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(54) **KING PIN CONSOLE ARRANGEMENT**

(57) A king pin coupling for locking a king pin (3) of a semitrailer (2) to a railway wagon (1) has a slide (8) with an aperture (36) configured to receive the king pin (3). The slide (8) is movable back and forth in a continuous movement. A locking assembly (17, 18, 25) ar-

ranged on the slide (8) defines an open state and a closed state. Freely pivotable locking jaws (17a, 17b) of the locking assembly (17, 18, 25) are configured to grip and lock the king pin (3) in the closed state.

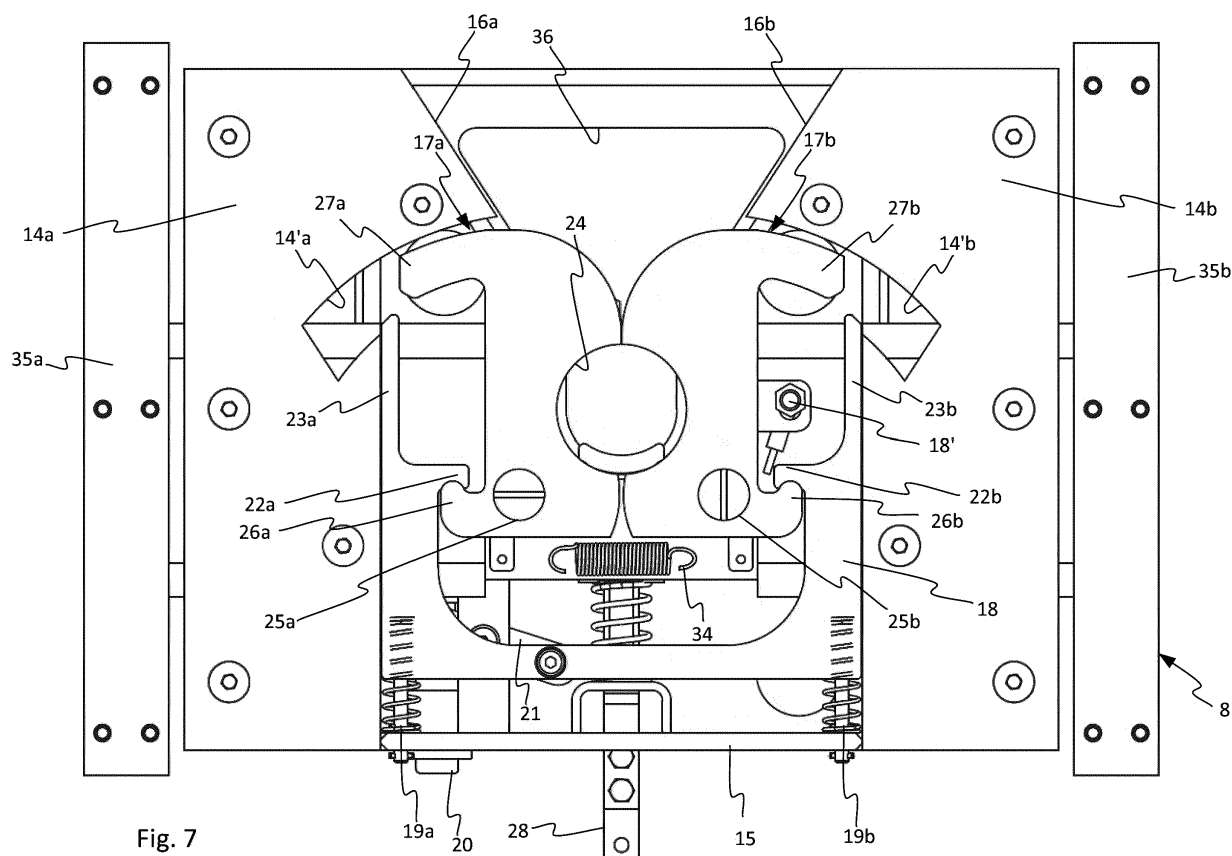


Fig. 7

Description

TECHNICAL FIELD

[0001] The present invention concerns a king pin coupling and a king pin locking device. The king pin coupling is used for locking a king pin of a semitrailer in position on a railway wagon.

BACKGROUND

[0002] It is well known to provide railway wagons for receiving and carrying semitrailers. By placing a semitrailer, normally intended for road transport, on a railway wagon for transportation on the railway, a more efficient and environmentally friendly transportation is achieved compared to road transport. The railway is normally used for long distances. A railway wagon of this type is disclosed in WO2010/120236A1.

[0003] In such railway wagons configured to receive and carry semitrailers, it is important to keep the semitrailer safely on the railway wagon by securing the semitrailer in relation to the railway wagon. At its front end, the semitrailer has a downwardly projecting king pin which is received and locked in a locking device mounted to the railway wagon.

[0004] Examples of devices for locking a semi-trailer to a railway wagon are disclosed for instance in DE102009015775A1. However, these known king pin locking devices suffer from certain disadvantages. The known king pin coupling is limited in use since the king pin of the semitrailer has to be quite precisely positioned longitudinally in relation to the railway wagon. This is a drawback in particular since semitrailers oftentimes are loaded on the railway wagon in a quite rough manner by the towing truck. Another drawback is that the known king pin coupling is of complicated structure involving a plurality of components, which adds on costs.

SUMMARY

[0005] An object of the present invention is to provide a novel king pin coupling and a novel king pin locking device which is improved over prior art. This object and other objects, which will appear from the following detailed description, have now been achieved by the technique set forth in the appended independent claims; preferred embodiments being defined in the dependent claims.

[0006] By these inventive arrangements, a more or less automatic way of locking and unlocking a semitrailer to a railway wagon is achieved. Thanks to the automatic locking and unlocking of the king pin of the semitrailer, the time for loading and unloading the semitrailer from the railway wagon can be reduced. At the same time, the locking of the semitrailer is safe.

[0007] In a first aspect, a king pin coupling is provided for locking a king pin of a semitrailer to a railway wagon.

The king pin coupling is mounted to the railway wagon and it comprises a slide having an aperture configured to receive the king pin. The slide is movable - preferably in a continuously movement - back and forth. The king pin coupling further comprises a locking assembly arranged on the slide. The locking assembly defines an open state and a closed state, wherein pivotable locking jaws of the locking assembly in the closed state are configured to grip and lock the king pin in the aperture of the slide.

[0008] In a second aspect, a king pin locking device is provided for locking a semitrailer to a railway wagon. The king pin locking device comprises a base portion and a top portion connected to the base portion. The top portion is vertically movable relative the base portion. Furthermore, the top portion comprises an open space in which a king pin of a semitrailer can be received. The king pin locking device further comprises a king pin coupling having a slide arranged in the open space of the top portion. The slide has an aperture configured to receive the king pin, and it is movable in a longitudinal direction of the open space - preferably in a continuous movement - back and forth. A locking assembly is arranged on the slide, and it defines an open state and a closed state, wherein locking jaws of the locking assembly in the closed state are configured to grip and lock the king pin in the aperture of the slide.

[0009] In a third aspect, there is provided a method for locking a king pin of a semitrailer to a railway wagon, comprising the following steps:

- positioning the king pin of said semitrailer above a king pin locking device,
- raising a top portion of said king pin locking device vertically until an indicating element of said top portion sends a stop signal to a vertical drive assembly, and
- moving a king pin coupling towards said king pin until an indicator of said king pin coupling sends a stop signal to a longitudinal drive assembly.

[0010] Several advantages can be achieved by the inventive concept, some of which are set forth below:

- Automatic height and longitudinal adjustments when securing a king pin to e.g. a transporting railway wagon.
- Large tolerance as regards incorrect positioning of the semitrailer laterally and longitudinally, respectively.
- Secure coupling to the railway wagon.
- Possibility to release the king pin from the coupling in order to lift the semitrailer vertically.
- Indication that all locks are secured.
- Improved security in terms of shock absorbers and the like which can be connected to the brake system.

[0011] Further objects and advantages of the present

invention as well as further aspects and variants will be anticipated by a person skilled in the art when reading the detailed description below of at present preferred embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Embodiments of the present invention will now be described further by way of example and with reference to the enclosed drawings, in which:

- Fig. 1 is a perspective view of a railway wagon in position to receive a semitrailer;
- Fig. 2 is a perspective view of the railway wagon of Fig. 1 with a semitrailer loaded on the same;
- Fig. 3 is a detail view illustrating one example of a king pin of a semitrailer;
- Fig. 4 is a plan view of a king pin locking device according to an embodiment;
- Fig. 5 is a cross section view taken along the line V-V in Fig. 4;
- Fig. 6 is a perspective view of a part of the king pin locking device of Fig. 4;
- Fig. 7 is a plan view of a slide of the king pin locking device of Fig. 4; and
- Figs 8 - 10 are plan views of the slide of Fig. 7 in different operating states.

DETAILED DESCRIPTION OF EMBODIMENTS

[0013] As used in this description the expressions forward, rear, side etc. and similar expressions are in relation to a railway wagon and its normal orientation in a train.

[0014] With reference to Figs 1-2, there is illustrated an example of a railway wagon 1 adapted to receive a semitrailer 2. The railway wagon 1 can for instance be of the type described in WO2010/120236A1 mentioned above. The wagon 1 has a first bogie section 1a, a second bogie section 1b and a main load-carrying section 1c. The main section 1c of the wagon 1 may be turned outwards to make it possible to drive the semitrailer 2 onto this load-carrying section 1c. When the semitrailer 2 has been loaded onto the main section 1c of the wagon 1, this section 1c is turned back with the semitrailer 2 carried thereon to the position shown in Fig. 2. The exact design of the railway wagon 1 may vary, but according to the described embodiment a king pin locking coupling is used for locking a king pin 3 of the semitrailer 2 to the railway wagon 1. Fig. 3 shows a detail of one end portion 2a of the semitrailer 2 illustrating the king pin 3 extending downwardly from the bottom surface of the semitrailer 2.

[0015] Locking the king pin 3 of the semitrailer 2 to the railway wagon 1 is accomplished by means of a king pin locking device 4 placed at the first section 1a of the railway wagon 1. The king pin locking device 4 has a base portion 5 and a top portion 6. The base portion 5 comprises two scissor lifts 7 driven collectively by a drive unit

7' (see Fig. 4). The top portion 6 can be raised and lowered in relation to the base portion 5 by means of the scissor lifts 7.

[0016] The top portion 6 comprises a slide 8 that can be moved continuously back and forth in a longitudinal direction of the railway wagon 1. The slide 8 is moved by means of two parallel threaded bars 9a, 9b each cooperating with a nut 10a, 10b (see Fig 6). The two nuts 10a, 10b mounted to opposite sides of the slide 8 are each received on one of the threaded bars 9a, 9b. To move the slide 8 the two threaded bars 9a, 9b are rotated in unison, whereby the nuts 10a, 10b will move along the threaded bars 9a, 9b.

[0017] Furthermore, the top portion 6 comprises a frame inside which the slide 8 is placed. The slide 8 is arranged moveable inside the frame which is formed by two side pieces 11a, 11b, a first piece 12 and a second piece 13. One of the scissor lifts 7 are connected to one of the side pieces 11a of the frame of the top portion 6, while the other scissor lift 7 is connected to the other side piece 11b. Each of the threaded bars 9a, 9b are connected to the first piece 12 and the second piece 13 in such a way that they can rotate. The threaded bars 9a, 9b are rotated by means of a hydraulic motor 30 (see Fig. 4), connected to one of the threaded bars 9a, and a chain (not shown) transferring the rotational movement to the other threaded bar 9b.

[0018] The slide 8 comprises two parallel base plates 14a, 14b at opposite sides. The nuts 10a, 10b are connected to the bottom of the base plates 14a, 14b. Furthermore, the slide 8 comprises a first plate 15 and two inclined second plates 16a, 16b. Each of the inclined second plates 16a, 16b is inclined inwards and forward from a rear end of one of the parallel base plates 14a, 14b of the slide 8. Both the first plate 15 and the inclined plates 16a, 16b are directed downwards from the base plates 14a, 14b. The inclined plates 16a, 16b are to guide the king pin 3 of the semitrailer 2. This will be further explained below.

[0019] Support plates 35a, 35b are placed outside of the base plates 14a, 14b of the slide 8, and they are supported on the side pieces 11a, 11b of the top portion 6. The slide 8 further comprises a pair of locking jaws 17a, 17b and a U-shaped jaw locking clamp 18. A funnel-shaped or triangular aperture 36 is defined by the inclined plates 16a, 16b and the locking jaws 17a, 17b. The aperture 36 is configured to receive the king pin 3 of the semitrailer 2.

[0020] The locking jaws 17a, 17b are mounted to pivots 25a, 25b and are preferably freely pivotable between a closed state and an open state. The jaw locking clamp 18 locks the locking jaws 17a, 17b in the closed state, and it is moveable back and forth inside the slide 8, between a locking state and an unlocking state. In the locking state, the jaw locking clamp 18 locks the locking jaws 17a, 17b in their closed state. In the unlocking state of the jaw locking clamp 18, the locking jaws 17a, 17b are free to move. The jaw locking clamp 18 is urged rearward

by means of springs 19a, 19b, each of which has one end connected to the first plate 15 of the slide 8 and the other end received in an opening of the jaw locking clamp 18.

[0021] A push button 20 extends through an opening of the first plate 15 of the slide 8 is connected to one end of a lever 21. The other end of the lever 21 is connected to the jaw locking clamp 18 in such a way that when the push button 20 is pressed the lever 21 will be turned around a central pivot, whereby the jaw locking clamp 18 is moved forward, releasing the locking jaws 17a, 17b.

[0022] The sides of the jaw locking clamp 18 about the two base plates 14a, 14b of the slide 8. In view from above the jaw locking clamp 18 has a U-like profile, wherein a straight front part forms the bottom of the "U". Each of the sides of the jaw locking clamp 18 has a part 22a, 22b projecting inwards, and a leg portion 23a, 23b of each side behind the part 22a, 22b is somewhat thinner than the rest of the side of the jaw locking clamp 18.

[0023] The locking jaws 17a, 17b are designed in such a way that they define a vertical opening 24 in the closed state (see Fig. 7). Each locking jaw 17a, 17b is mounted on top of a housing 34 by means of the pivots 25a, 25b. These pivots 25a, 25b are placed at the front of the locking jaws 17a, 17b outside the opening 24 formed in the closed state of the locking jaws 17a, 17b. Each jaw has a part 26a, 26b projecting outwards at one end and a curved part 27a, 27b at the opposite end. The parts 22a, 22b of the jaw locking clamp 18 projecting inwards can move between the parts 26a, 26b projecting outwards and the curved part 27a, 27b of the respective locking jaw 17a, 17b.

[0024] When the jaw locking clamp 18 is moved forward, the parts 22a, 22b of the jaw locking clamp 18 projecting inwards will contact the parts 26a, 22b of the locking jaws 17a, 17b projecting outwards, moving the locking jaws 17a, 17b toward the open state. In the closed state of the locking jaws 17a, 17b, the leg portions 23a, 23b of the jaw locking clamp 18 will be placed outside the curved parts 27a, 27b of the locking jaws 17a, 17b, whereby the locking jaws 17a, 17b are locked in the closed state. As shown in Fig. 7, each base plate 14a, 14b has a recess 14'a, 14'b matching the two curved parts 27a, 27b of the locking jaws 17a, 17b. In the open state (see Fig. 8), the curved parts 27a, 27b are moved into the respective recess 14'a and 14'b for engagement therein.

[0025] In the open state of the locking jaws 17a, 17b, the leg portions 23a, 23b of the jaw locking clamp 18 are abutting front sides of the curved parts 27a, 27b of the locking jaws 17a, 17b, preventing relative movement between the locking jaws 17a, 17b and the jaw locking clamp 18. The sizes of the curved parts 27a, 27b of the locking jaws 17a, 17b are such that when the locking jaws 17a, 17b are in the closed position the leg portions 23a, 23b of the jaw locking clamp 18 are free to pass the locking jaws 17a, 17b.

[0026] The king pin coupling further has an indicator

or inductive sensor 18' to sense when the jaw locking clamp 18 is in the position locking the locking jaws 17a, 17b in their closed state. The indicator 18' then sends a stop signal to the longitudinal drive assembly 9, 30, whereby the movement of the slide 8 is stopped.

[0027] A locking boss 28 is arranged on the slide 8 and projects into the opening 24 formed when the locking jaws 17a, 17b are in the closed state. The locking boss 28 is arranged to extend through the housing 34 of the slide 8, and it will project into a groove of the king pin 3 of the semitrailer 2 when the king pin 3 is received inside the opening 24, whereby vertical movement of the king pin is hindered. The locking boss 28 may be retracted against the action of a spring to release the king pin 3, if vertical movement upwards of the king pin 3 is desired when the locking jaws 17a, 17b are in the closed state.

[0028] An indicating device 29 is placed partly projecting above one of the side pieces 11a, 11b of the top portion 6 of the king pin locking device 4. In the shown embodiment the indicating device 29 is received at a pivot at one end, and a part of the indicating device 29 opposite the end received at the pivot extends up through a slot in the side piece 11a of the top portion 6. The part of the indicating device 29 received in the slot of the side piece 11a is urged upwards by means of a spring. When the indicating device 29 is pressed downwards against the force of the spring the movements of the scissor lifts 7 are stopped, by means of a sensor.

[0029] As shown in Fig. 5, the height of each scissor lift 7 is controlled by a bar 31, the end of which is moved inwards or outwards by rotation in a nut 32 at one end of the scissor lift 7. The bars 31 of the scissor lifts are interconnected to give the same rotation and so that the scissor lifts 7 are moved in unison. The design of the scissor lifts 7 may vary, and the embodiment shown herein is just an example.

[0030] An open space 37 is formed in the top portion 6 between the parallel side pieces 11a, 11b, the second piece 13 and the slide 8. In the open space 37 the king pin 3 of the semitrailer 2 is to be received. When to receive the king pin 3 in the open space 37, the slide 8 is placed in its foremost position adjacent the first piece 12 of the top portion 6, giving the maximal size of the open space 37. In an embodiment the open space 37 with the slide 8 placed adjacent the first piece 12 of the top portion 6 has a length of about 300 mm and a width of about 100 mm.

[0031] Plastic sleeves or blocks 33a, 33b and 33a', 33b' are placed at each end of the threaded bars 9a, 9b used to move the slide 8 back and forth. The purpose of these blocks 33 is to take up jerks. In case of big jerks, such as at heavy breaking or collision, the plastic blocks 33 will be deformed protecting the king pin coupling. Hence, these plastic blocks 33 serve as shock absorbing crush elements. A rocker is placed at one of the plastic blocks 33, which rocker (not shown) reacts on longitudinal movement. If the rocker sense a sudden change of speed it will activate a valve, which valve in turn activates

the brakes of the railway wagon 1.

[0032] The operation of the king pin coupling in accordance with the example given is described in the following. The semitrailer 2 is placed on the railway wagon 1 with the king pin 3 of the semitrailer 2 placed above the open space 37 of the top portion 6 of the king pin locking device 4. The slide 8 is placed adjacent the first piece 12 of the top portion 6, giving the maximal open space 37 for receiving the king pin 3. Then the scissor lifts 7 are activated, whereby the top portion 6 will be lifted, until the indicating device 29 is activated when the top portion 6 hits the bottom of the semitrailer 2. In this position, the semitrailer 2 rests on its wheels and on the top portion 6 of the king pin locking device 4. In the next step, the slide 8 is moved backwards, whereby the inclined second plates 16a, 16b will assist in guiding the king pin 3 into the triangular aperture 36, defined by the inclined second plates 16a, 16b and the locking jaws 17a, 17b.

[0033] The locking jaws 17a, 17b are held in their open state by means of the jaw locking clamp 18, as shown in Fig. 8. When the locking jaws 17a, 17b hit the king pin 3, the locking jaws 17a, 17b will be turned inwards around the pivots 25a, 25b by the continued movement of the slide 8 backwards, as indicated in Fig. 9. When the locking jaws 17a, 17b have been turned completely inwards, forming the vertical opening 24, the jaw locking clamp 18 is pushed backwards by means of the springs 19a, 19b, locking the locking jaws 17a, 17b in their closed state and with the king pin 3 inside the opening 24 formed by the locking jaws 17a, 17b, as indicated in Fig. 10. When the inductive sensor 18' registers that the jaw locking clamp 18 is in the position locking the locking jaws 17a, 17b, the hydraulic motor 30 is stopped, stopping the movement of the slide 8.

[0034] When the semitrailer 2 is to be unloaded from the railway wagon 1, the slide 8 is moved forward, bringing the semitrailer 2 with it in this movement forward. As the slide 8 approaches the first piece 12 of the top portion 6, the push button 20 will move the jaw locking clamp 18 forward in relation to the locking jaws 17a, 17b by means of the lever 21 connected at one end to the push button 20. As the jaw locking clamp 18 is moved forward, the locking jaws 17a, 17b will no longer be locked and when the inwards projecting parts 22a, 22b of the jaw locking clamp 18 hits the outward projecting parts 26a, 26b of the locking jaws 17a, 17b, the locking jaws will be turned around the pivots 25a, 25b into the open state. The scissor lifts 7 are then activated to lower the top portion 6 out of contact with the semitrailer 2, whereby the semitrailer 2 can be unloaded from the railway wagon 1.

[0035] Finally, it should be mentioned that the invention is by no means not limited to the embodiments described herein and several modifications are feasible within the scope of the appended claims. For instance, alternative means can be used for achieving the vertical and longitudinal movements of components included in the king pin console arrangement.

Claims

1. A king pin coupling for locking a king pin (3) of a semitrailer (2) to a railway wagon (1) to which said king pin coupling is mounted, said coupling comprising:
 - a slide (8) having an aperture (36) configured to receive the king pin (3), said slide (8) being movable back and forth; and
 - a locking assembly (17, 18, 25) arranged on said slide (8), said locking assembly defining an open state and a closed state, wherein pivotable locking jaws (17a, 17b) of said locking assembly in the closed state are configured to grip and lock said king pin (3) in said aperture (36) of said slide (8).
2. The king pin coupling according to claim 1, wherein said locking jaws (17a, 17b) are each pivotally arranged on one side of said aperture (36), respectively.
3. The king pin coupling according to claim 1 or 2, wherein said aperture (36) of said slide (8) is funnel shaped and configured to guide the king pin (3) towards said locking assembly (17, 18, 25).
4. The king pin coupling according to any one of the preceding claims, wherein a drive assembly (9, 30) is connected to said slide (8) and configured to move said slide (8) back and forth, wherein said drive assembly preferably comprises a hydraulic motor (30) and two threaded bars (9a, 9b), wherein said hydraulic motor (30) is configured to rotate said threaded bars (9a, 9b), and wherein said threaded bars (9a, 9b) are arranged one on each side of said king pin coupling and configured to move said slide (8) back and forth.
5. The king pin coupling according to any one of the preceding claims, further comprising a jaw locking clamp (18) movable between an unlocking state and a locking state and configured to lock said locking jaws (17a, 17b) in its locking state, wherein said jaw locking clamp (18) preferably at least partly surrounds said locking jaws (17a, 17b) in its locking state.
6. The king pin coupling according to claim 5, wherein said jaw locking clamp (18) is further configured to pivot said locking jaws (17) from their closed state to their open state, when said king pin (3) is removed.
7. The king pin coupling according to claims 6, further comprising an indicator (18') which is configured to send a stop signal to said drive assembly when said jaw locking clamp (18) is in its locked state.

8. A king pin locking device for locking a semitrailer (2) to a railway wagon (1) comprising:

a base portion (5), and
 a top portion (6) connected to said base portion (5) and vertically movable relative said base portion (5), wherein said top portion (6) comprises an open space (37) configured to receive said king pin (3),
 the king pin locking device further comprising:

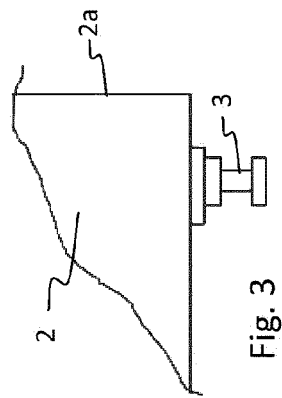
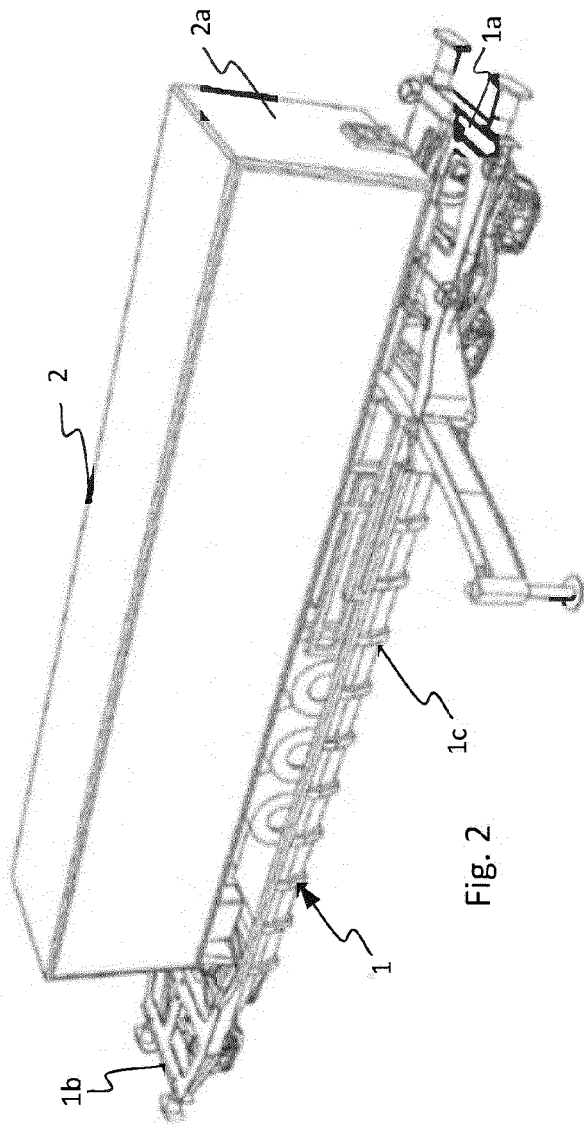
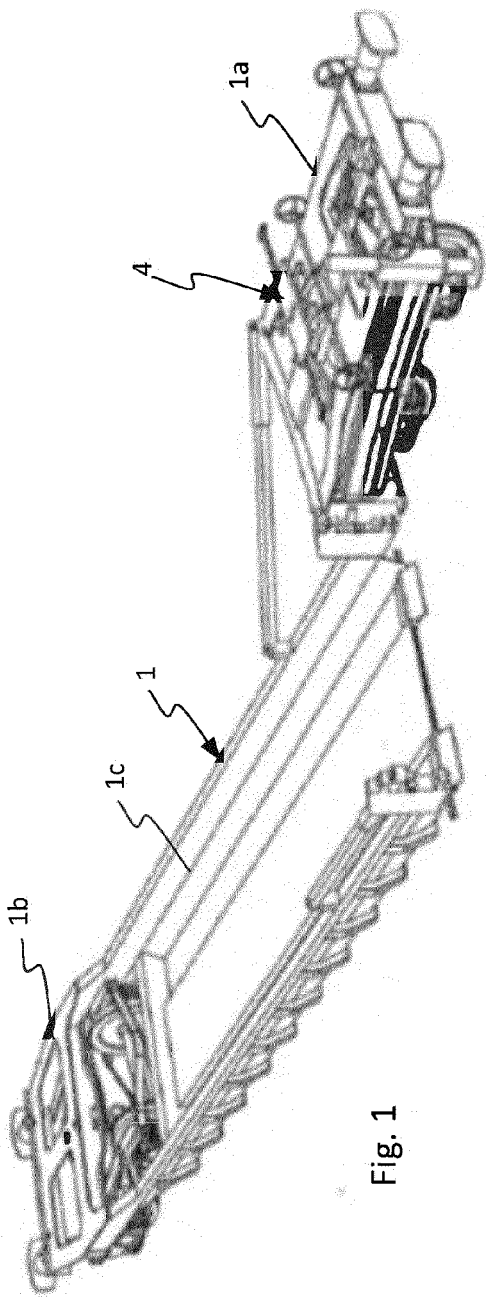
a king pin coupling having:

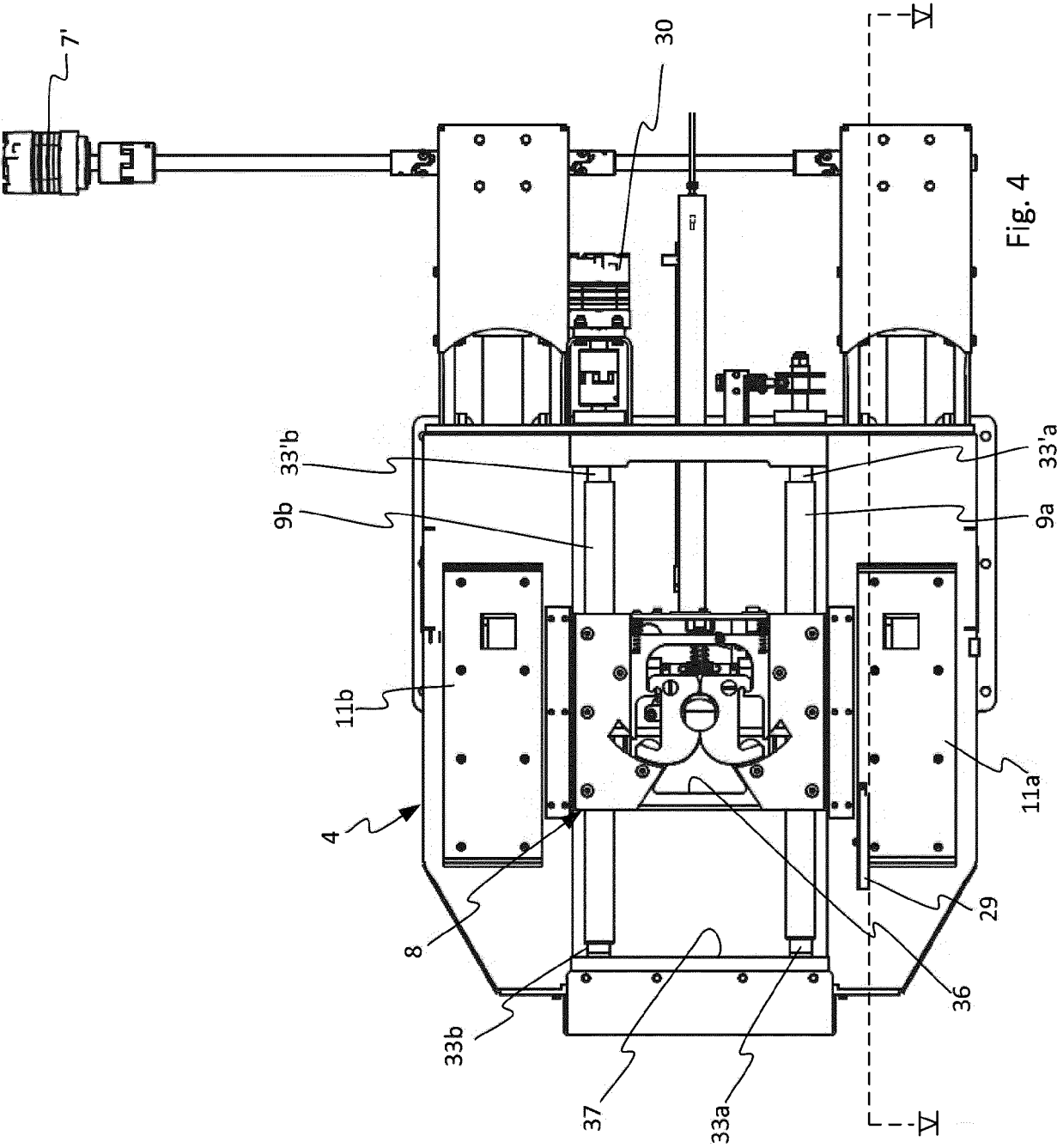
a slide (8) arranged in said open space (37) of the top portion (6) and having an aperture (36) configured to receive said king pin (2), said slide (8) being movable, in a longitudinal direction of said open space (37), back and forth, and
 a locking assembly (17, 18, 25) arranged on said slide (8), said locking assembly defining an open state and a closed state, wherein locking jaws (17a, 17b) of said locking assembly in the closed state are configured to grip and lock said king pin (3) in said aperture (36) of said slide (8).

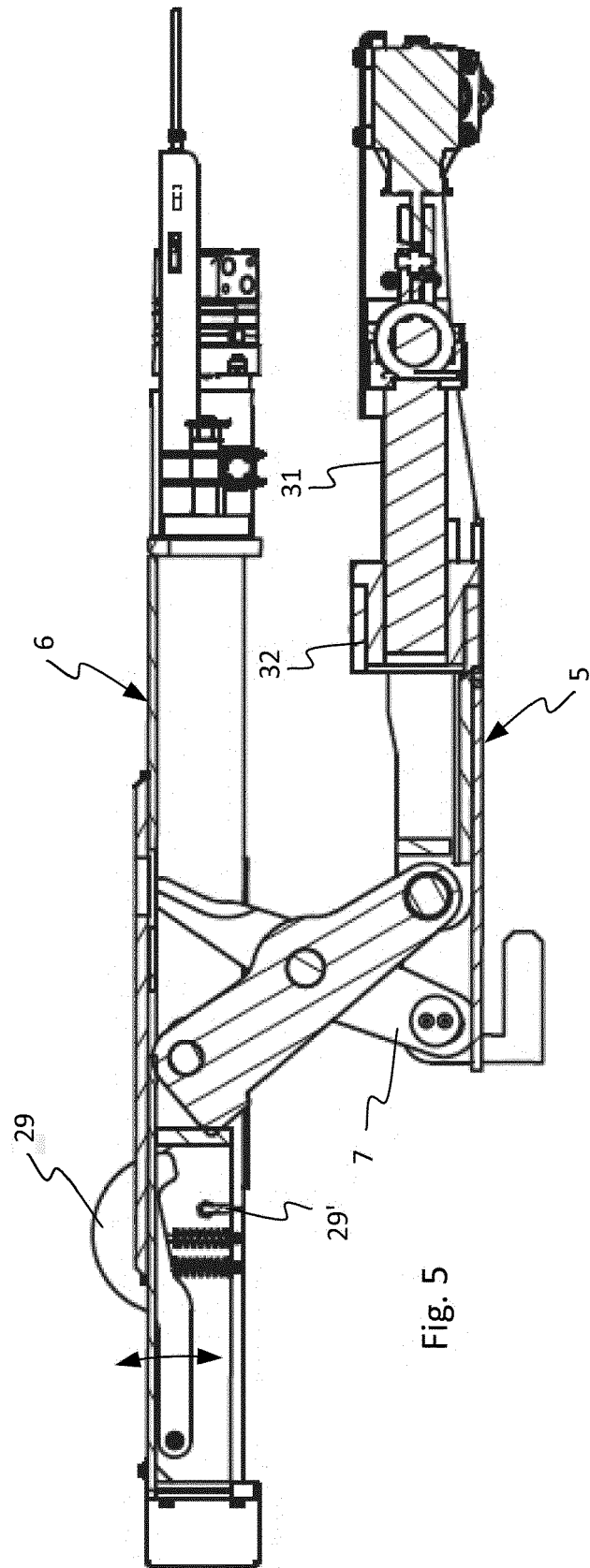
9. The king pin locking device according to claim 8, further comprising a vertical drive assembly (7) interconnected between said base portion (5) and said top portion (6) and configured to vertically move said top portion (6), wherein said vertical drive assembly preferably comprises a drive unit (7') and scissor lifts (7), and wherein said top portion (6) is mounted to said scissor lifts (7) and said drive unit (7') is configured to raise and lower said scissor lifts (7) so that said top portion (6) is vertically adjusted.
10. The king pin locking device according to claim 8 or 9, wherein said top portion (6) comprises an indicating device (29), configured to send a stop signal to said vertical drive assembly (7) when said top portion (6) is at a predetermined position relative a bottom surface of the semitrailer (2), wherein said indicating device preferably comprises an element (29) protruding from a top surface of said top portion (6) and configured to abut a bottom surface of said semitrailer (2), and an indicator (29') configured to send a stop signal to said vertical drive assembly when said protruding element (29) abuts the bottom surface of said semitrailer (2).
11. The king pin locking device according to any one of the claims 8-10, further comprising a longitudinal drive assembly (9, 30) connected to said king pin coupling and configured to move said king pin cou-

pling back and forth in a longitudinal direction of said open space (37).

12. The king pin locking device according to claim 11, wherein said king pin coupling further comprises an indicator (18') configured to send a stop signal to said longitudinal drive assembly (9, 30) when said king pin coupling is locked with said king pin (3), wherein said indicator (18') preferably is connected to a jaw locking clamp (18) movable between an unlocking state and a locking state and configured to secure said locking jaws (17) in its locking state, and wherein said indicator (18') is configured to send a stop signal to said longitudinal drive assembly (9, 30) when the jaw locking clamp (18) is in its locking state.
13. The king pin locking device according to claim 11 or 12, wherein said longitudinal drive assembly (9, 30) comprises two threaded bars (9a, 9b), and wherein each threaded bar comprises deformable elements (33a, 33b) at opposite ends.
14. A railway wagon comprising a king pin locking device according to any of the claims 8-13.
15. A method for locking a king pin (3) of a semitrailer (2) to a railway wagon (1) by means of a king pin locking device (4) according to any of the claims 8-13 mounted to the railway wagon (1), comprising the steps of:
- positioning the king pin (3) of said semitrailer (2) above said king pin locking device (4),
 - raising a top portion (6) of said king pin locking device (4) vertically until an indicating element (29) of said top portion (6) sends a stop signal to a vertical drive assembly (7), and
 - moving a king pin coupling towards said king pin (3) until an indicator (18') of said king pin coupling sends a stop signal to a longitudinal drive assembly (9, 30).







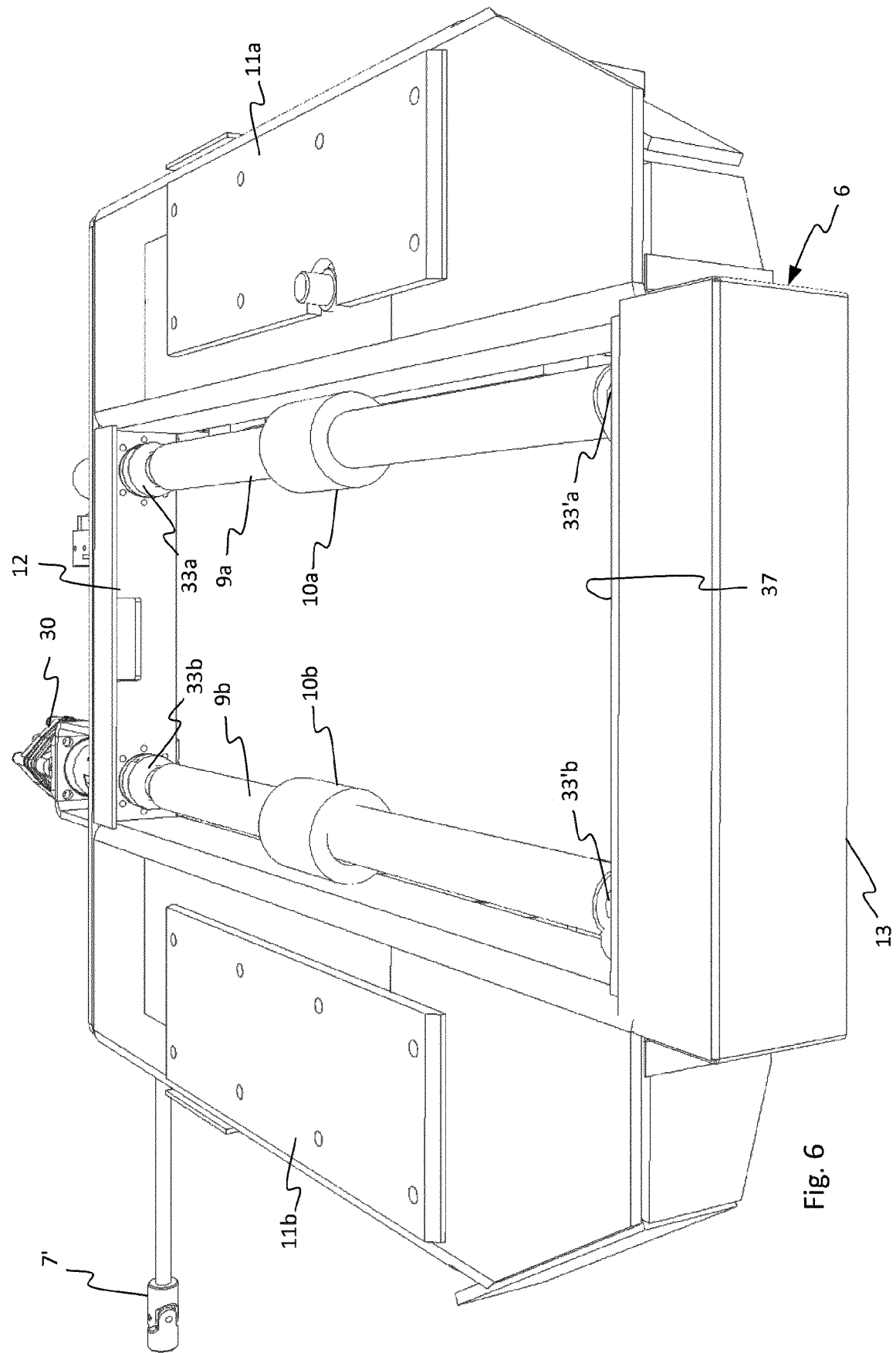


Fig. 6

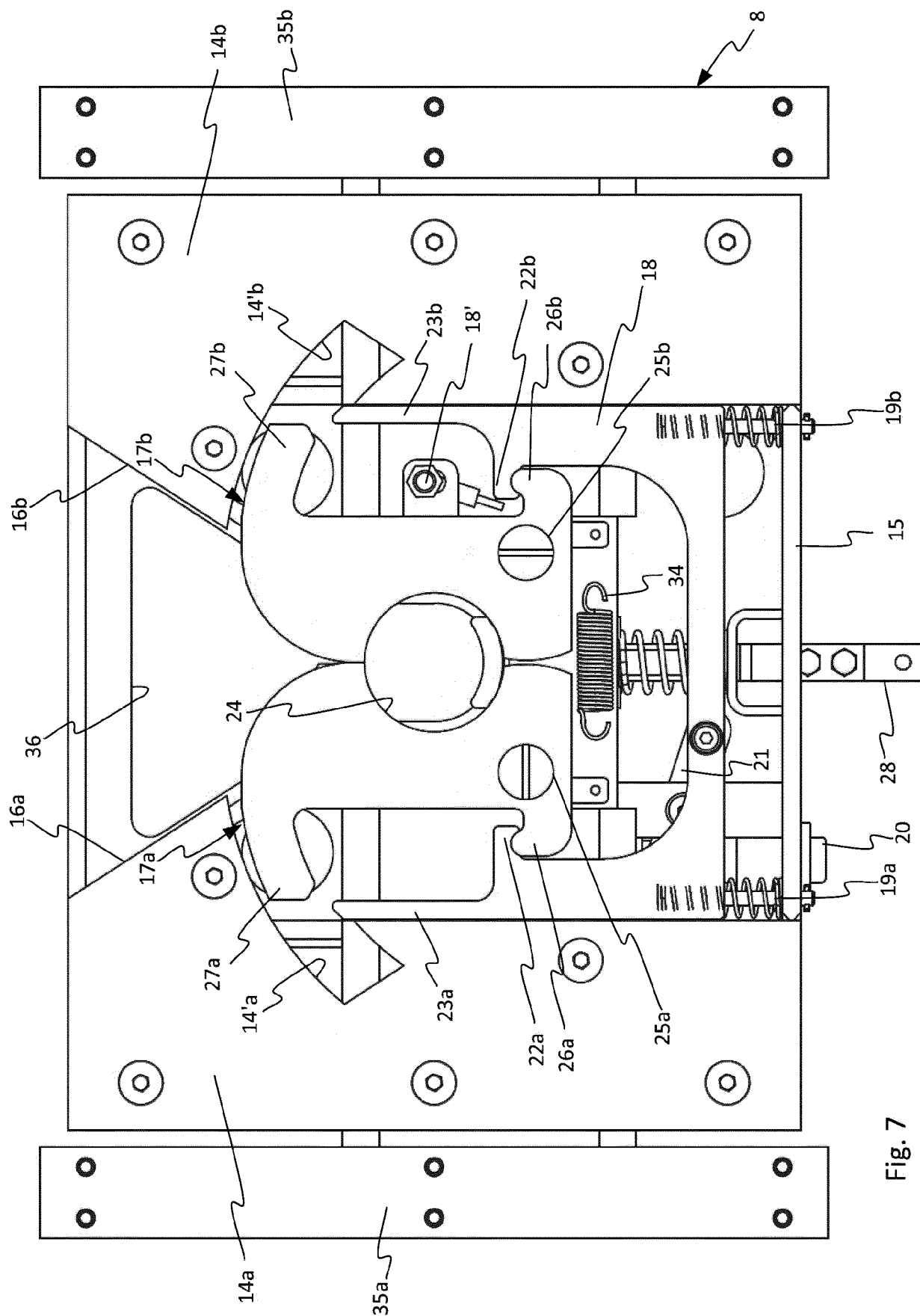


Fig. 7

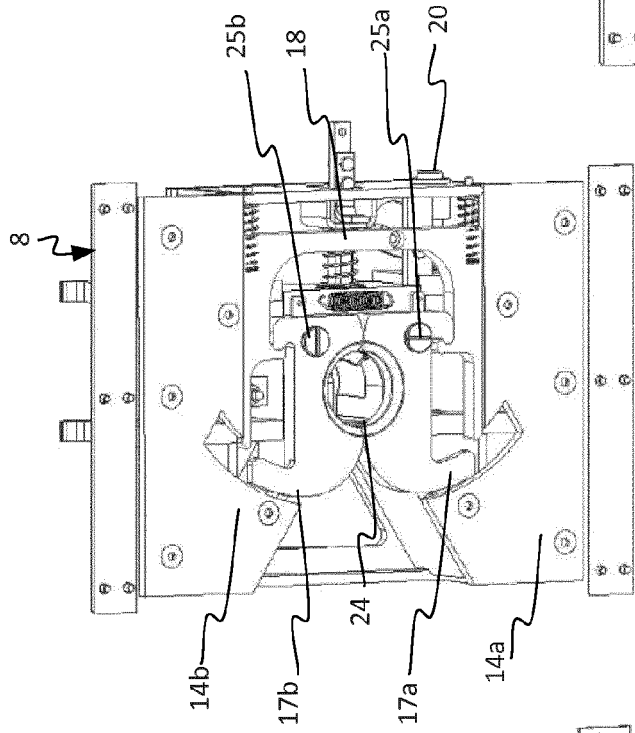


Fig. 9

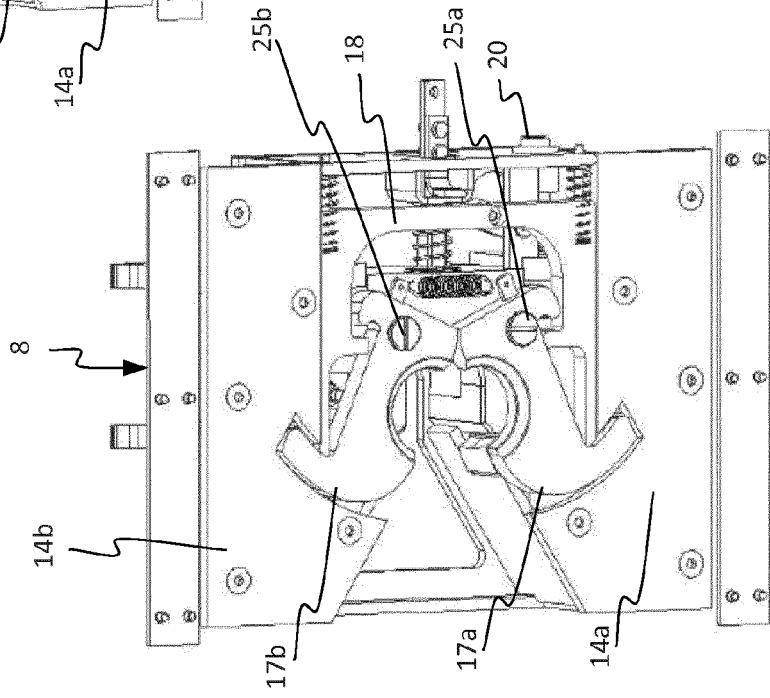


Fig. 8

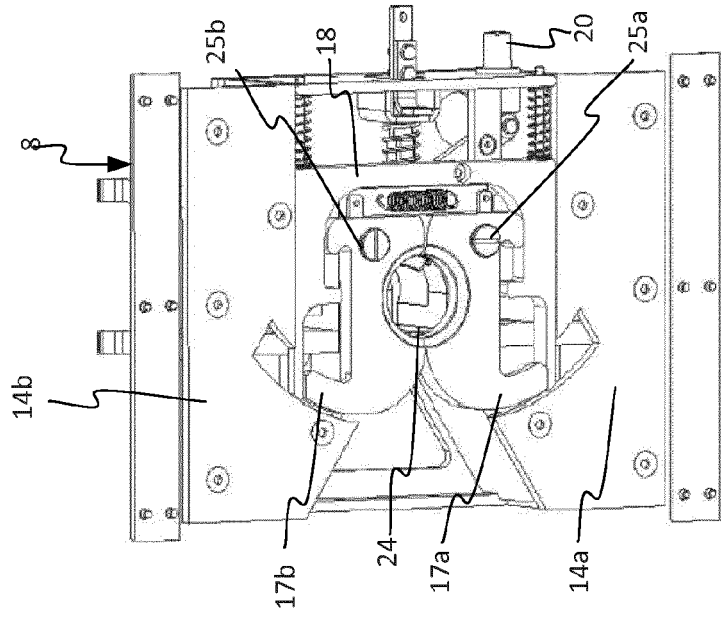


Fig. 10



EUROPEAN SEARCH REPORT

Application Number
EP 17 16 8041

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 10 November 2017	Examiner Lorandi, Lorenzo
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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REFERENCES CITED IN THE DESCRIPTION

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