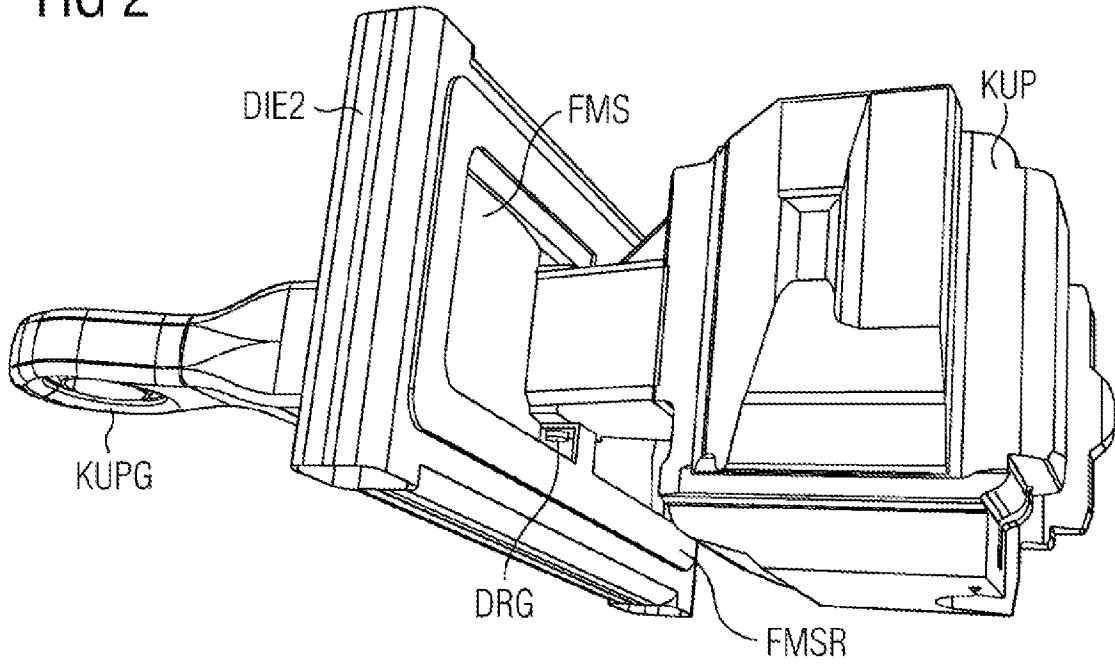
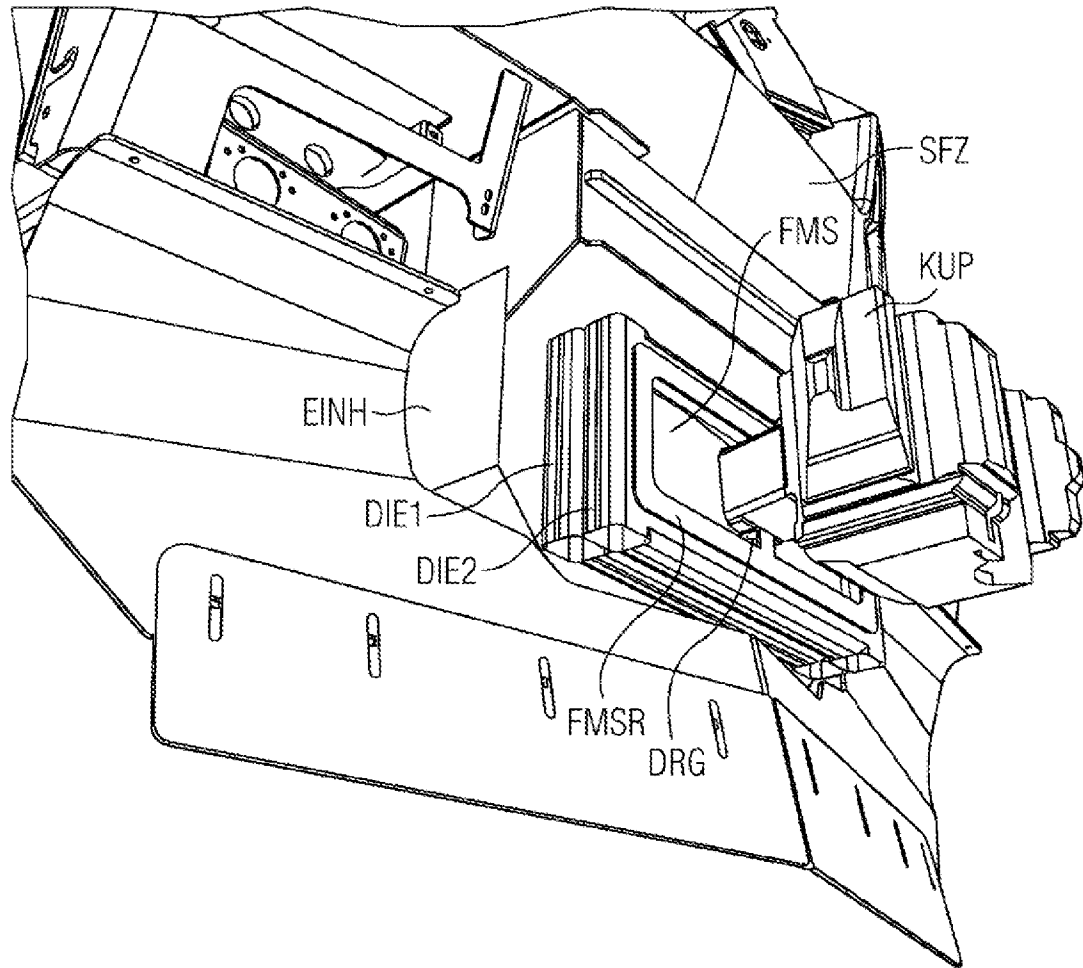


FIG 3



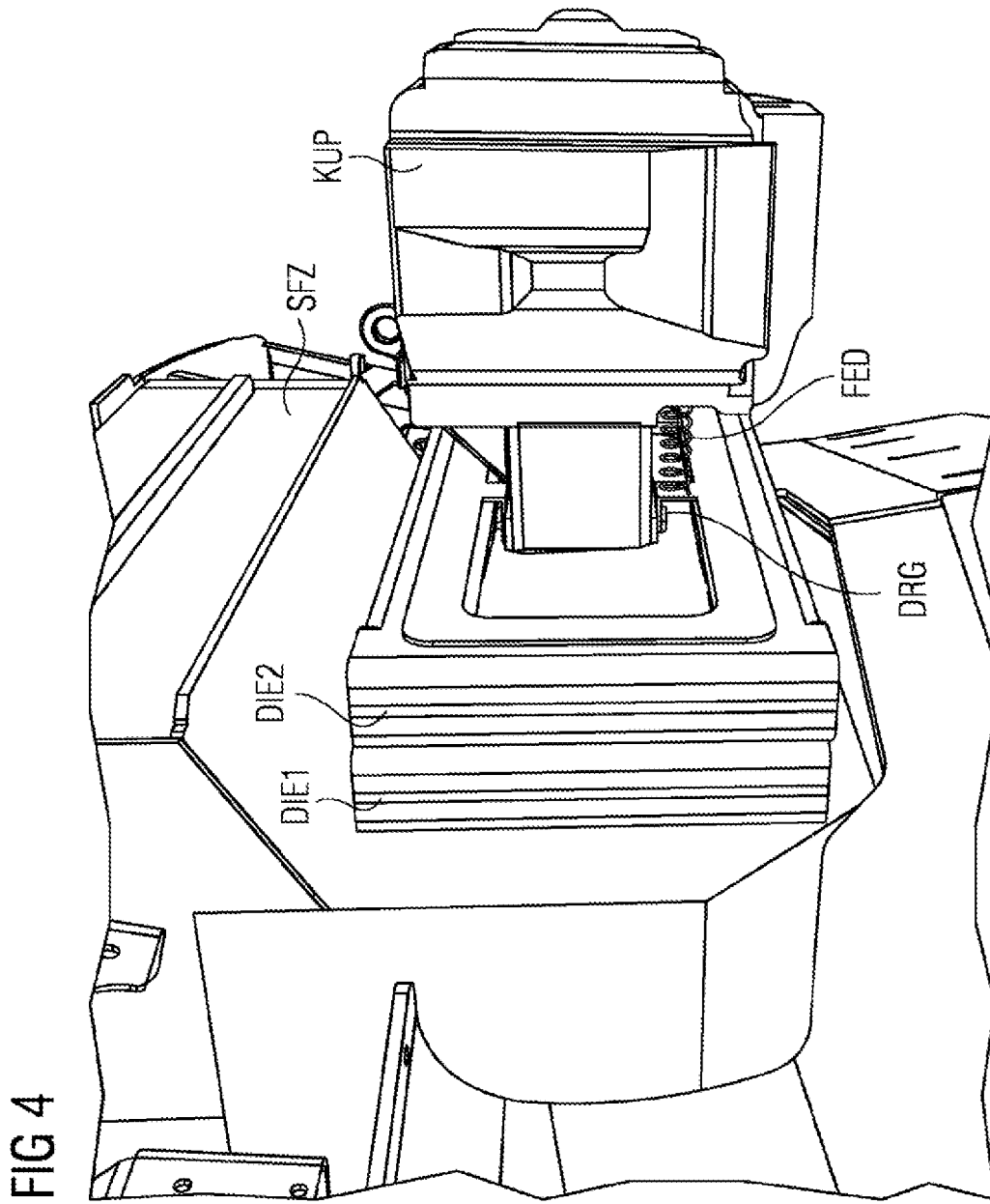


FIG 5

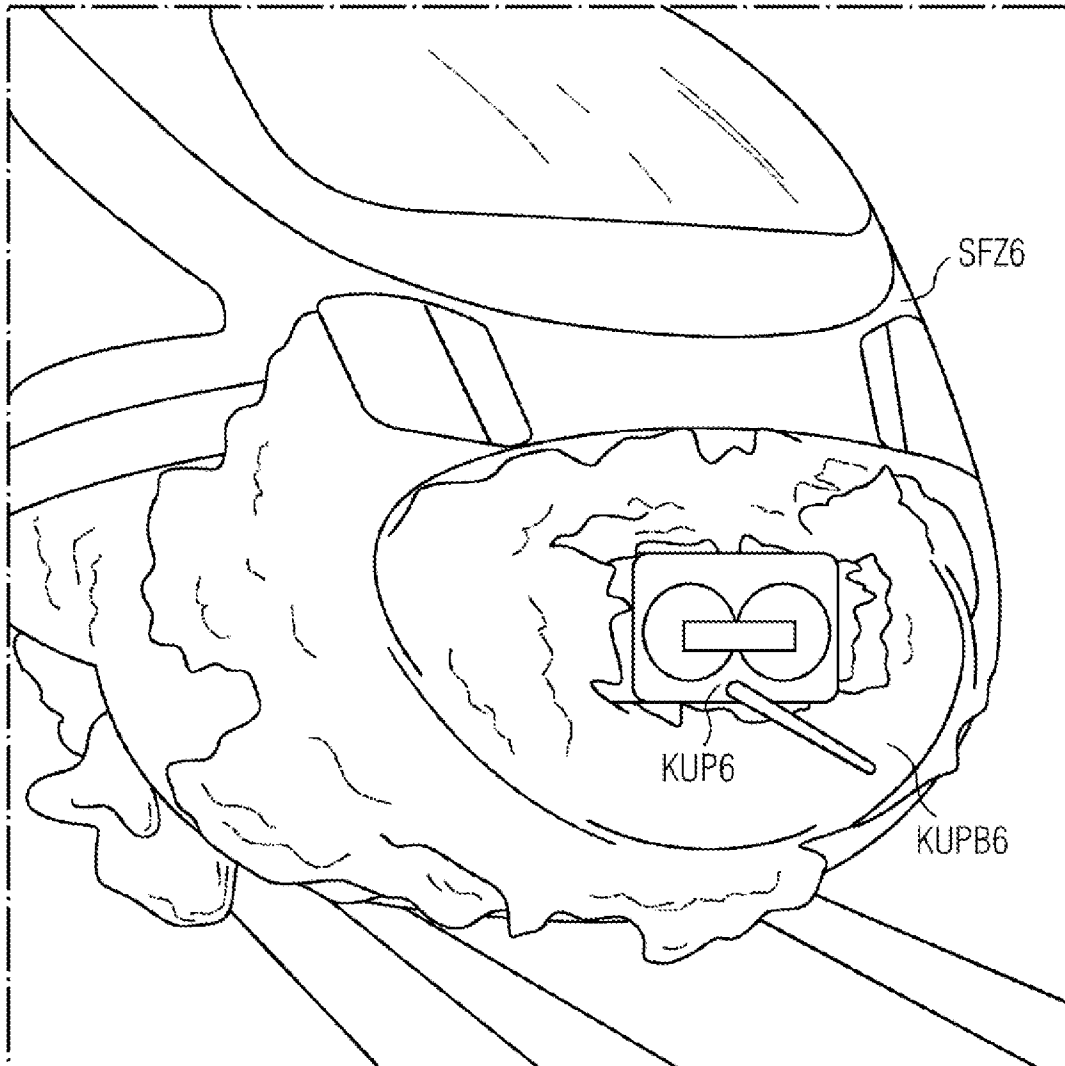


FIG 6

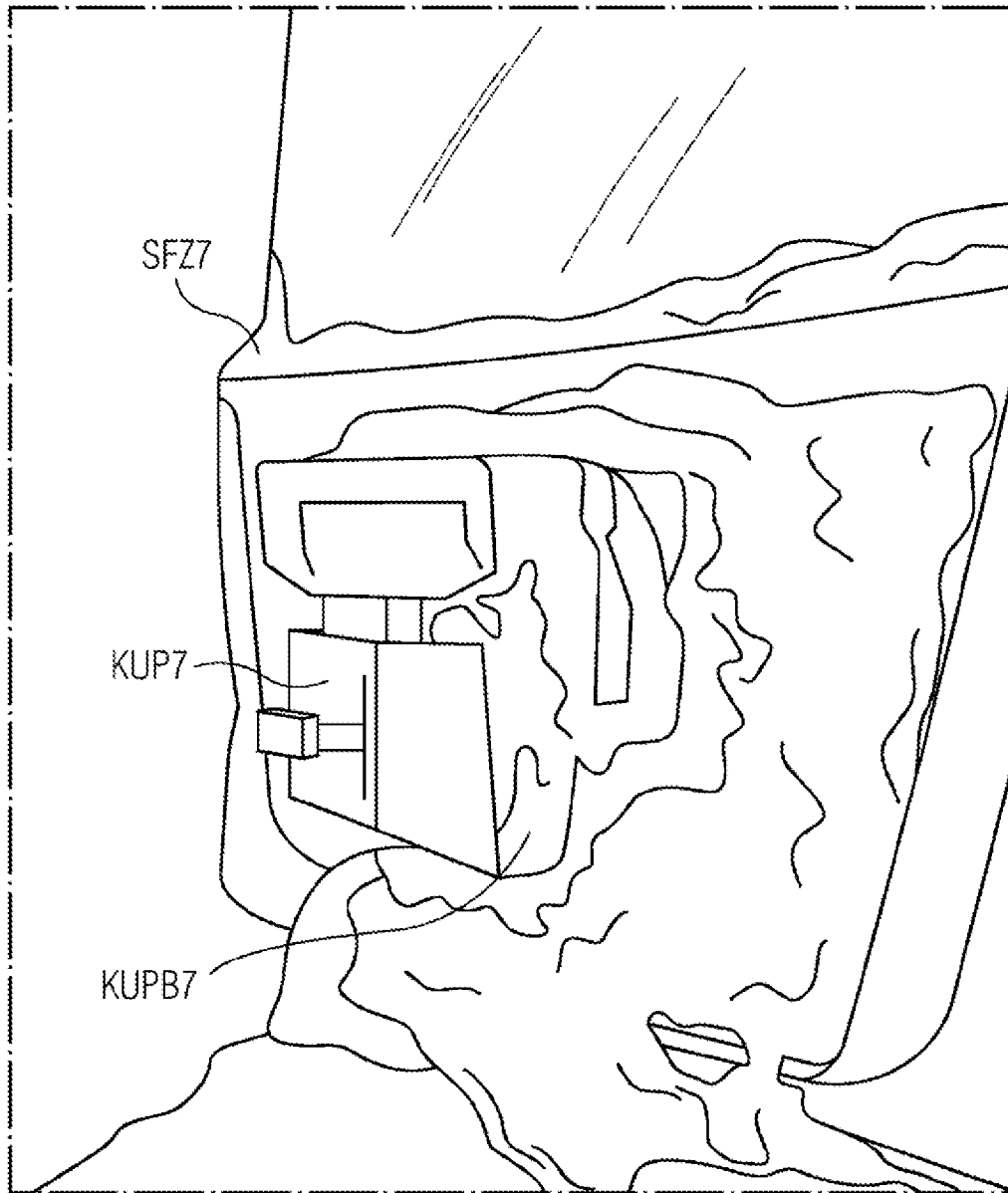


FIG 7

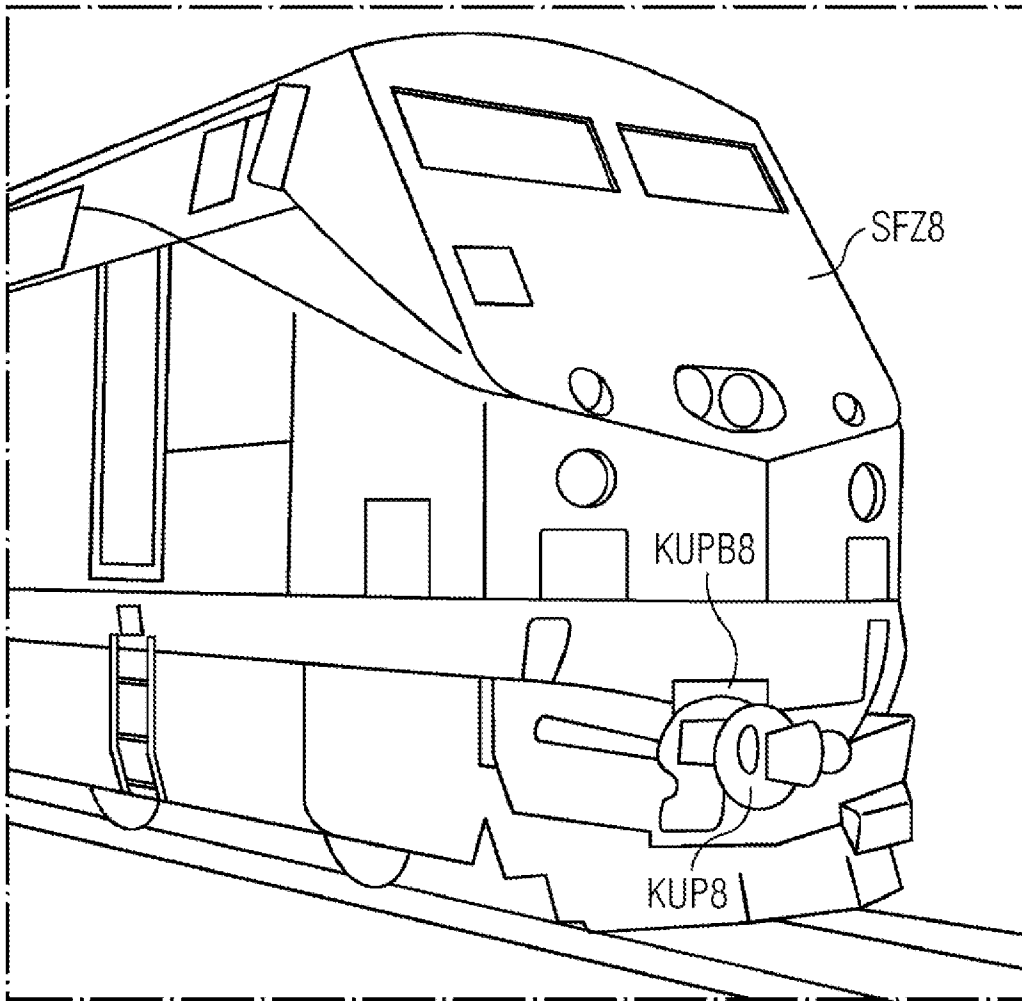


FIG 8

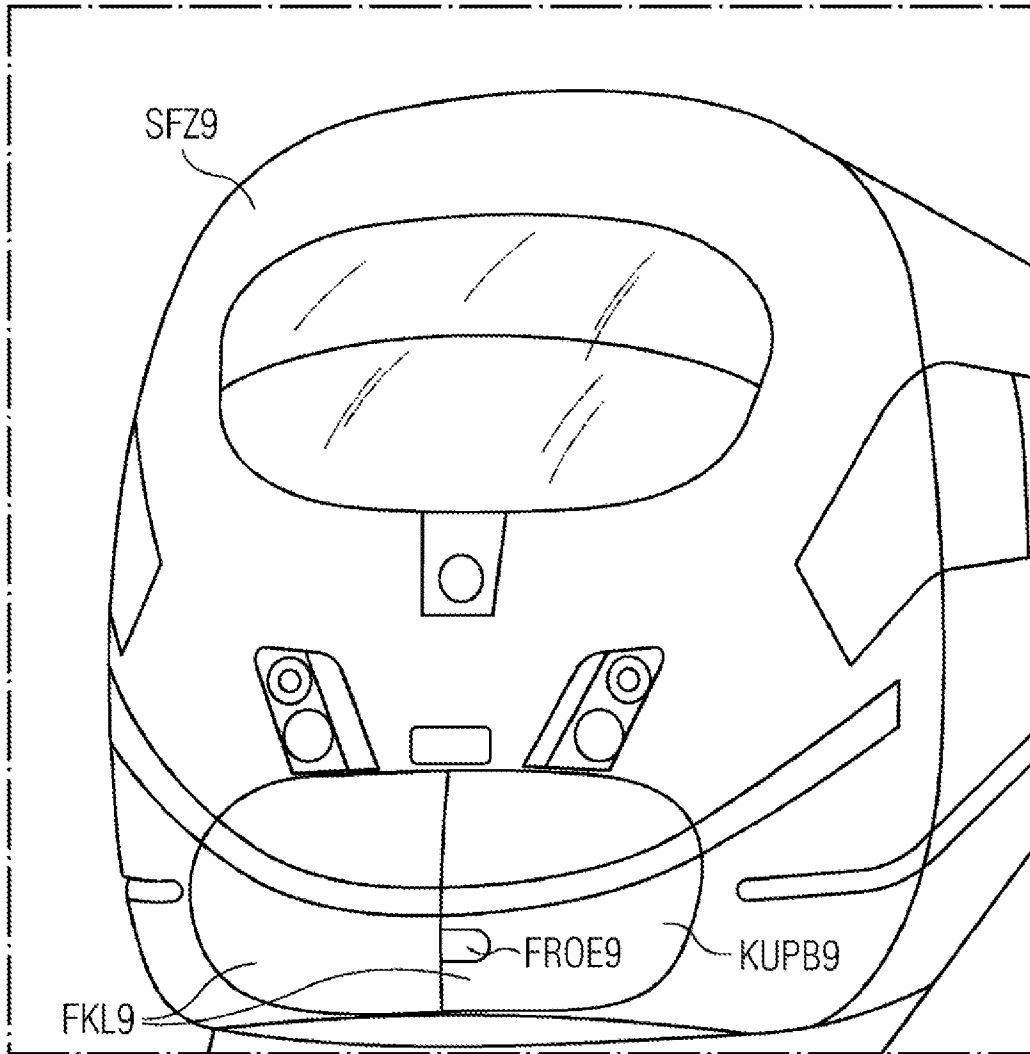


FIG 9

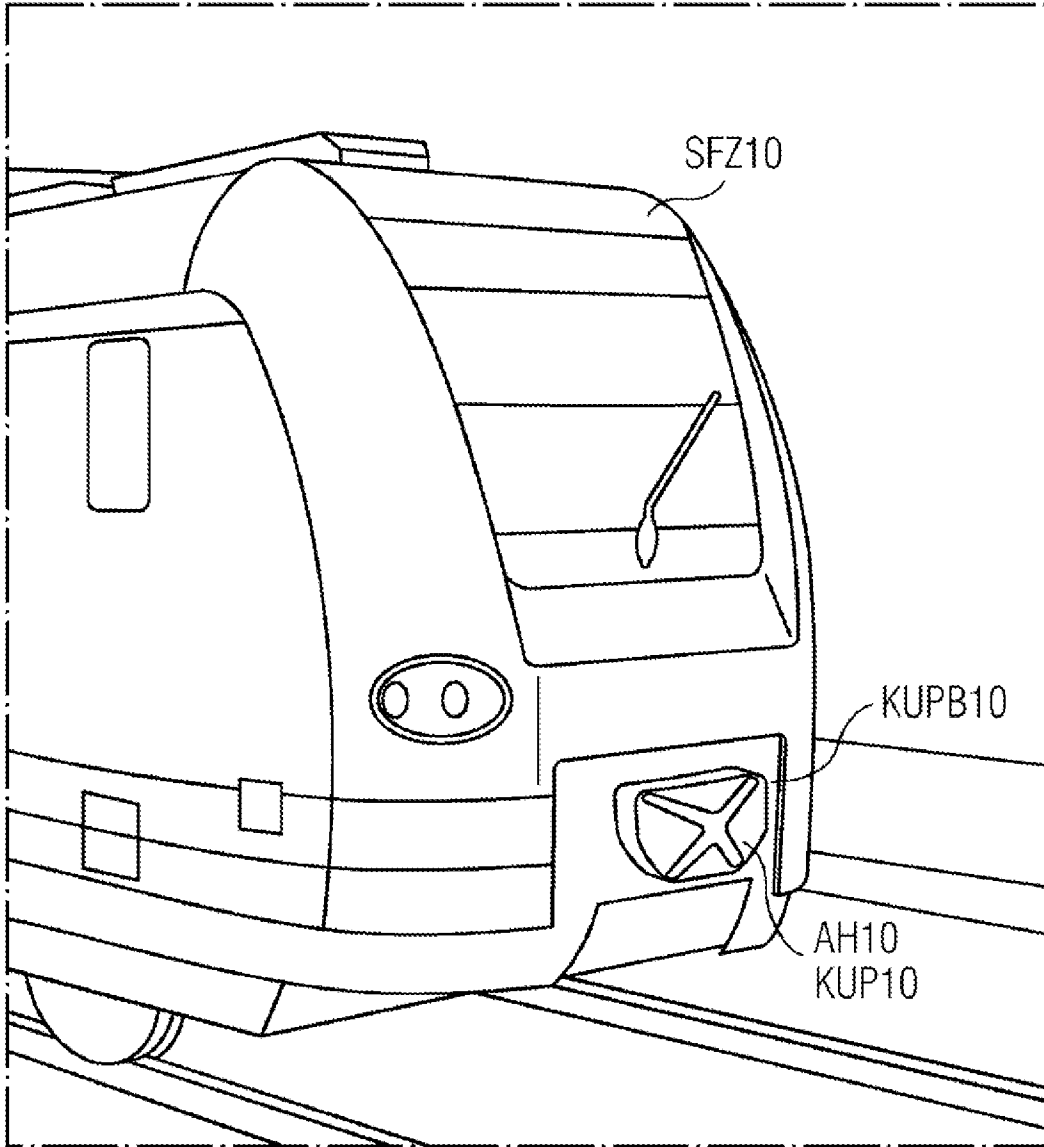


FIG 10

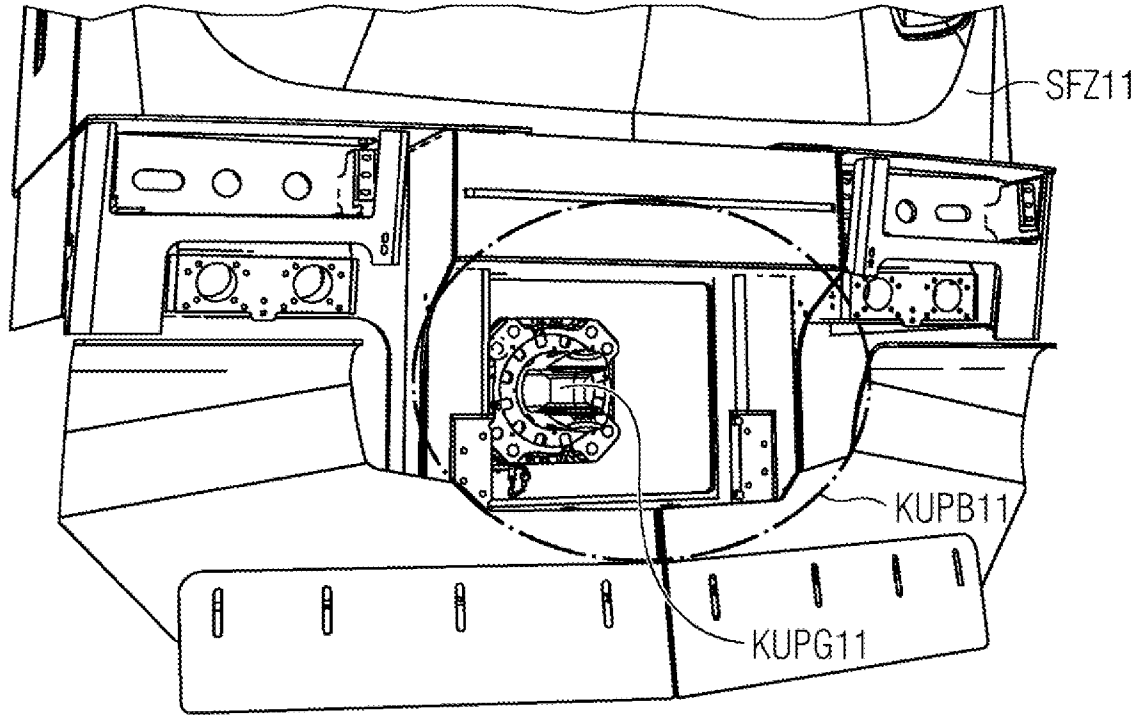


FIG 11

