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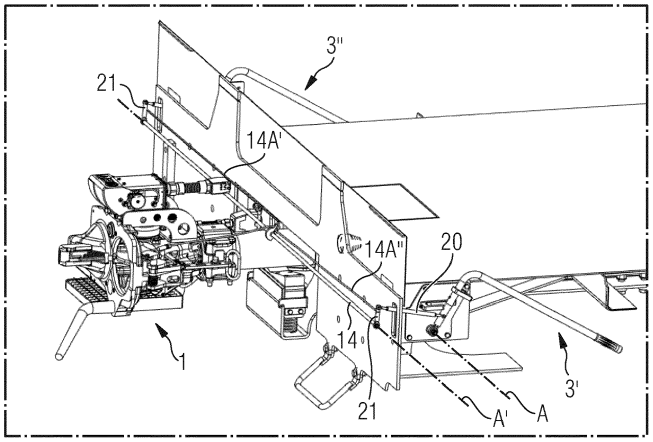
(54) COUPLER ARRANGEMENT FOR RAIL VEHICLE

(57) A coupler arrangement for a rail vehicle comprises a coupler head (1) and an uncoupling device having at least one handle (3; 3', 3") which is manually swivellable about an axis of rotation (A) in a swivel direction (S) from a first position, in which the coupler head (1) is in a state in which it is coupled to or ready to couple with the coupler head of another coupler arrangement, into a second position, in which the coupler head (1) is in an uncoupled state. In one embodiment the handle (3; 3', 3") comprises a handle arm (3A) which is oriented horizontally when the handle is either in the first or in the second position. In another embodiment the handle (3; 3', 3") is mechanically lockable by moving, preferably shifting or tilting, at least a portion of the handle in a locking direction from the second position into a third position, wherein the locking direction differs from the swivel direction (S). In an even further embodiment, two of those handles (3', 3") are provided, preferably on opposite sides relative to the coupler head 1, wherein preferably swivelling of one of the two handles (3', 3") causes a corresponding swivelling of the respective other handle.

FIG 12



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Description

FIELD OF THE INVENTION

[0001] This invention relates to a coupler arrangement for a rail vehicle, in particular for automatic coupling systems (AC) in rail freight transportation (RFT).

BACKGROUND OF THE INVENTION

[0002] An analysis of worldwide RFT activities which was conducted by Berlin University of Technology for the German Federal Ministry of Transport and Digital Infrastructure (BMVI) and published on 29 June 2020 as "Development of a concept for the EU-wide migration to a digital automatic coupling system (DAC) for rail freight transportation" (generally referred to as Technical Report "DAC Technology") showed that the couplings currently used in RFT (Janney and SA3) only create the mechanical connection between the wagons automatically. The BMVI proposes that the European rail freight sector upgrades from a screw coupling (SC) to a DAC Type 4. A DAC Type 4 permits automatic coupling of compressed air, electrical power, and data lines, in addition to the mechanical connection.

[0003] One type of a DAC is the Scharfenberg coupling which is, however, not used in RFT so far but is the standard for high-speed rail transportation in Europe. Scharfenberg couplings are also available as DAC Type 4. The coupler heads of a Scharfenberg coupling have a coupling profile with a cone and a cup, the cone of one coupler head being guided into and centered in the cup of the opposing coupler head during the coupling process, thereby aligning the two coupler heads. Each coupler head contains a rotating metal disc, also known as "hook plate", which is sometimes also referred to as the heart of the coupler head. Attached to one circumferential side of the disc is a plunger, often also referred to as "coupling link" or "hoop". On the opposing side there is a "notch" in the disc. The rotating disc is held in position by a tensioning spring, in which position the notch is drawn into and the hoop urged outwards of the coupler head. Usually, there are two of these tensioning springs provided inside the coupler head. During coupling, when the hoop of one coupler head is pressed against the disc of the opposing coupler head, its own disc rotates. Since the coupler heads are identical, such rotation of the disc occurs on both coupler heads simultaneously until the hoops of both coupler heads engage with the notch in the disc of the respective other coupler head. The discs then automatically return to their original position due to the spring force and then the coupling process is complete. This way, half of the tensile force is transmitted by each hoop. Uncoupling of the coupler heads requires an external force in order to turn the disc of one of the coupler heads against the spring force into its uncoupling position until the hoop of the coupler head slides out of the notch in the disc of the other coupler head. Since the disc of the other coupler head follows such movement, actuating the release mechanism of one coupler head simultaneously unlocks both coupler heads. The present invention is particularly useful in connection with Scharfenberg-type couplings, but is likewise useful for other couplings, in particular those in which a locking force needs to be overcome in order to release the coupling.

[0004] In RFT today, at least in Europe, uncoupling is made manually. A worker crawls underneath a side buffer to get to the couplers and uncouples the connected wagons. Side buffers are usually on each side of the coupler. According to the German General Railway Act (AEG), the free space at the end of the vehicle between the coupling and a side buffer, referred to as the "Berne rectangle", is essential for the workers as they have to step between the wagons in order to uncouple them. Thus, there is a need to improve conditions for the workers doing the uncoupling. For instance, it would be good if the workers did not have to stand between the wagons during the uncoupling process.

[0005] DE 102020119328 A1 discloses a manual uncoupling device including a hand lever attached to a pull wire so as to reduce the force needed for uncoupling the coupler head by pulling the pull wire. The hand lever is located on a lateral side of the wagon. Thus, the hand lever can be reached easily by an operator without the need to get between two wagons. The hand lever is arranged vertically and is tilted outwards from the wagon in order to uncouple the coupler head. There are rest positions for the hand lever which indicate the respective positions in which the coupler head is in a coupled and an uncoupled state. The hand lever may be designed with a removable handle bar, such that removal of the handle bar prevents unauthorized operation of the manual uncoupling device.

[0006] However, there is still room for improvement of the uncoupling process.

SUMMARY OF THE INVENTION

[0007] It is therefore an object of the present invention to provide a coupler arrangement for a rail vehicle which offers improved handling during uncoupling processes.

[0008] Accordingly, the invention relates to a coupler arrangement for a rail vehicle, comprising a coupler head and an uncoupling device having at least one handle which is manually swivellable about an axis of rotation in a swivel direction from a first position, in which the coupler head is in a state in which it is coupled to or ready to couple with a coupler head of another coupler arrangement, into a second position, in which the coupler head is in an uncoupled state.

HORIZONTAL HANDLE

[0009] According to a first aspect of the present disclosure, the axis of rotation is horizontal and one end of the at least one handle forms a handle arm which extends

in a vertical swivel plane and which has a free end that can be gripped by a person so that the at least one handle arm provides a leverage for the person, wherein the handle arm is oriented horizontally when the at least one handle is either in the first or in the second position. "Horizontally" in the present context also includes positions in which the handle is only approximately horizontal, i.e. within a range of +/- 10° from an exact horizontal position, more preferably within a range of not more than +/- 5° from an exact horizontal position, in which positions a worker would still have the impression that the handle is horizontal.

[0010] The advantage of the handle arm being oriented horizontally with the axis of rotation also being horizontal is that a worker can put his entire weight on the handle, in an extreme case even hanging onto the handle, wherein the levering effect and, thus, the created momentum about the axis of rotation is high as compared to, e.g., a vertically arranged lever arm. The advantage of the handle arm being oriented horizontally in either the first position, i.e. the coupler head's coupled or ready-to-couple state, or in the second position, i.e. the coupler head's uncoupled state, is that it is easily recognizable from the horizontal or non-horizontal position whether the coupler head is in the one or the other state. A further advantage is that, as compared to an upright vertical orientation of the handle, the uncoupling can be carried out faster because a worker does not have to climb as high up in order to reach the free end of the handle, because the distance from the ground up to the free end of the handle is shorter. Furthermore, if required, an extension rod can be easily attached to the handle in order to increase the leverage, wherein the free end of the extension rod can still be easily reached by a worker, as compared to a situation where the handle was oriented vertically.

[0011] Preferably, swivel of the handle between the first position and second position includes a starting position, intermediate position or end position in which the free end of the handle and the axis of rotation are on a same vertical level. Assuming that a worker will hang onto the handle at its free end with his body weight, then the lever arm is longest and, thus, the momentum created about the axis of rotation is highest when the free end of the handle and the axis of rotation are on a same vertical level. Therefore, it is advantageous if the movement of the handle between the first and second positions passes through this point.

[0012] For a similar reason it is further preferably that the angle of rotation of the handle about the axis of rotation between the first position and second position is less than 45°, preferably about 30° or less. The smaller the angle of rotation is, the lesser will the levering effect change during the movement of the handle between the two positions.

[0013] Most preferably, the handle is mounted on a front side, lateral side or rear side of a wagon or car of a rail vehicle with the horizontal axis of rotation extending perpendicularly relative to said side of the wagon. Conclusively, swivel of the at least one handle about the horizontal axis of rotation results in a movement of the handle in a plane that is parallel to the respective front, lateral or rear side. In other words, the handle will not extend outwards away from the side of the wagon upon swivelling. This increases the overall safety of the coupler arrangement.

[0014] In particular, the handle may be arranged on a lateral side of the wagon or car, in which case the horizontal axis of rotation is preferably oriented perpendicular to the longitudinal axis of the coupler rod, in order to keep the space between the wagons, i.e. the Berne rectangle, substantially free of components.

[0015] While an arrangement of the handle on a front side of the wagon is generally preferred, it is nevertheless possible to mount the handle in front of a front side or rear side of the wagon or car. In this case, the free end of the handle is arranged to point towards a lateral side of the wagon. This way, the handle is manually accessible and movable from the first into the second position by a worker standing laterally relative to the wagon.

BUFF POSITION

[0016] According to a second aspect of the present disclosure, the handle is mechanically lockable by moving at least a portion of the handle in a locking direction from the second position into a third position, wherein the locking direction differs from the swivel direction. That is, usually the handle returns automatically from the second position back to the first position as soon as the weight on the handle is lifted, due to the force of the spring in the coupler head which urges the coupler head back into its coupled or read-to-couple state. However, by moving at least a portion of the handle into a third position so that the handle is mechanically locked in such third position, the handle cannot automatically return to the first position. Thus, the coupler head remains in its uncoupled state and is not ready to couple in this state. This uncoupled and not-ready-to-couple state of the coupler head is referred to as "buff state" or "buffer state" and the respective position of the handle is the "buff position" or "buffer position". The buff state is helpful on shunting yards where the wagons are pushed uphill and where, after the top of the hump is reached, different wagons can be rolled downhill on a track by gravity. This kind of management is important in the handling of freight wagons

[0017] One important aspect of this particular buff arrangement is that the locking of the handle is achieved by movement of the handle in a direction which differs from the swivel direction. Thus, the worker who is swivelling the handle from the first to the second position can keep holding on the handle and simply needs to change the direction of motion, for instance in a sidewards direction, in order to reach the handle's third position. Thus, the movement of the handle in the locking direction may include a sideways shifting or sideways tilting of at least

said portion of the handle in a direction parallel to said axis of rotation. This is easily and intuitively manageable by a worker.

[0018] In a preferred embodiment, in the third position, the handle abuts against a holder such that rotation of the handle about the axis of rotation towards the first position is prevented. The holder may have the function of an undercut under which the handle can slide and from which the handle can easily be shifted backwards in order to release it.

[0019] In order for the handle to be tiltable from the second into the third position, a joint may be provided which permits, when the handle is in said second position, sideways tilting of the handle about a tilting axis which is perpendicular relative to the axis of rotation.

[0020] The handle described so far may be a removable handle with a connecting interface for a worker to attach the removable handle via the connecting interface to the coupler arrangement. This prevents unauthorized access to the uncoupling mechanism. Preferably, the connecting interface of the removable handle comprises one part of a key-and-lock assembly. A key-and-lock assembly has a connecting interface with irregular mating structures, which are typically non-standard, thereby increasing the security against unauthorized use.

[0021] Furthermore, the movement of the handle needs to be translated in an action by which the coupler head is released to uncouple. In this regard, a cable may be provided, wherein the handle is arranged to cooperate with the cable so that, upon swivelling of the at least one handle from the first position towards the second position, the cable is being pulled. The coupler arrangement is configured such that pulling of the cable causes the coupler arrangement, i.e. the coupler head, to uncouple. In relation with the handle described so far, the cable may comprise a Bowden cable, i.e. the cable is guided in a bendable but incompressible sheath, as is well known, e.g., from bicycle cables. This offers flexibility in the positioning of the handle anywhere along the sides of the wagon.

TWO HANDLES

[0022] According to a third aspect of the present disclosure, there are provided two handles, namely a first handle which is preferably arranged on one side of the coupler head and a second handle which is preferably arranged on the other or opposite side of the coupler head, namely preferably on opposite sides of the longitudinal axis of the coupler rod. The first and second handles are functionally connected to the coupler head to uncouple the coupler head. Particularly, the first and second handles are preferably arranged on the same wagon so that either one of the first and second handles can be used to release the coupler head mounted on this wagon. Both the first handle and the second handle are manually swivellable about a respective axis of rotation in a corresponding swivel direction from a respective first position, in which the coupler head of the coupler arrangement is in the state in which it is coupled to or couplable with the coupler head of another coupler arrangement, into a respective second position, in which the coupler head is in the uncoupled state. The handles may have the same special characteristics as the above-mentioned handles. In one embodiment, the two handles are movable between the first and second positions independent from each other. In another embodiment, the configuration is such that swivelling of one of the first and second handles from its respective first to its respective second position causes swivelling of the respective other one of the first and second handles from said other one's respective first to said other one's respective second position

[0023] Usually, there is only one handle provided for each coupler head, e.g. on the front left and rear right of a wagon, because then, independent of the side of the wagon where a worker is standing, he has access to one handle to release one of the coupler heads. As mentioned before, releasing one coupler head causes simultaneous release of the other coupler head, thereby uncoupling the two coupler heads. However, in some situations it is advantageous for the worker to be able to act on the other coupler head directly. Thus, with the provision of the second handle, this becomes possible.

[0024] In particular, the provision of a second handle in such a manner that actuation of one handle associated with one coupler head causes a corresponding action of the other handle associated with the same coupler head has the advantage that a worker standing on one side of the wagon and actuating one coupler head can easily verify whether the other coupler head has already been brought into the uncoupled state by the position of its associated handle. This is particularly helpful in situations where the other coupler head is in a buff state, because such state is not easily recognizable from the coupler head itself. And even in cases where the state of the coupler head is recognizable from the coupler head itself, this is less obvious than a position of the handle when observing from a safe position which is beside the wagons and not between the wagons. The second handle thus avoids in such situations the need for the worker to crawl to the other side in order to verify whether the other coupler head is locked in the buff state.

[0025] There are various ways of how the movement of the first handle can be translated into a corresponding movement of the second handle, including the employment of chains, wires, belts, rods, etc. According to a preferred embodiment, the first and second handles are interconnected by rod which is configured to translate swivelling of one of the first and second handles about its respective axis of rotation to a swivelling of the respective other one of the first and second handles about the respective other one's axis of rotation. For instance, both the first handle and second handle may each be attached with one of their ends to the rod and the rod is mounted to be rotatable about said axis of rotation so that swivelling of one of the handles about the axis of

rotation causes rotation of the rod and, thus, causes also a corresponding swivelling of the other handle.

[0026] A cable may be connected to the rod, wherein swivelling of either one of the first and second handles from its respective first position towards its respective second position causes a pulling movement on the cable and, thereby, causes the coupler arrangement, i.e. the coupler head, to uncouple. When the axis of rotation coincides with the longitudinal axis of the rod, then the pulling movement results in an up-winding of the cable on the rod. If the axis of rotation does not coincide with the longitudinal axis of the rod, but is parallel thereto, then the cable will simply be pulled by the movement of the rod, e.g. upwards or downwards, which movement may be supported by suitable guide rollers for guiding the cable. For instance, the cable may be attached to a central section of the rod, close to the coupler head. The (single) cable is very short as compared to the alternative that both handles are directly connected to the coupler head by an own cable.

[0027] Preferably, the configuration of the coupler arrangement is such that a direction of orientation of the first handle in the first handle's first and second positions is identical to a direction of orientation of the second handle in the second handle's respective first and second positions. Thus, independent of the side of the wagon on which the worker is standing, he can unambiguously conclude from the position of the handle on his side of the wagon whether or not the coupler head is in an uncoupled and not-ready-to-couple state.

[0028] In a preferred embodiment, the first handle or an extension of the first handle is arranged to extend through a first mounting plate and the second handle or an extension of the second handle is arranged to extend through a second mounting plate, which first and second mounting plates respectively extend laterally from a front side or rear side of a wagon or car of a rail vehicle, so that the first and second handles extend along a respective lateral side of said wagon or car. Thus, the handles extend parallel to the wagon's lateral sides, whereas the afore-mentioned rod may extend in front of the front or rear side of the wagon. For instance, the rod may be mounted to the mounting plate so as to be rotatable about said axis of rotation and the handles may be mounted to the rod.

[0029] In those cases where it is desired that the two handles are mechanically lockable in a buff position, as described above, it is advantageous when locking of one handle in the buff position results in a locking also of the other handle and/or releasing one handle from the buff position results in a release also of the other handle. In this respect, according to a preferred embodiment, the configuration of the coupler arrangement is such that movement of at least a portion of one of the handles in a respective locking direction from its respective second position into a respective third position, with the locking direction differing from the handle's swivel direction, causes movement of the respective other handle in the locking direction of the respective other handle.

[0030] This can be achieved in various ways. According to a first embodiment, the configuration is such that the movement of one handle in its respective locking direction and the movement of the other handle in the locking direction of the other handle includes both a sideways shifting of at least the portion of the one handle and a sideways shifting of at least the portion of the other handle. This may be realized, e.g., in that the handles are attached to the afore-mentioned rod such that pushing or pulling one handle in a direction towards the other handle causes the rod to be pushed and pulled, respectively, in that direction, thereby transferring the pushing and pulling movement from the one to the other handle. In the simplest case the two handles and the rod may be fixedly attached to each other or integrally formed so as to form together a wide "U".

[0031] The same effect may also be achieved according to a second embodiment, according to which the configuration is such that the movement of one handle in its respective locking direction and the movement of the other handle in the locking direction of the other handle includes both a sideways tilting of at least the portion of the one handle and a sideways tilting of at least the portion of the other handle. This may be realized, e.g., in that the handles are mounted on the afore-mentioned rod such that, while swivelling of the handles about the rod's axis of rotation causes the rod to rotate accordingly, tilting of the handles has no effect on the position of the rod. For instance, the longitudinal axis of the rod may coincide with the axes of rotation of the two handles and the handles may each be mounted on the rod in a bearing in which they can journal about a tilting axis which is perpendicular to the axis of rotation. Then, in order to transfer the tilting movement from one handle to the other, there may be provided a second rod which interconnects the two handles at a short distance from said bearing. This embodiment is advantageous over the first embodiment in that the worker, when tilting the handle, may benefit from the levering effect provided by the handle, so that the worker does not need to use much force for bringing the handles in and out of the buff position.

[0032] In the first and second embodiments described above, shifting as well as tilting of one handle in or against the locking direction causes a shifting and tilting, respectively, of the other handle in the same direction. In other words, movement of the one handle in a direction towards the wagon's lateral side in order to, e.g., bring the coupler head in the buff state would cause other handle to move away from the wagon's lateral side into its corresponding buff state. This is usually not desired. Rather, both handles should be moved either towards or away from the lateral side in order to reach the buff state, and vice versa, in order not to confuse the worker. Therefore, the first and second embodiments may be further improved by configuring the coupler arrangement such that the locking direction of one handle is opposite to the locking direction of the other handle.

[0033] This may be achieved in various ways. According to a preferred embodiment, the second rod in the second embodiment comprises two separate rod sections, each having one end attached to the handle (at a distance from said axis of rotation) and the other end attached to a return mechanism. The return mechanism has the effect that a movement of one rod section in one direction, e.g. a forward direction, causes the other rod section to move in the opposite direction, i.e. a backward direction. For instance, the return mechanism may comprise an element which is rotatable about a rotational axis that is perpendicular to the direction of movement of the rod sections, and the rod sections may be attached to this element on opposite sides of the rotational axis, preferably at an equal distance therefrom.

[0034] In the case where the coupler arrangement comprises two handles, it is not feasible to design the handles as removable handles because the worker would have to carry a couple of handles and he would have to attach the handles on both sides of the wagon in order to benefit from the advantages of having two handles. Therefore, according to a preferred embodiment, there is provided a key-and-lock arrangement acting directly on the rod, namely with a key-and-lock mechanism at both ends of the rod, The key-and-lock arrangement is so configured that the rod is prevented from rotating about said axis of rotation when one of the key-and-lock mechanisms is in its locked condition. This kind of key-and-lock assembly can likewise be used on single-handle coupler arrangements. However, in the case of a two-handle coupler arrangement, the key-and-lock mechanism at one end of the rod advantageously cooperates with the key-and-lock mechanism at the other end of the rod through the hollow interior of the rod, e.g., by means of a wire or by means of a complete pulley system, so that unlocking the key-and-lock mechanism at the one end of the rod causes unlocking of the respective other key-and-lock mechanism at the other end of the rod. In this way, the worker only has to carry one specific tool with him, the "key", which works for all couplers of that particular type (and possibly other types).

GENERAL ASPECTS

[0035] The coupler arrangement of the present invention is particularly suitable in combination with a biasing element that is configured to permanently bias the handle or handles towards the first position. Preferably, such biasing element is constituted by a spring of a coupler head, which spring urges the coupler head into its coupled or ready-to-couple state, as is the case in the Scharfenberg-type couplings. Accordingly, the present invention is particularly suitable for coupler arrangement comprising a Scharfenberg-type coupler head.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036] 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 is not limited, however, to the specific embodiments disclosed in the drawings. In the drawings:

Fig. 1 is a perspective view of a coupler arrangement attached to the undercarriage of a wagon or car of a rail vehicle;

Fig. 2 shows a detail of Fig. 1;

Figs. 3A and 3B show the handle of the coupler arrangement of Fig. 1 in a side view and top view, respectively, in a first ("coupled") position;

Figs. 4A and 4B show the handle of the coupler arrangement of Fig. 1 in a side view and top view, respectively, in a third ("buff') position;

Fig. 5 shows a key-and-lock mechanism for attaching the handle of the coupler arrangement of Fig. 1;

Fig. 6 illustrates a first principle ("shifting") for use in a coupler arrangement having two handles;

Fig. 7 illustrates an aspect of the first principle of Fig. 6 in further detail;

Fig. 8 illustrates a second principle ("tilting") for use in a coupler arrangement having two handles;

Fig. 9 illustrates an advancement of the second principle ("tilting") shown in Fig. 8;

Fig. 10 illustrates an aspect of the advanced second principle of Fig. 8 in further detail;

Fig. 11 is a perspective view of a coupler arrangement with two handles in a coupled or ready-to-couple state, attached to the undercarriage of a wagon or car of a rail vehicle;

Fig. 12 is a perspective view of the coupler arrangement of Fig. 10 in a buff state; and

Fig. 13 illustrates a locking mechanism for preventing actuation of the uncoupling device of a coupler arrangement having two handles.

DETAILED DESCRIPTION

[0037] Fig. 1 is a perspective view of a coupler arrangement attached to the undercarriage of a wagon or car of a rail vehicle. The coupler arrangement comprises a coupler head 1 for coupling with a second coupler head of

identical shape, a coupler rod 2 for connecting the coupler head 1 to the undercarriage, and further components which are either not visible in this view or not of importance for the following description. The skilled person will recognize that the coupler head 1 is of the Scharfenberg type, more specifically a Scharfenberg Type 10 coupler head, and fulfils all requirements of a DAC-Type 4. The coupler arrangement further comprises an uncoupling device for bringing the coupler head 1 from a first state in which it is either coupled to a second coupler head or ready to couple to a second coupler head into a second, uncoupled state. The uncoupling device includes a handle 3 which is manually swivellable about an axis of rotation A in a swivel direction S from a first position, as shown in Fig. 1, in which the coupler arrangement, more specifically the coupler head 1, is in the coupled or ready-to-couple state, into a second position (not shown) in which the coupler head 1 is in an uncoupled state. The handle 3 is connected to a release mechanism 4 via a cable 5. As described above, actuation of the release mechanism is against the force of a tensile spring or tensile springs inside the coupler head 1 (not shown), which holds/hold the coupler head 1 in its coupled or ready-to-coupled state. Spring 4A is an additional spring which has the sole purpose of providing an additional tensile force on the handle 3 to force the handle 3 towards the coupler head 1, but this additional spring 4A is optional. Thus, when the handle 3 is pushed or pulled downwards so as to swivel about the axis of rotation A in the swivel direction S, it pulls on the cable 5, which is guided (as a Bowden cable) through a mounting plate 6 on the front/rear side of the undercarriage to the release mechanism 4, thereby actuating the release mechanism 4 accordingly. In the position of the handle 3 as shown in Fig. 1, the tension force of the tensile spring(s) inside the coupler head 1 (and of the - optional - spring 4A of the release mechanism 4) acting on the cable 5 urges the handle 3 against a stopper 7, which may be made of a rubber or any other material which provides a damping effect. Optionally, a further spring (not shown) may be connected to the handle 3 directly or indirectly in order to further support the horizontal position of the handle 3 in the coupled or ready-to-couple state of the coupler head 1.

[0038] As can be seen from Fig. 1, the axis of rotation A is horizontal. More specifically, it runs parallel to the front/rear side of the undercarriage. Furthermore, the handle 3 has a handle arm 3A which extends away from the axis of rotation A, i.e. it extends in a vertical swivel plane. More specifically, the swivel plane is parallel relative to a lateral side of the undercarriage. The free end 3B can be gripped by a worker so that the handle 3 provides a leverage for the worker. In this position, which is also referred to as the "first position" within the present disclosure, the handle arm is oriented horizontally. In an alternative embodiment, which is not explicitly shown here, the handle arm 3A may be oriented horizontally in a respective "second position", which is the position of the handle in which the coupler head 1 is in its decoupled state. The horizontal position of the handle 3 gives a clear indication to the worker about the current state of the coupler head 1.

[0039] Fig. 2 shows the release mechanism 4 in greater detail. Accordingly, the cable 5 is attached to an eccentric plate or cam plate 4B and runs along a circumference thereof so that pulling of the cable 5 causes the eccentric plate 4B to rotate against the tensile force of the tensioning spring(s) inside the coupler head 1 and against the tensile force of the - optional - spring 4A, thereby releasing (not shown) the coupler head 1 into its uncoupled state.

[0040] Fig. 3A and 3B show only the mounting of the handle 3 of the coupler arrangement of Fig. 1 in a side view and top view, respectively, namely in said first "coupled position", in which the coupler head 1 is either coupled or ready to couple to a second coupler head. The cable 5 is not shown, except for its Bowden cable mounting fitting 8. There are provided two stops 9 and 10, the first stop 9 holding the handle 3 in position against the pulling force of the cable 5, and the second stop 10 limiting the swivel motion of the handle 3 in the swivel direction S about the axis of rotation A. Thus, the second stop 10 defines the "second position" or "buff position" of the handle 3.

[0041] Fig. 4A and 4B show the handle 3 of the coupler arrangement in a side view and top view, respectively, in a "third position", also referred to as the "buff position". As can be seen, the handle 3 has been tilted from the intermediate second position (not shown) to the buff position by tilting the handle 3 sideways. The fixed end 3C of the handle is mounted to a bearing 11, which allows both the handle's rotation about the axis of rotation A between the first and second positions and the handle's tilting about a tilting axis T between the second and third positions, wherein the tilting axis T is perpendicular to the axis of rotation A.

[0042] As can be seen from Fig. 4B, in its buff position the handle 3 abuts against a holder 12. The holder 12 and the second stop 10 are integrally formed as a hook 13. The holder 12 has the form of an undercut under which the handle 3 can slide when it is moved from the second to the third position and from which the handle 3 can easily be shifted backwards towards its second position in order to release the handle 3 from the holder 12.

[0043] As can be seen from Fig. 4A, in the buff position the free end 3B of the handle 3 is positioned below the level of the axis of rotation A, whereas in its first position it is above the level of the axis of rotation A (Fig. 3A). The angle of rotation α of the handle 3 between the stops 9 and 10 is only about 30°, and the maximum leverage provided by the handle 3 is at an intermediate position between the handle's first and second positions, which is the position in which the free end 3b of the handle 3 is on the same level as the axis of rotation A. This way, the worker pushing or pulling or even hanging onto the handle 3 has an optimum leverage over the whole swivel range.

[0044] In the embodiment shown in Fig. 1, the arrangement of the handle 3 is on a lateral side of the undercarriage. However, in an embodiment not specifically illustrated, the handle arrangement as shown in Figs. 3A to 4B may be mounted on a front side or rear side of the undercarriage, for instance attached to the mounting plate 6, provided that the Berne rectangle is not compromised.

[0045] As shown in Fig. 5, the handle 3 is removable. The connecting interface provides a key-and-lock assembly, i.e. the connecting interface has non-standard mating structures in order to prevent unauthorized use.

[0046] Fig. 6 illustrates a first principle for use in a coupler arrangement having two handles, namely a first handle 3' and a second handle 3", instead of only the one handle 3. The handles 3', 3" each extend through the mounting plate 6 towards a front of the mounting plate 6 where they are fixedly connected to a rod 14. The rod 14 is rotatably mounted in two bearings 15 so as to be rotatable about an axis of rotation, which is the axis of rotation A of the handles 3', 3". Accordingly, when pushing or pulling the first handle 3' downwards, as indicated by the vertical arrow in Fig. 6, the second handle 3" automatically moves in the same direction, as indicated by the other vertical arrow in Fig. 6. Thus, since the two handles 3', 3" are arranged in parallel to each other, they always have a common orientation.

[0047] However, the rod 14 is not only rotatable about the axis of rotation A but can also be shifted in the bearings 15 along the axis of rotation A. As a result, when the first handle 3' is pulled away from the undercarriage so as to shift it under a holder (not shown) into a buff position, similar to the holder 12 in Fig. 4B, then the second handle 3" is simultaneously shifts the same direction so that, when a second holding element is appropriately arranged, also the second handle 3" will move into its respective buff position. The shifting motion is indicated by the two horizontal arrows on the handles 3', 3" and the two-headed arrow on the rod 14 in Fig. 6.

[0048] A cable 5, not shown in Fig. 6 but shown in the detailed view in Fig. 7, is fixed to the rod 14 in such a manner that it winds up onto the rod 14 as one of the handles 3', 3" is moved downwards. As a result, due to the tensile force acting on the cable 5 or due to any other spring force urging the handles 3', 3" towards their first (horizontal) position, when one of the handles 3', 3" is shifted sideways from its buff position towards its second position (both positions not shown in Fig. 6) in order to release it from its buff position, the respective handle as well as the other handle are automatically urged upwards into their first positions shown in Fig. 6, which is the ready-to-couple or coupled position. Of course, the coupler arrangement may alternatively be configured such that the two handles 3', 3" are to be moved upwards, instead of downwards, between their first and second positions, and the same is possible for the previously described single handle 3.

[0049] Fig. 8 illustrates a second principle for use in a coupler arrangement having two handles. Again, the arrangement comprises the rod 14 and the first and second handles 3', 3" which are attached to the rod 14 such that upward or downward movement of one of the handles results in a rotation of the rod about the axis of rotation A and, conclusively, a corresponding upward or downward movement of the other handle 3", in the same way as described in relation to Fig. 6. However, the difference to the arrangement in Fig. 6 is that the handles 3' and 3" are not fixedly attached to the rod 14, but they are attached in such a way that they can be tilted about a tilting axis T which is perpendicular to the axis of rotation A. Limitators 16 prevent the rod 14 from moving axially in a direction of the axis of rotation A. A second rod 14A connects the ends of the handles 3', 3" which extend beyond the rod 14. This way, when one of the handles 3', 3" is tilted about the tilting axis T, e.g. in order to move the handle back and forth between the afore-described second position and buff position, the second rod 14A translates such tilting into a corresponding tilting of the respective other handle in the same direction, as indicated by the arrows in Fig. 8. The advantage of this arrangement over the arrangement of Fig. 6 is that a worker has the same levering effect when tilting the handles 3', 3" between the second position and buff position, which he has when he swivels the handles 3', 3" about the axis of rotation A between the first and second positions.

[0050] Instead of connecting the ends of the handles 3', 3" which extend beyond the rod 14, the second rod 14A may alternatively connect the lever arms of the handles 3', 3" at connecting points somewhere between the rod 14 and the free ends of the handles 3', 3". The distance between these connecting points and the rod 14 need only be little in order to achieve the desired sideways movement of the handles.

[0051] A disadvantage of the coupler arrangements with two handles 3', 3", as described above, lies in the fact that the handles 3', 3" move in the same direction when they are shifted or tilted between their second position and buff position, meaning that the worker has to push one handle towards the wagon into its buff position on one side of a wagon, whereas he has to pull the other handle into its respective buff position on the other side of the wagon. Fig. 9 shows an advancement of the second principle of Fig. 8, in which the tilting movement of the one handle 3' in one direction results in a corresponding tilting movement of the other handle 3" in an opposite direction, and vice versa. The difference to the principle shown in Fig. 8 is that the second rod 14A comprises two separate rod sections 14A' and 14A", each having one end attached to one of the handles 3', 3" and the other end attached to a return mechanism 17. The return mechanism 17 comprises a rotatable element 18 which is rotatable about a rotational axis Z which is perpendicular to the direction of movement of the rod sections 14A', 14A". The rod sections 14A', 14A" are connected with their respective other ends to this rotatable element 18 on opposite sides of its rotational axis Z at an equal dis-

tance therefrom, and the rotatable element 18 itself is fixedly mounted to the rod 14 by a connector 19. As a result, movement of the first rod section 14A' in one direction is translated by the rotatable element 18 into a movement of the second rod section 14A" in an opposite direction, which has the effect that the handles 3', 3", when they are tilted about the tilting axis T, move in opposite directions.

[0052] Fig. 10 shows in more detail how the rod 14, rod sections 14A' and 14A", rotatable element 18 and connector 19 may be configured and arranged relative to each other. In particular, the connector 19 may have the form of a cam plate or eccentric plate and the cable 5 may wind up on a circumferential surface thereof when the handles 3', 3" are moved from their first to their second positions.

[0053] The advanced second principle described above in relation to Fig. 9 can likewise be realized with a handle 3 as disclosed above in relation to Figs. 3A to 4B. A respective embodiment is shown in Figs. 11 and 12, wherein Fig. 11 shows the two handles 3', 3" in their first position, corresponding to the coupled or ready-to-couple state of the coupler head 1, and Fig. 12 shows the handles 3', 3" in their third position, which corresponds to the buff state of the coupler head 1. Here, an extension of the handle 3' in the form of a connector rod 20 translates the swivel movement of the handle 3' about the axis of rotation A into a corresponding rotation of the rod 14 about an axis of rotation A' that is parallel to the axis of rotation A, on the one hand, and translates the tilting movement of the handles 3', 3" about the tilting axis T (see Fig. 4B) into a corresponding tilting movement of a ledge 21, to which the first rod section 14A' is attached with one of its ends, on the other hand. The second handle 3" is connected to the rod 14 and second rod section 14" in the same manner. As a result, swivel movement about the axis of rotation A and/or tilting movement about the tilting axis T of the first handle 3' will result in a corresponding swivel and/or tilting movement of the other handle 3", and vice versa.

[0054] In order to prevent that the uncoupling mechanism of a coupler arrangement having two handles 3', 3" is used without authorization, there is provided a locking mechanism by which rotation of the rod 14 can be blocked. The locking mechanism may comprise a locking pin 22 mounted on a shaft 23 which is rotatably mounted on the rod 14 such that the locking pin 22 can be moved into and out of a static component, such as the mounting plate 6 of the undercarriage. Such locking mechanism is provided at both ends of the rod 14, and a wire 24 is wound around the respective two shafts 23 and connects them so as to form a pulley system, i.e. rotation of one shaft 23 is translated by the wire 24 into a rotation of the respective other shaft 23. By arranging the wire 24 so that it crosses itself, e.g., in the middle of its returning path, the locking pins 22 move in opposite directions when one of the two shafts 23 rotates, as is shown in Fig. 13. Conveniently, the wire 24 and even the entire pulley system can be arranged and, thus, protected inside the rod 14, provided the rod 14 is hollow.

[0055] Preferably, the locking mechanism is a key-and-lock mechanism similar to what is disclosed above in relation to Fig. 5. That is, one end of each of the shafts 23 may be accessible from the outside and may have a specific structure, e.g. as shown in Fig. 5, so that it can be rotated only by using a tool having a corresponding mating structure.

[0056] Preferred aspects of the present disclosure are specified in the following paragraphs ("paras"), whereas the scope of protection of the present invention is defined by the appended paras:

1. Coupler arrangement for a rail vehicle, comprising a coupler head 1 and an uncoupling device having at least one handle 3 which is manually swivelable about an axis of rotation A in a swivel direction S from a first position, in which the coupler head 1 is in a state in which it is coupled to or ready to couple with a coupler head of another coupler arrangement, into a second position, in which the coupler head 1 is in an uncoupled state.

HORIZONTAL HANDLE

[0057]

2. Coupler arrangement of para 1, wherein the axis of rotation A is horizontal and wherein one end of the at least one handle 3 forms a handle arm 3A which extends in a vertical swivel plane and which has a free end 3B that can be gripped by a person so that the at least one handle arm 3A provides a leverage for the person, wherein the handle arm 3A is oriented horizontally when the at least one handle 3 is either in the first or in the second position.

3. Coupler arrangement of para 2, wherein swivel of the at least one handle 3 between the first position and second position includes a starting position, intermediate position or end position in which the free end 3B of the at least one handle 3 and the axis of rotation A are on a same vertical level.

4. Coupler arrangement of para 2 or 3, wherein an angle of rotation α of the at least one handle 3 about the axis of rotation A between the first position and second position of the at least one handle 3 is less than 45°.

5. Coupler arrangement of any one of paras 2 to 4, wherein the at least one handle 3 is mounted on a front side, lateral side or rear side of a wagon or car of a rail vehicle and said axis of rotation A extends perpendicular relative to said side of the wagon or car so that swivel of the at least one handle 3 about the axis of rotation A results in a movement of the at

least one handle 3 in a plane that is parallel to the respective front, lateral or rear side of the wagon or car.

6. Coupler arrangement of any one of paras 2 to 5, wherein the at least one handle 3 is mounted in front of a front side or rear side of a wagon or car of a rail vehicle with the free end 3B of the at least one handle 3 pointing towards a lateral side of the wagon so as to be manually accessible and movable from the first into the second position by a person standing laterally relative to the wagon.

BUFF POSITION

[0058]

7. Coupler arrangement of para 1 or any one of paras 2 to 6, wherein the at least one handle 3 is mechanically lockable by moving at least a portion of the at least one handle 3 in a locking direction from the second position into a third position, wherein the locking direction differs from the swivel direction S.

8. Coupler arrangement of para 7, wherein movement of the at least one handle 3 in the locking direction includes a sideways shifting or sideways tilting of at least the portion of the at least one handle 3, wherein the sideways shifting or sideways tilting of said portion of the at least one handle 3 is in a direction parallel to said axis of rotation A.

9. Coupler arrangement of para 7 or 8, wherein in the third position the at least one handle 3 abuts against a holder 12 such that rotation of the at least one handle 3 about the axis of rotation A towards the first position is prevented.

10. Coupler arrangement of any one of paras 7 to 9, comprising a joint which permits, when the at least one handle 3 is in said second position, sideways tilting of the at least one handle about a tilting axis T which is perpendicular relative to said axis of rotation A.

TWO HANDLES

[0059]

11. Coupler arrangement of para 1 or any one of paras 2 to 10, comprising one of said at least one handle 3 as a first handle 3 and another one of said at least one handle 3' as a second handle 3", wherein both the first handle 3' and the second handle 3" are manually swivellable about a respective axis of rotation A in a corresponding swivel direction S from a respective first position, in which the coupler head 1 is in the state in which it is coupled to or couplable with a coupler head of another coupler arrangement, into a respective second position, in which the coupler head 1 is in the uncoupled state.

12. Coupler arrangement of para 11, wherein the coupler arrangement is configured such that swivelling of one of the first and second handles 3', 3" from its respective first to its respective second position causes swivelling of the respective other one of the first and second handles 3', 3" from said other one's respective first to said other one's respective second position

13. Coupler arrangement of para 11 or 12, wherein the first and second handles 3', 3" are arranged on opposite sides relative to the coupler head 1.

14. Coupler arrangement of any one of paras 11 to 13, wherein the first and second handles 3', 3" are interconnected by a rod 14 which is configured to translate swivelling of one of the first and second handles 3', 3" about its respective axis of rotation A to a swivelling of the respective other one of the first and second handles 3', 3" about the respective other one's axis of rotation A.

15. Coupler arrangement of para 14, comprising a cable 5 connected to the rod 14, wherein swivelling of either one of the first and second handles 3', 3" from its respective first position towards its respective second position causes a pulling movement on the cable 5 and, thereby, causes the coupler head 1 to uncouple.

16. Coupler arrangement of any one of paras 11 to 15, wherein a direction of orientation of the first handle 3' in the first handle's first and second positions is identical to a direction of orientation of the second handle 3" in the second handle's respective first and second positions.

17. Coupler arrangement of any one of paras 11 to 16, wherein the first handle 3' or an extension of the first handle 3' is arranged to extend through a first mounting plate 6 and the second handle 3" or an extension of the second handle 3" is arranged to extend through a second mounting plate 6, which first and second mounting plates 6, respectively, extend laterally from a front side or rear side of a wagon or car of a rail vehicle, so that the first and second handles 3', 3" extend along a respective lateral side of said wagon or car.

18. Coupler arrangement of any one of paras 11 to 17, wherein, in a case where each of the first and second handles 3', 3" is configured such that it is mechanically lockable by moving at least a portion thereof in a respective locking direction from its re-

spective second position into a respective third position, with the handles' locking directions differing from their respective swivel direction, movement of one of the first and second handles 3', 3" in its respective locking direction causes movement of the respective other one of the first and second handles 3', 3" in the locking direction of the respective other one of the first and second handles 3', 3".

19. Coupler arrangement of para 18, wherein said movement of one of the first and second handles 3', 3" in its respective locking direction and said movement of the respective other one of the first and second handles 3', 3" in the locking direction of the respective other one of the first and second handles 3', 3" includes both a sideways shifting of at least the portion of the first handle 3' and a sideways shifting of at least the portion of the second handle 3".

20. Coupler arrangement according to para 19, including para 14, wherein the first and second handles 3', 3" are each attached to the rod 14 in such a manner that pushing or respectively pulling one of the first and second handles 3', 3" in a direction towards the other one of the first and second handles 3', 3" causes the rod 14 to be pushed or respectively pulled in that direction, thereby transferring the pushing and pulling movement from the one of the first and second handles 3', 3" to the other one of the first and second handles 3', 3".

21. Coupler arrangement of para 18, wherein said movement of one of the first and second handles 3', 3" in its respective locking direction and said movement of the respective other one of the first and second handles 3', 3" in the locking direction of the respective other one of the first and second handles 3', 3" includes both a sideways tilting of at least the portion of the first handle 3' and a sideways tilting of at least the portion of the second handle 3".

22. Coupler arrangement of para 21, including para 14, wherein the first and second handles 3', 3" are each mounted on the rod 14 in such a manner that swivelling of either one of the first and second handles 3', 3" about the axis of rotation causes the rod 14 to rotate accordingly, but the sideways tilting of any one of the first and second handles 3', 3" has no effect on the position of the rod 14.

23. Coupler arrangement of para 22, wherein a longitudinal axis of the rod 14 coincides with the axes of rotation A of the first and second handles 3', 3" and wherein the first and second handles 3', 3" are each mounted on the rod 14 in an associated bearing in which they can journal about a tilting axis T which is perpendicular to said axis of rotation A.

24. Coupler arrangement according to para 23, comprising a further rod 14A which interconnects the first and second handles 3', 3" at a distance from said axis of rotation A so as to transfer tilting movement from either one of the first and second handles 3', 3" to the respective other one of the first and second handles3', 3".

25. Coupler arrangement of any one of paras 11 to 24, wherein the locking direction of the first handle 3' is opposite to the locking direction of the second handle 3".

26. Coupler arrangement of para 24, wherein the further rod 14A comprises two separate rod sections 14A', 14A", each having one end thereof attached to a respective one of the first and second handles 3', 3" at a distance from said axis of rotation A and an opposing end thereof attached to a return mechanism 17 which is configured to translate a movement of one of the two rod sections 14A', 14A" in one direction into a movement of the respective other one of the two rod sections 14A', 14A" in a direction opposite to said one direction.

27. Coupler arrangement of para 26, wherein the return mechanism 17 comprises a rotatable element 18 which is rotatable about a rotational axis that is perpendicular to the directions of movement of the two rod sections 14A', 14A", and the two rod sections 14A', 14A" are each attached to the rotatable element 18 on opposite sides relative to its rotational axis.

28. Coupler arrangement of any one of paras 11 to 27, comprising a key-and-lock arrangement acting directly on the rod 14 and having a key-and-lock mechanism 22-24 at both ends of the rod 14, the key-and-lock arrangement 22-24 being configured to prevent the rod 14 from rotating about said axis of rotation A when one of the key-and-lock mechanisms 22-24 is in its locked condition.

29. Coupler arrangement of para 28, wherein the key-and-lock mechanism 22-24 at one end of the rod 14 cooperates with the key-and-lock mechanism 22-24 at the other end of the rod 14 through a hollow interior of the rod 14 so that unlocking the key-and-lock mechanism 22-24 at the one end of the rod 14 causes unlocking of the respective other key-and-lock mechanism 22-24 at the other end of the rod 14.

30. Coupler arrangement of para 29, wherein the key-and-lock arrangement comprises a pulley system 23, 24 that interconnects the two key-and-lock mechanisms 22-24.

GENERAL ASPECTS

[0060]

31. Coupler arrangement of any one of paras 1 to 30, wherein the at least one handle 3 is arranged in front of a lateral side of a wagon or car of a rail vehicle.

32. Coupler arrangement of any one of paras 7 to 30, wherein the axis of rotation A is a horizontal axis of rotation and wherein rotation of the at least one handle 3 from the first position into the second position includes rotation of the at least one handle 3 about the horizontal axis of rotation A.

33. Coupler arrangement of any one of the previous paras, wherein the at least one handle 3 is a removable handle with a connecting interface for a worker to attach the handle 3 via the connecting interface to the coupler arrangement.

34. Coupler arrangement of para 33, wherein the connecting interface of the handle 3 comprises one part of a key-and-lock assembly.

35. Coupler arrangement of any one of the previous paras, comprising a cable 5, wherein the at least one handle 3 is arranged to cooperate with the cable 5 so that, upon swivelling of the at least one handle 3 from the first position towards the second position, the cable 5 is being pulled, wherein the coupler arrangement is configured such that pulling of the cable 5 causes the coupler head 1 to uncouple.

36. Coupler arrangement of para 35, wherein the cable 5 comprises a Bowden cable.

37. Coupler arrangement of any one of the previous paras, comprising a biasing element configured to permanently bias the at least one handle 3 towards the first position.

38. Coupler arrangement of any one of the previous paras, wherein the coupler arrangement comprises a Scharfenberg-type coupler head 1.

Claims

1. Coupler arrangement for a rail vehicle, comprising a coupler head and an uncoupling device having at least one handle which is manually swivellable about an axis of rotation in a swivel direction from a first position, in which the coupler head is in a state in which it is coupled to or ready to couple with a coupler head of another coupler arrangement, into a second position, in which the coupler head is in an uncoupled state.

2. Coupler arrangement of claim 1, wherein the axis of rotation is horizontal and wherein one end of the at least one handle forms a handle arm which extends in a vertical swivel plane and which has a free end that can be gripped by a person so that the at least one handle arm provides a leverage for the person, wherein the handle arm is oriented horizontally when the at least one handle is either in the first or in the second position, wherein **preferably** swivel of the at least one handle between the first position and second position includes a starting position, intermediate position or end position in which the free end of the at least one handle and the axis of rotation are on a same vertical level.

3. Coupler arrangement of claim 2, wherein an angle of rotation of the at least one handle about the axis of rotation between the first position and second position of the at least one handle is less than 45°, **preferably** about 30° or less.

4. Coupler arrangement of claim 2 or 3, wherein the at least one handle is mounted on a front side, lateral side or rear side of a wagon or car of a rail vehicle and said axis of rotation extends perpendicular relative to said side of the wagon or car so that swivel of the at least one handle about the axis of rotation results in a movement of the at least one handle in a plane that is parallel to the respective front, lateral or rear side of the wagon or car.

5. Coupler arrangement of any one of claims 2 to 4, wherein the at least one handle is mounted in front of a front side or rear side of a wagon or car of a rail vehicle with the free end of the at least one handle pointing towards a lateral side of the wagon so as to be manually accessible and movable from the first into the second position by a person standing laterally relative to the wagon.

6. Coupler arrangement of claim 1 or any one of claims 2 to 5, wherein the at least one handle is mechanically lockable by moving at least a portion of the at least one handle in a locking direction from the second position into a third position, wherein the locking direction differs from the swivel direction, wherein **preferably** movement of the at least one handle in the locking direction includes a sideways shifting or sideways tilting of at least the portion of the at least one handle, wherein **more preferably** the sideways shifting or sideways tilting of said portion of the at least one handle is in a direction parallel to said axis of rotation.

7. Coupler arrangement of claim 6, wherein in the third position the at least one handle abuts against a holder such that rotation of the at least one handle about the axis of rotation towards the first position is pre-

vented.

8. Coupler arrangement of claim 6 or 7, comprising a joint which permits, when the at least one handle is in said second position, sideways tilting of the at least one handle about a tilting axis which is perpendicular relative to said axis of rotation, wherein preferably the tilting axis is perpendicular relative to the axis of rotation.

9. Coupler arrangement of claim 1 or any one of claims 2 to 8, comprising one of said at least one handle as a first handle and another one of said at least one handle as a second handle, wherein both the first handle and the second handle are manually swivellable about a respective axis of rotation in a corresponding swivel direction from a respective first position, in which the coupler head is in the state in which it is coupled to or couplable with a coupler head of another coupler arrangement, into a respective second position, in which the coupler head is in the uncoupled state, wherein **preferably** the first and second handles are arranged on opposite sides relative to the coupler head.

10. Coupler arrangement of claim 9, wherein the coupler arrangement is configured such that swivelling of one of the first and second handles from its respective first to its respective second position causes swivelling of the respective other one of the first and second handles from said other one's respective first to said other one's respective second position.

11. Coupler arrangement of claim 10, wherein the first and second handles are interconnected by rod which is configured to translate swivelling of one of the first and second handles about its respective axis of rotation to a swivelling of the respective other one of the first and second handles about the respective other one's axis of rotation, wherein the coupler arrangement **preferably** comprises a cable connected to the rod, wherein swivelling of either one of the first and second handles from its respective first position towards its respective second position causes a pulling movement on the cable and, thereby, causes the coupler head to uncouple **and/or** wherein **preferably** a direction of orientation of the first handle in the first handle's first and second positions is identical to a direction of orientation of the second handle in the second handle's respective first and second positions.

12. Coupler arrangement of claim 10 or 11, wherein, in a case where each of the first and second handles is configured such that it is mechanically lockable by moving at least a portion thereof in a respective locking direction from its respective second position into a respective third position, with the handles' locking directions differing from their respective swivel direction, movement of one of the first and second handles in its respective locking direction causes movement of the respective other one of the first and second handles in the locking direction of the respective other one of the first and second handles.

13. Coupler arrangement of claim 12, wherein said movement of one of the first and second handles in its respective locking direction and said movement of the respective other one of the first and second handles in the locking direction of the respective other one of the first and second handles includes both a sideways shifting of at least the portion of the first handle and a sideways shifting of at least the portion of the second handle, wherein **preferably** the first and second handles are each attached to a rod in such a manner that pushing or respectively pulling one of the first and second handles in a direction towards the other one of the first and second handles causes the rod to be pushed or respectively pulled in that direction, thereby transferring the pushing and pulling movement from the one of the first and second handles to the other one of the first and second handles.

14. Coupler arrangement of claim 12, wherein said movement of one of the first and second handles in its respective locking direction and said movement of the respective other one of the first and second handles in the locking direction of the respective other one of the first and second handles includes both a sideways tilting of at least the portion of the first handle and a sideways tilting of at least the portion of the second handle, wherein **preferably** the first and second handles are each mounted on the rod in such a manner that swivelling of either one of the first and second handles about the axis of rotation causes the rod to rotate accordingly but the sideways tilting of any one of the first and second handles has no effect on the position of the rod, wherein **further preferably** a longitudinal axis of the rod coincides with the axes of rotation of the first and second handles and the first and second handles are each mounted on the rod in an associated bearing in which they can journal about a tilting axis which is perpendicular to said axis of rotation., wherein the coupler arrangement **even further preferably** comprises a further rod which interconnects the first and second handles at a distance from said axis of rotation so as to transfer tilting movement from either one of the first and second handles to the respective other one of the first and second handles, wherein the further rod **preferably** comprises two separate rod sections, each having one end thereof attached to a respective one of the first and second handles at a distance from said axis of rotation and an opposing end thereof attached to a return mechanism which is config-

ured to translate a movement of one of the two rod sections in one direction into a movement of the respective other one of the two rod sections in a direction opposite to said one direction, wherein the return mechanism **preferably** comprises a rotatable element which is rotatable about a rotational axis that is perpendicular to the directions of movement of the two rod sections, and the two rod sections are each attached to the rotatable element on opposite sides relative to its rotational axis.

15. Coupler arrangement of any one of claims 9 to 14, comprising a key-and-lock arrangement acting directly on the rod and having a key-and-lock mechanism at both ends of the rod, the key-and-lock arrangement being configured to prevent the rod from rotating about said axis of rotation when one of the key-and-lock mechanisms is in its locked condition, wherein **preferably** the key-and-lock mechanism at one end of the rod cooperates with the key-and-lock mechanism at the other end of the rod through a hollow interior of the rod so that unlocking the key-and-lock mechanism at the one end of the rod causes unlocking of the respective other key-and-lock mechanism at the other end of the rod, wherein **further preferably** the key-and-lock arrangement comprises a pulley system that interconnects the two key-and-lock mechanisms.

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

1. Coupler arrangement for a rail vehicle, comprising a coupler head (1) and an uncoupling device having at least one handle (3; 3', 3") which is manually swivellable about an axis of rotation (A) in a swivel direction (S) from a first position, in which the coupler head (1) is in a state in which it is coupled to or ready to couple with a coupler head of another coupler arrangement, into a second position, in which the coupler head (1) is in an uncoupled state, **characterized in that** the at least one handle (3; 3', 3") is mechanically lockable by moving at least a portion of the at least one handle (3; 3', 3") in a locking direction from the second position into a third position, wherein the locking direction differs from the swivel direction (S).

2. Coupler arrangement of claim 1, wherein the axis of rotation (A) is horizontal and wherein one end of the at least one handle (3; 3', 3") forms a handle arm (3A) which extends in a vertical swivel plane and which has a free end that can be gripped by a person so that the at least one handle (3; 3', 3") provides a leverage for the person, wherein the handle arm (3A) is oriented horizontally when the at least one handle (3; 3', 3") is either in the first or in the second position, wherein **preferably** swivel of the at least one handle (3; 3', 3") between the first position and second position includes a starting position, intermediate position or end position in which the free end of the at least one handle (3; 3', 3") and the axis of rotation (A) are on a same vertical level.

3. Coupler arrangement of claim 2, wherein an angle of rotation of the at least one handle (3; 3', 3") about the axis of rotation (A) between the first position and second position of the at least one handle (3; 3', 3") is less than 45°, **preferably** about 30° or less.

4. Coupler arrangement of claim 2 or 3, wherein the at least one handle (3; 3', 3") is mounted on a front side, lateral side or rear side of a wagon or car of a rail vehicle and said axis of rotation (A) extends perpendicular relative to said side of the wagon or car so that swivel of the at least one handle (3; 3', 3") about the axis of rotation (A) results in a movement of the at least one handle (3; 3', 3") in a plane that is parallel to the respective front, lateral or rear side of the wagon or car.

5. Coupler arrangement of any one of claims 2 to 4, wherein the at least one handle (3; 3', 3") is mounted in front of a front side or rear side of a wagon or car of a rail vehicle with the free end of the at least one handle (3; 3', 3") pointing towards a lateral side of the wagon or car so as to be manually accessible and movable from the first into the second position by a person standing laterally relative to the wagon or car.

6. Coupler arrangement of claim 1 or any one of claims 1 to 5, wherein movement of the at least one handle (3; 3', 3") in the locking direction includes a sideways shifting or sideways tilting of at least the portion of the at least one handle(3; 3', 3"), wherein **preferably** the sideways shifting or sideways tilting of said portion of the at least one handle (3; 3', 3") is in a direction parallel to said axis of rotation.

7. Coupler arrangement of claim 6, wherein in the third position the at least one handle (3; 3', 3") abuts against a holder (12) such that rotation of the at least one handle (3; 3', 3") about the axis of rotation (A) towards the first position is prevented.

8. Coupler arrangement of claim 6 or 7, comprising a joint which permits, when the at least one handle (3; 3', 3") is in said second position, sideways tilting of the at least one handle (3; 3', 3") about a tilting axis (T), wherein **preferably** the tilting axis (T) is perpendicular relative to the axis of rotation (A).

9. Coupler arrangement of claim 1 or any one of claims 2 to 8, comprising one of said at least one handle (3', 3") as a first handle (3') and another one of said

at least one handle (3; 3', 3") as a second handle (3"), wherein both the first handle (3') and the second handle (3") are manually swivellable about a respective axis of rotation (A) in a corresponding swivel direction from a respective first position, in which the coupler head (1) is in the state in which it is coupled to or couplable with a coupler head of another coupler arrangement, into a respective second position, in which the coupler head (1) is in the uncoupled state, wherein **preferably** the first and second handles (3', 3") are arranged on opposite sides relative to the coupler head (1).

10. Coupler arrangement of claim 9, wherein the coupler arrangement is configured such that swivelling of one of the first and second handles (3', 3") from its respective first to its respective second position causes swivelling of the respective other one of the first and second handles (3", 3') from said other one's respective first to said other one's respective second position.

11. Coupler arrangement of claim 10, wherein the first and second handles (3', 3") are interconnected by rod (14) which is configured to translate swivelling of one of the first and second handles (3', 3") about its respective axis of rotation (A) to a swivelling of the respective other one of the first and second handles (3', 3") about the respective other one's axis of rotation (A), wherein the coupler arrangement **preferably** comprises a cable (5) connected to the rod (14), wherein swivelling of either one of the first and second handles (3', 3") from its respective first position towards its respective second position causes a pulling movement on the cable (5) and, thereby, causes the coupler head (1) to uncouple **and/or** wherein **preferably** a direction of orientation of the first handle (3') in the first handle's first and second positions is identical to a direction of orientation of the second handle (3") in the second handle's respective first and second positions.

12. Coupler arrangement of claim 10 or 11, wherein, in a case where each of the first and second handles (3', 3") is configured such that it is mechanically lockable by moving at least a portion thereof in a respective locking direction from its respective second position into a respective third position, with the handles' locking directions differing from their respective swivel direction (S), movement of one of the first and second handles (3', 3") in its respective locking direction causes movement of the respective other one of the first and second handles (3", 3') in the locking direction of the respective other one of the first and second handles (3", 3').

13. Coupler arrangement of claim 12, wherein said movement of one of the first and second handles (3', 3") in its respective locking direction and said movement of the respective other one of the first and second handles (3", 3') in the locking direction of the respective other one of the first and second handles (3", 3') includes both a sideways shifting of at least the portion of the first handle (3') and a sideways shifting of at least the portion of the second handle (3"), wherein **preferably** the first and second handles (3', 3") are each attached to a rod (14) in such a manner that pushing or respectively pulling one of the first and second handles (3', 3") in a direction towards the other one of the first and second handles (3", 3') causes the rod (14) to be pushed or respectively pulled in that direction, thereby transferring the pushing and pulling movement from the one of the first and second handles (3', 3") to the other one of the first and second handles(3", 3').

14. Coupler arrangement of claim 12, wherein said movement of one of the first and second handles (3', 3") in its respective locking direction and said movement of the respective other one of the first and second handles (3", 3') in the locking direction of the respective other one of the first and second handles (3", 3') includes both a sideways tilting of at least the portion of the first handle (3') and a sideways tilting of at least the portion of the second handle (3"), wherein **preferably** the first and second handles (3', 3") are each mounted on the rod (14) in such a manner that swivelling of either one of the first and second handles (3', 3") about the axis of rotation (A) causes the rod (14) to rotate accordingly but the sideways tilting of any one of the first and second handles (3', 3") has no effect on the position of the rod (14), wherein **further preferably** a longitudinal axis of the rod (14) coincides with the axes of rotation (A) of the first and second handles (3', 3") and the first and second handles (3', 3") are each mounted on the rod (4) in an associated bearing (15) in which they can journal about a tilting axis (T) which is perpendicular to said axis of rotation (A), wherein the coupler arrangement **even further preferably** comprises a further rod (14A) which interconnects the first and second handles (3', 3") at a distance from said axis of rotation (A) so as to transfer tilting movement from either one of the first and second handles (3', 3") to the respective other one of the first and second handles(3", 3'), wherein the further rod (14A) **preferably** comprises two separate rod sections (14A', 14A"), each having one end thereof attached to a respective one of the first and second handles (3', 3") at a distance from said axis of rotation (A) and an opposing end thereof attached to a return mechanism (17) which is configured to translate a movement of one of the two rod sections (14A', 14A") in one direction into a movement of the respective other one of the two rod sections (14A", 14A') in a direction opposite to said one direction, wherein the return mechanism

(17) **preferably** comprises a rotatable element (18) which is rotatable about a rotational axis (Z) that is perpendicular to the directions of movement of the two rod sections (14A', 14A"), and the two rod sections (14A', 14A") are each attached to the rotatable element (18) on opposite sides relative to its rotational axis (Z).

15. Coupler arrangement of any one of claims 9 to 14, comprising a key-and-lock arrangement acting directly on the rod (14) and having a key-and-lock mechanism at both ends of the rod (14), the key-and-lock arrangement being configured to prevent the rod (14) from rotating about said axis of rotation (A) when one of the key-and-lock mechanisms is in its locked condition, wherein **preferably** the key-and-lock mechanism at one end of the rod (14) cooperates with the key-and-lock mechanism at the other end of the rod (14) through a hollow interior of the rod (14) so that unlocking the key-and-lock mechanism at the one end of the rod (14) causes unlocking of the respective other key-and-lock mechanism at the other end of the rod (14), wherein **further preferably** the key-and-lock arrangement comprises a pulley system (23, 24) that interconnects the two key-and-lock mechanisms.

FIG 1

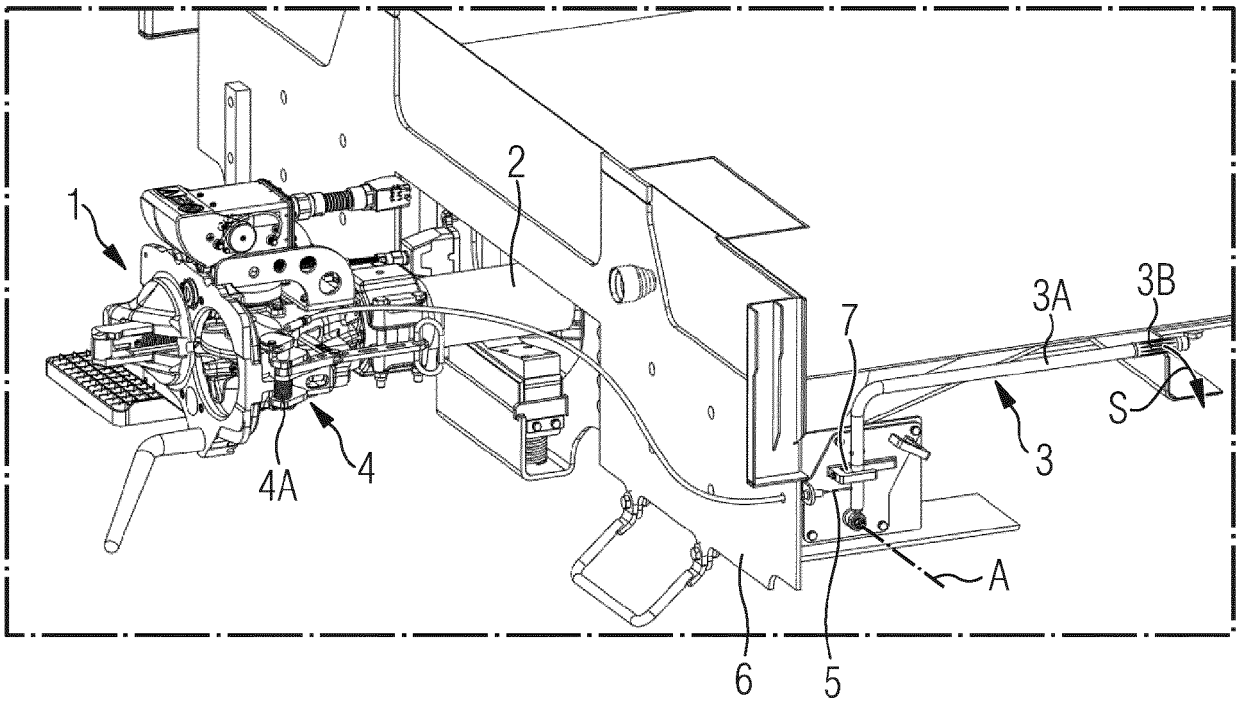


FIG 2

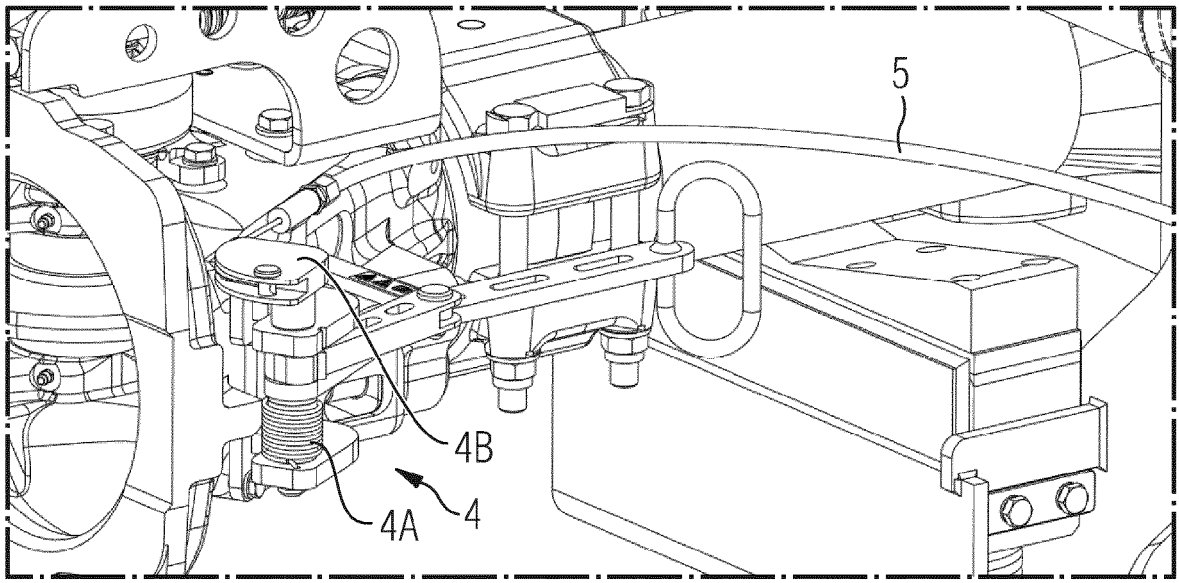


FIG 3A

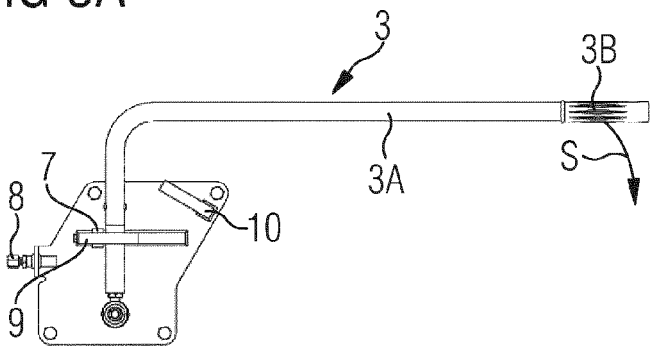


FIG 3B

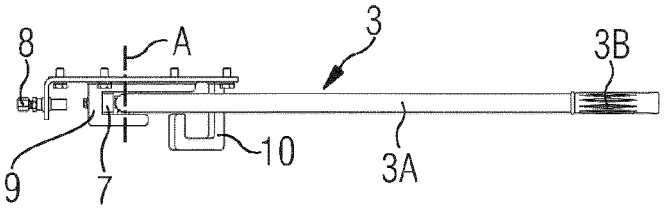


FIG 4A

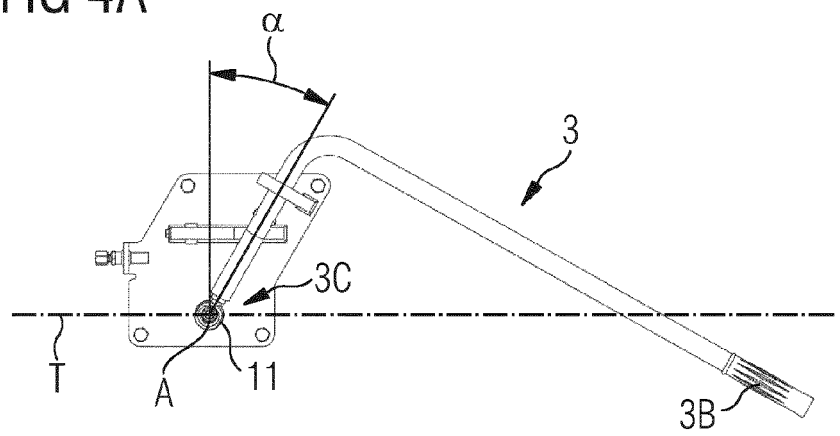


FIG 4B

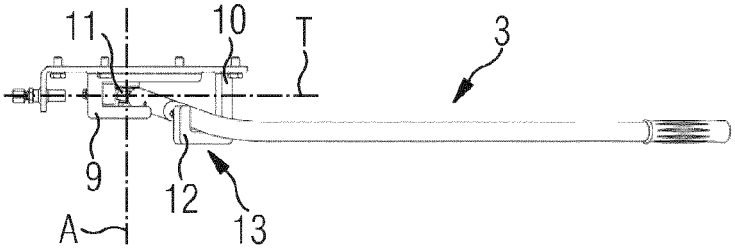


FIG 5

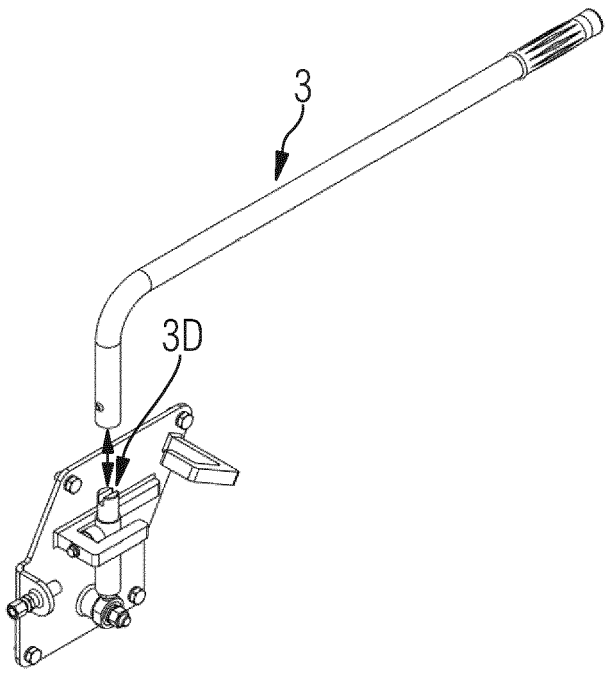


FIG 6

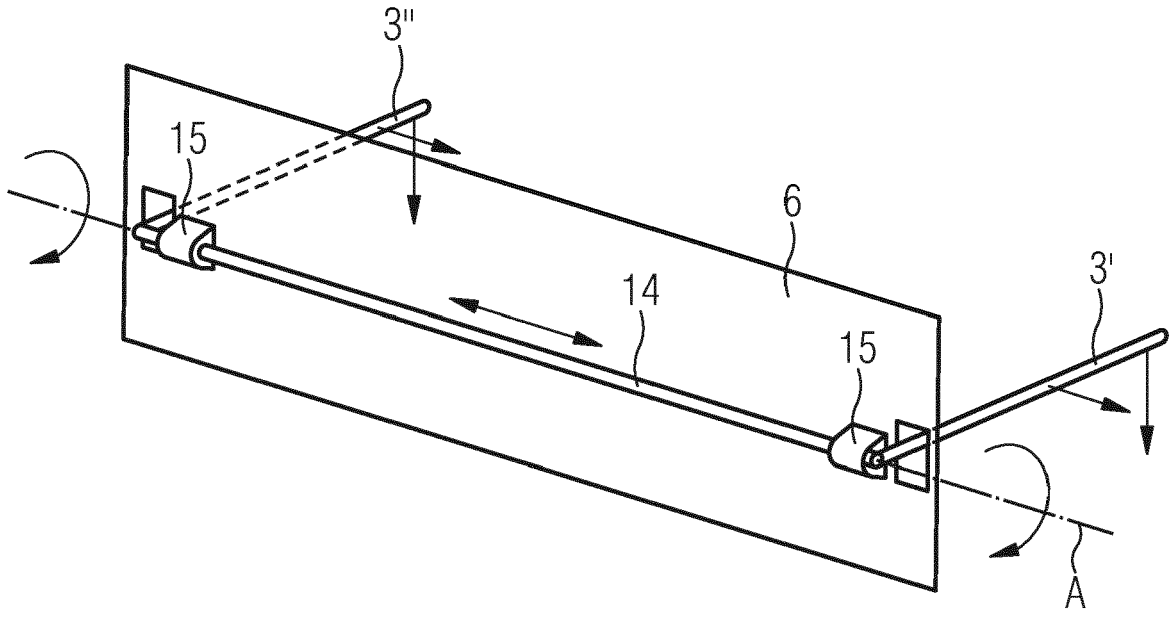


FIG 7

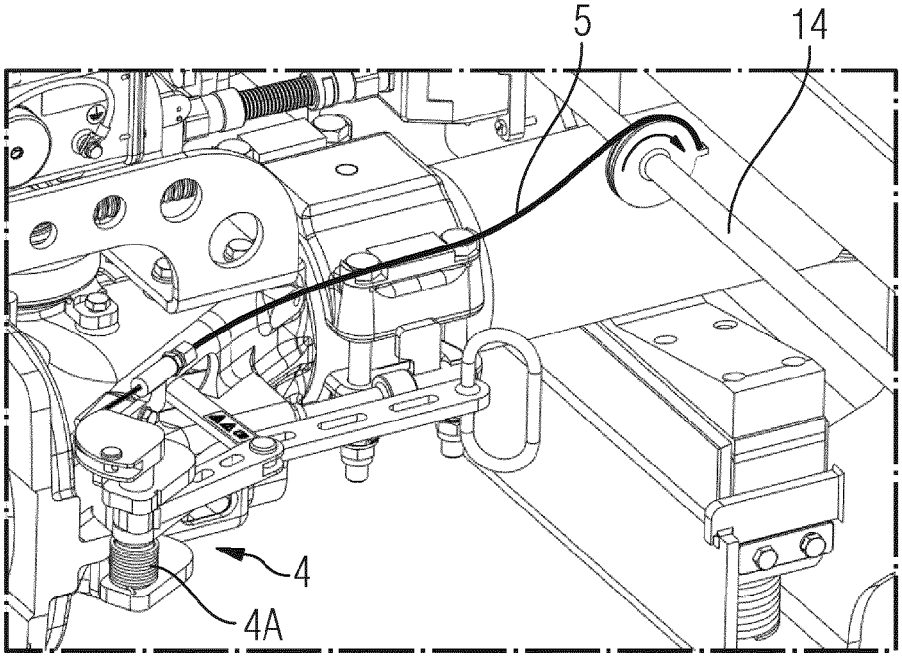


FIG 8

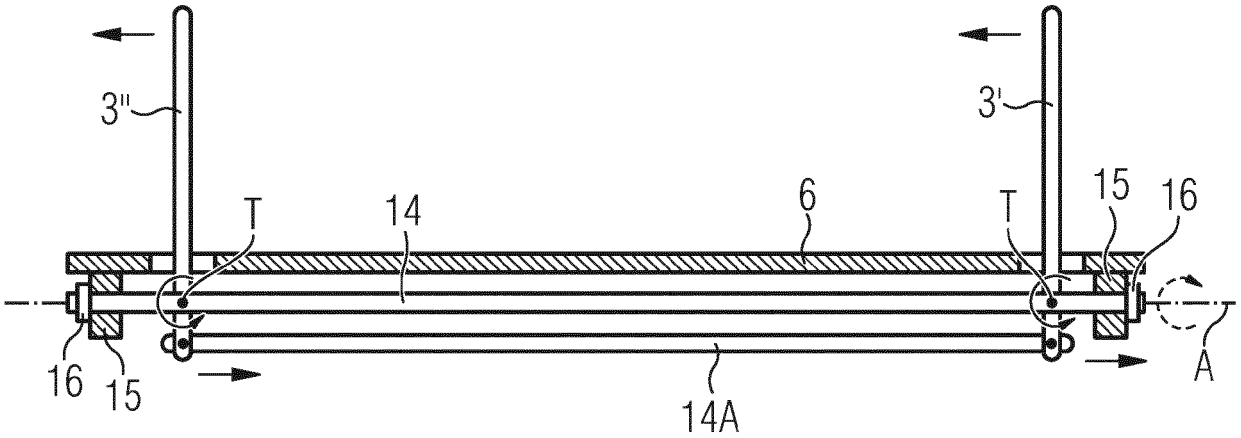


FIG 9

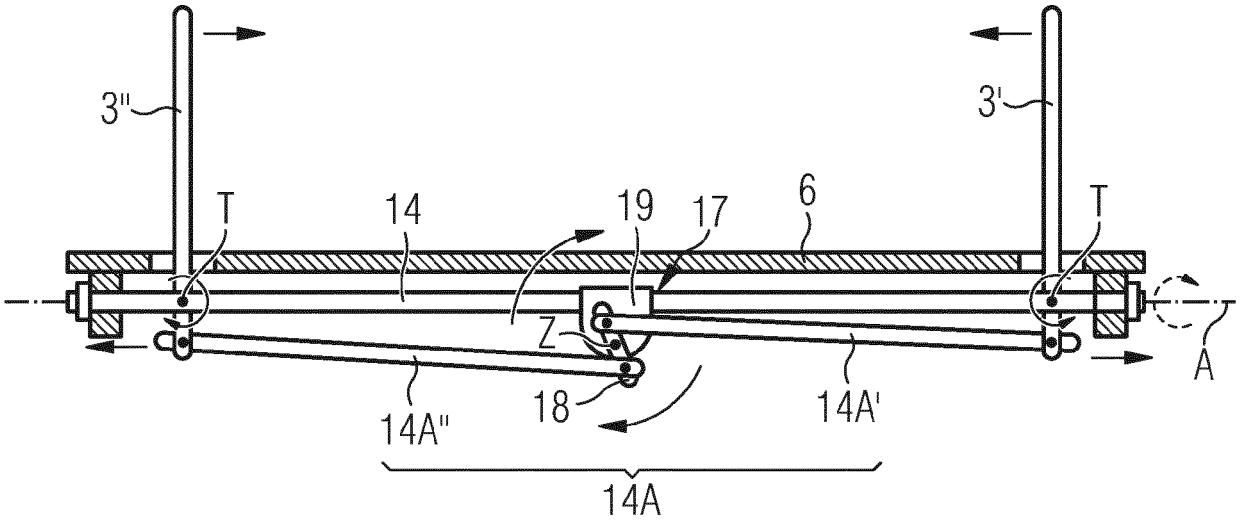


FIG 10

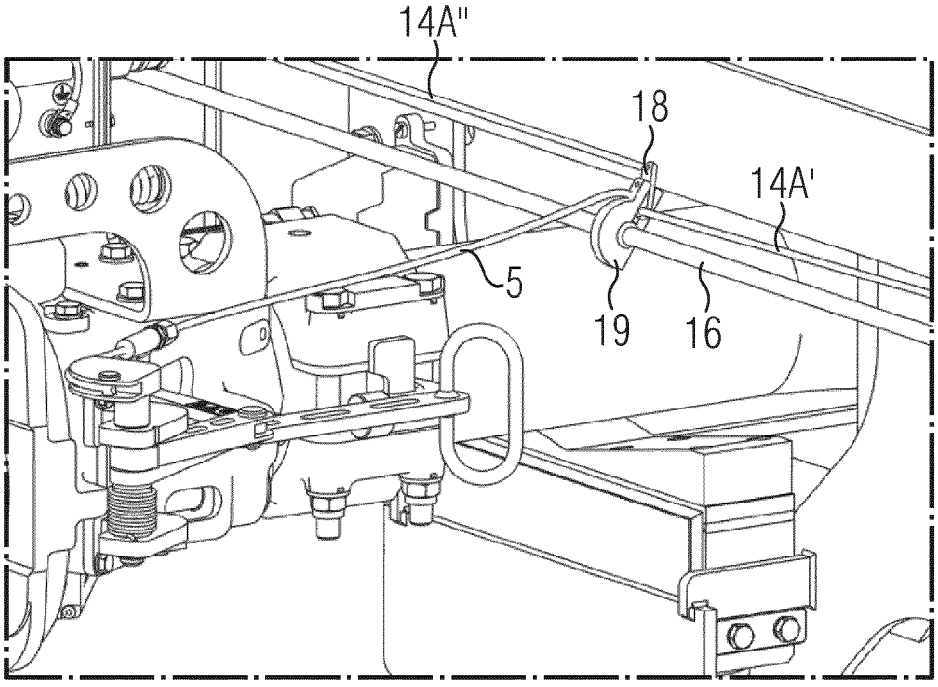


FIG 11

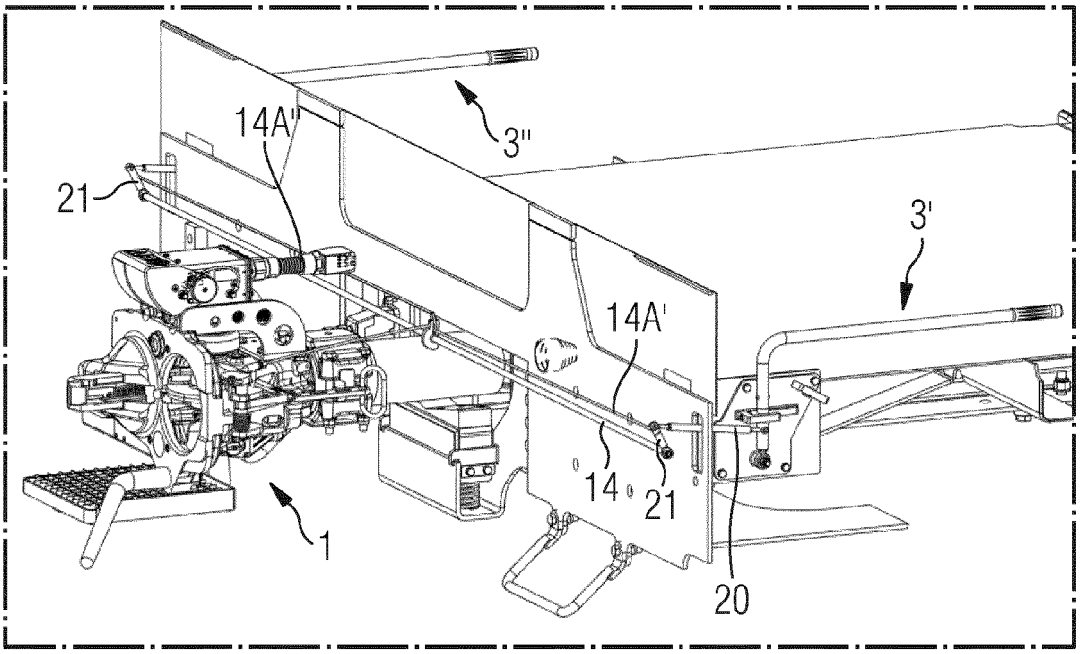


FIG 12

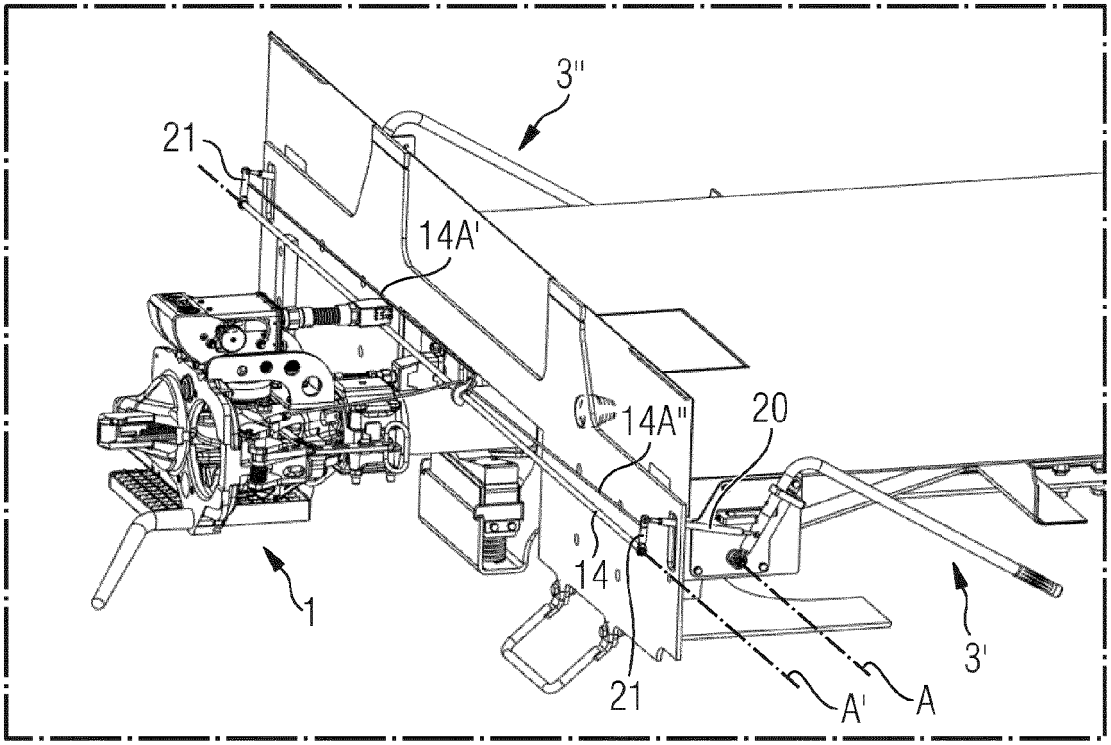
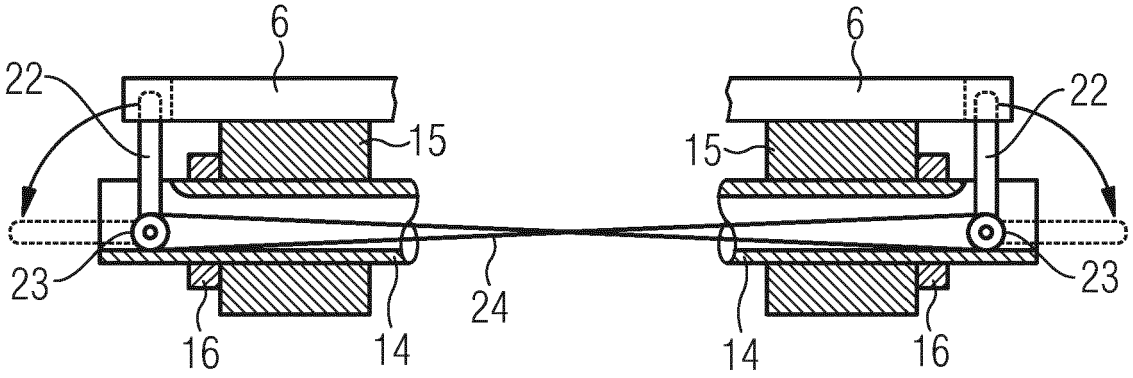


FIG 13



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EUROPEAN SEARCH REPORT

Application Number
EP 22 19 8207

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A	* paragraph [0044]; figures 1, 2 *	7-15	
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A	* figures 1, 2 *	7,8, 12-15	
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A	* figures 1a, 1b, 2a, 2b *	7-15	
X	CH 405 395 A (SOC D APP BOIRAULT [FR]; SAMBRE & MEUSE USINES [FR]) 15 January 1966 (1966-01-15)	1-6,9-11	
A	* page 2, lines 45-56; figures 1-4 *	7,8, 12-15	
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A	* 0:34-0:36 *	3-15	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	28 February 2023	Denis, Marco

CATEGORY OF CITED DOCUMENTS

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