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US-A- 3 990 386

Ship coupling for connecting two ship hulls

Ship coupling for connecting two ship hulls, in particular a pushing vehicle, such as a pusher tug, and a pushed vehicle, such as a lighter, comprising a coupling rod with a coupling element and a hydraulic cylinder with a piston rod guided in the hydraulic cylinder, wherein the piston rod and the coupling rod are
5 connected to each other.

The invention particularly relates to a ship coupling for providing a formation consisting of one or more pushing vehicles and one or more pushed vehicles, while the ship coupling according to the invention is intended for both the
10 connection of two pushing vehicles and for the connection of two pushed vehicles or for the connection of one pushing vehicle and one pushed vehicle. By means of the ship coupling according to the invention it is therefore possible to form ship formations from one or more pushing vehicles and/or one or more
15 pushed vehicles.

In order to transport large loads on the water, ship formations containing several ship hulls are formed, in particular during inland water navigation, but also when using shipping routes near the coast. At least one of those ship hulls within the ship formations is a pushing vehicle, such as a pusher tug or a tugboat, while
20 the other ship hulls are pushed vehicles, such as so-called lighters. Lighters are ship hulls without their own main drive. The ship hulls can be connected by hawsers or wire ropes. However, it is difficult to navigate such a ship formation if the pushed vehicles are not provided with auxiliary drives and helms, which results in an easy sideways drift of the lighters. Furthermore, the ship hulls
25 move against each other in all six degrees of freedom due to the movement of the waves. The six degrees of freedom are, as is generally known, three translation and three rotation degrees of freedom. If a tugboat is used as a drive for a ship formation, said tugboat tows the lighters. With the use of a pusher tug

as a drive for the ship formation, the pusher tug pushes the lighters, so that the pushing force is transmitted from the hull of the pusher tug to the hulls of the lighters. In order to transmit the pushing force and the forces resulting from the ability to maneuver the pusher tug towards a lighter, ship couplings are used.

5 For a formation with one or more lighters, the pushing force must additionally be transmitted from one lighter to the other by means of a coupling. Such a coupling is required to transmit the forces to the adjacent ship hulls, in spite of the different relative movements of the ship hulls against each other in the six degrees of freedom, resulting from the wave movements. Thus, if the ship
10 corner or if one of the ships of the formation drifts to the side, the ship hulls lean towards each other in a horizontal plane. The coupling between the ship hulls therefore also needs to allow for such a leaning of the ship hulls towards each other.

15 Ship couplings with one or more hydraulic cylinders are known from prior art. US 3 882 813 A discloses a ship coupling which features a pivot-mounted carrier with two hydraulic cylinders at the one end. At the other end, the hydraulic cylinders are arranged at the two side pieces of a grapple, so that the side pieces move towards each other when engaging the hydraulic cylinder in
20 order to contact a corresponding coupling element, which is connected to an adjacent ship hull, or to release from the corresponding coupling element. US 3 882 813 A further discloses a ship coupling featuring a pivot arm with a rigid coupling element, that is pivot-mounted around its center in a horizontal plane on the deck of a ship hull. The plunger rod of each hydraulic cylinder is attached
25 to the outer ends of the pivot arm, while the housings of the two hydraulic cylinders are connected to the ship hull. The rigid coupling elements features a coupling means at the far end of the pivot arm, that contact an adjacent ship hull or a coupling body that is connected to a ship hull.

30 DE 26 37 253 discloses a ship coupling with hydraulic cylinder featuring a housing that is fixed permanently at a ship hull and a rotatable and moveable

piston rod arranged in the housing. At the one end, the piston rod features a piston, that is arranged in the housing, and a funnel-shaped coupling element at the other end. Within the parts of the housing that are located at the left and right sides of the piston is each arranged a fluid and a coil spring. The two coil
5 springs are under compression arranged within the respective parts of the housing and result in an absorption of the movement of the piston rod. The coupling element of the piston rod is connected with a corresponding coupling element of an adjacent ship hull. Both the fluids and the spring coils within the parts of the housing result in an absorption of the horizontal movement of the
10 piston rod. The funnel-shaped form of the coupling element of the piston rod allows for a vertical movement of the two ship hulls connected by the ship coupling.

DE 102 59 532 A1 discloses a support bearing for motor vehicles, which
15 contains a housing made from an elastic material. The housing is fixed permanently to a hydraulic cylinder and is coupled hydraulically by the hydraulic medium of the hydraulic cylinder. During a movement of the piston arranged within the hydraulic cylinder, the support bearing absorbs a part of the force transmitted by the hydraulic medium, while the reset force of the support
20 bearing is in particular larger than the friction force of the piston within the hydraulic cylinder. Due to this embodiment of a support bearing the driving comfort of a vehicle may be increased.

US 3,990,386 A discloses a cable system for connecting two ship hulls, in
25 particular a ship with a sonar buoy. The cable system includes a cable with a multitude of ropes and, if need be, electrical cables. Furthermore, the cable system is provided with a fastening mechanism to which the ends of the ropes are attached. In the fastening mechanism, the ropes of the cable are each attached to the piston rod of a first hydraulic cylinder. The housing of each of
30 these first hydraulic cylinders is connected via a frame to the piston rod of another hydraulic cylinder. The fluid receiving chambers of the first and other

hydraulic cylinders are interconnected by a piping system, which ensures that a load applied to one of the cable's ropes is transmitted to the other ropes of the cable, thus distributing the load over the cable's ropes.

5 From the patent application DE 31 23 709 A1, which is considered to be the closest prior art, an axially sprung coupling rod for adjacent pusher craft units is known. The coupling rod is connected at one end to the piston rod of a hydraulic cylinder and has a coupling pin at the other end. The coupling rod is connected to the piston rod of the hydraulic cylinder in the area of a movably
10 mounted guide carriage. The guide carriage moves on a slideway when tensile and impact forces are applied. Prestressed buffer springs are arranged in the guide carriage between two movable bearing plates. A tensile or impact force acting on the coupling rod is transmitted to the buffer springs via one of the bearing plates arranged in the guide carriage. The buffer springs of this ship's
15 coupling contribute to the absorption of both tractive and shock forces as soon as these are greater than the pretension of the buffer springs, so that load peaks are absorbed by the buffer springs.

DE 102 59 532 A1 discloses a support bearing for motor vehicles which works
20 together with a hydraulic cylinder. The support bearing disclosed contains a housing made of an elastic material and is connected to the interior of a hydraulic cylinder via a hydraulic active surface, so that the hydraulic medium is pressed into the support bearing when the piston moves in the direction of the support bearing and the elastic housing of the support bearing contributes to
25 absorbing the piston movement, whereby in particular the restoring force of the support bearing is greater than the frictional force of the piston in the hydraulic cylinder. According to this publication, this measure increases the driving comfort of a motor vehicle equipped with appropriate support bearings.

30 The task at hand to be solved by the invention is to provide a ship coupling, which has additional means for absorbing load peaks.

For the solution of the task, a ship coupling is suggested, of which the hydraulic cylinder is mounted, in an axially movable manner, in a housing fixedly connected to a ship hull, a prestressed elastic element being disposed in the housing and pushing the hydraulic cylinder in its axial direction against the housing such that the restoring force of the prestressed elastic element, causes the hydraulic cylinder to be stationarily held in the housing at normal load, and only at peak loads that are greater than the restoring force of the prestressed elastic element, it absorbs a part of the load. Further advantageous embodiments are provided in the sub-claims.

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In the ship coupling according to the invention, two attenuators are combined in an advantageous way. The prestressed elastic element holds the hydraulic cylinder in a fixed position within the housing under normal load, so that the relative movement between the ship hull to which the housing of the marine coupling according to the invention is connected and the adjacent ship hull is only absorbed by the movement of the piston of the hydraulic cylinder and the piston rod connected to it. In case of load peaks between both ship hulls which are greater than the restoring force of the prestressed elastic element, the absorption is additionally effected by the elastic element. Due to this design of the ship coupling according to the invention, a hydraulic cylinder can be used to couple two ship hulls without the risk of being destroyed during load peaks. This can lead to a loss of the absorption capability of the ship coupling due to the escape of the fluid contained in the hydraulic cylinder or to the separation of the two ship hulls from each other. The mechanical coupling of the two ship hulls is achieved by the invention of the ship coupling by means of a coupling rod, which has a coupling element at one end and is rotatably connected to the piston rod of the hydraulic cylinder at the other end. The coupling element has a direction of extension perpendicular to the direction of extension of the coupling rod, whereby the coupling or uncoupling of an adjacent ship hull is effected by rotating the coupling rod by 90 degrees. The adjacent ship hull has a receiving element for receiving the coupling element, which essentially consists of a vertically oriented plate with a vertically extending recess. If the coupling element is vertically oriented, it can be pushed through the recess of the plate and then rotated by turning the coupling rod by 90 degrees, so that a backward movement of the coupling element through the recess of the plate of the

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receiving element is prevented. In addition, the vertically extending recess allows a vertical relative movement of the coupling rod on the one hand and the receiving element on the other hand and consequently a vertical relative movement of the two adjacent ship hulls.

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The coupling according to the invention allows for a coupling of the pushing and pushed vehicles with each other independent of the depth of floatation, while the horizontal coupling planes between the pushing and pushed vehicles are variable towards each other.

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In order to avoid tension to the housing during a relative movement of the two coupled ship hulls, an embodiment of the invention intends for the housing to be pivoted about a horizontal axis. Such a bearing is achieved, for example, by providing the housing with two bearing bolts being formed integrally to the sides, while the bearing bolts are being received by a respective bearing, while the bearing is fixedly attached to a ship hull.

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In a further embodiment of the ship coupling according to the invention it can be intended that the elastic element pushes the hydraulic cylinder into the direction opposite of the coupling rod. Due to this orientation of the restoring force of the prestressed elastic element, tension load peaks can be absorbed by the elastic element, that is unusually large forces acting on a removal of the two ship hulls from each other. Obviously, it is also possible that the elastic element pushes the hydraulic cylinder in the direction of the coupling rod, so that the restoring force of the prestressed elastic element is oriented towards the coupling rod. In this configuration, thrust load peaks, that is large forces acting to bring the two ship hulls closer together, can be absorbed by the elastic element.

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It is preferable for the elastic element to be prestressed by a force of $5 \cdot 10^5$ N or more. This means that the elastic element absorbs only forces of $5 \cdot 10^5$ N or more between the adjacent ship hulls. Naturally, the elastic element may also be stressed with another force, so that it contains a different reset force. This choice depends on the respective situation, namely, the expected sea condition, the push force of the pusher tug or the tugboat and the mass of the ship hulls to

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be connected. A force of $5 \cdot 10^5$ N correlates to the weight of a mass of 50.97 tons.

5 The ship coupling according to the invention may be formed so that the piston rod and the coupling rod are connected with each other by a connecting element, which is fixedly attached to the piston rod and grips around a flange collar of the coupling rod, so that the coupling rod is rotatably received by the connecting element. The flange collar of the coupling rod may be arranged at the end or a desired part of the coupling rod. This embodiment of the ship
10 coupling results in the fact that the rotation of the coupling rod, that is required for coupling the coupling element into the receiving element of the adjacent ship hull, occurs on its own, while the piston rod is not rotated at all. For this, the connecting element is fixedly attached to the piston rod and grips around the flange collar of the coupling rod, so that the latter is inseparably connected to
15 the piston rod while still being able to rotate.

Furthermore, the coupling rod can be advantageously mounted in at least one first bearing, which prevents movements of the coupling rod in non-axial direction and thereby absorbs forces acting on the coupling rod in non-axial
20 direction. The first bearing ensures that the coupling rod, and therefore also the piston rod, performs movements exclusively in the axial direction, which in particular prevents the hydraulic cylinder from being damaged. The first bearing can be made of bronze or entirely of bronze, at least on the surface facing the coupling rod. Furthermore, the housing of the ship coupling according to the
25 invention can also be connected to the ship hull by at least a second bearing. This second bearing absorbs the forces transmitted to the housing via the coupling rod and the piston rod. The second bearing can also be made of bronze at least on the surface facing the housing or completely of bronze.

30 In a further embodiment of the ship coupling according to the invention, it may be provided that it comprises a shock absorbing device which comprises a basic body, at least one contact element with a contact surface facing an adjacent ship hull and at least one non-metallic absorbing element, the absorbing element being arranged between the basic body and the contact

element, and the basic body being firmly connected to a ship hull. Contrary to the shock absorbing devices for ship couplings known from prior art, the shock absorbing device according to this further development of the ship coupling according to the invention does not consist exclusively of a metal, but has a
5 non-metallic absorbing element. The non-metallic absorbing element essentially absorbs the noise development when the contact element of the shock absorbing device collides with an adjacent ship hull, in particular the receiving element of an adjacent ship hull for a coupling element of a ship coupling. The absorbing element can be made of an elastic material, such as rubber or an
10 elastic plastic, or of another non-metallic material, such as a non-elastic plastic. The contact element and/or the basic body, on the other hand, can be made of a metal so that the absorbing element is not deformed or damaged by impact, even in the case of large force transmissions.

15 Furthermore, the ship coupling according to the invention can be designed in such a way that the contact element is connected to the basic body via an axially guided pin in such a way that the contact element is movable relative to the basic body. In this embodiment, the basic body is a rigid structure which is firmly connected to a ship hull and to which the contact element is movably
20 connected via an axially guided pin. Due to the axial movability of the contact element, the absorbing element can be compressed under impact and then return to its original shape. The absorbing element can be connected, for example glued, on one side either to an end face of the basic body or to a surface of the contact element facing away from the contact surface. In a
25 particular embodiment of the contact element, it is U-shaped in cross-section, with the absorbing element is being located in the recess of the U-shape. The wings of the U-shape can extend so far in the direction of the basic body that the end face of the basic body, with which the absorbing element comes into contact, is bordered by the wings. The axially guided pin can be firmly
30 connected to the contact element at one end and mounted in an aperture in the basic body and can have a bolt head at the other end whose cross-sectional

area is larger than the cross-sectional area of the aperture. The design of the bolt head with a cross-sectional area larger than the cross-sectional area of the opening in the basic body means that the bolt cannot detach from the basic body and the contact element can therefore move in the axial direction without ever being completely detached from the basic body.

The body of the shock absorbing device of the ship coupling according to the invention may be designed to have an opening in which the coupling rod of the ship coupling is guided. In this embodiment, the basic body of the shock absorbing device is arranged around the coupling rod, so that the basic body not only fulfils the function of shock absorption but also of guiding the coupling rod. This design of the shock absorbing device ensures that contact between adjacent ship hulls occurs only in the area of the coupling connection, which is usually located centrally at the bow or stern of a ship hull, thus preventing contact between the ship hulls away from the coupling connection.

In further embodiment of the shock absorbing device of the ship coupling, which has a basic body with an opening into which the coupling rod is guided, it may be provided that the first bearing for axial guidance of the coupling rod is located in the opening of the basic body. The advantage of this is that no additional mounting for the first bearing has to be attached to the ship hull.

The term axial direction or axial direction in the context of this application always refers to an axis centrally located with respect to the ship coupling and extending in the main direction of the ship coupling.

The invention is further explained by means of the drawings.

It shows

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Fig. 1 a horizontal cross-cut view of an embodiment of the ship coupling according to the invention in a coupled state and

5 Fig. 2 a horizontal cross-cut view of the embodiment of the ship coupling according to the invention in an uncoupled state.

Figure 1 shows an embodiment of the ship coupling 1 according to the invention. The ship coupling 1 features a hydraulic cylinder 2 with a piston rod 5, a coupling rod 6 with a coupling element 11 and a housing 4 as well as an
10 elastic element 3. The hydraulic cylinder 2 is arranged within the housing 4 and is pushed by the prestressed elastic element 3 against the housing 4 in an axial direction, while the prestressed elastic element 3 is arranged between the hydraulic cylinder 2 and the housing 4 in such a way that it pushes the hydraulic cylinder against the housing 4 into the direction of the far side of the coupling
15 rod 6. The reset force of the pretensioned elastic element 3 causes the hydraulic cylinder 2 to be held stationary in the housing 4 under normal load. Only in the case of load peaks that are greater than the restoring force of the pretensioned elastic element 3, the latter absorbs part of the load. The ship coupling 1 according to the invention is therefore capable of absorbing tensile
20 and shear loads between the ship hull on which the ship coupling 1 is arranged and an adjacent ship hull by the movement of the piston of hydraulic cylinder 2 connected to the piston rod 5. Tensile loads between the adjacent ship hulls, which are greater than the restoring force of the prestressed elastic element 3, are additionally absorbed by the elastic element 3. This prevents particularly
25 large loads from being absorbed by hydraulic cylinder 2 alone, thus preventing damage to hydraulic cylinder 2. In this design, the elastic element is prestressed with a force of $5,89 \cdot 10^5$ N, which corresponds to the weight force of a mass of 60 t.

30 The piston rod 5 of the hydraulic cylinder 2 is connected with the coupling rod 6 via a connecting element 7, while the connecting element 7 is fixedly attached

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to the piston rod 5 and grips the coupling rod 6 in such a way that it is rotatable in relation to the piston rod 5. The connecting element 7 comprises a first section 9 firmly connected to the piston rod 5 and a flange 10 fixed to the first section 9. Between the first section 9 of the connecting element 7 and the flange 10 there is an end flange collar 8 of the coupling rod 6, so that the coupling rod 6 is rotatably received by the connecting element 7 but cannot move away from the piston rod 5 in the axial direction. Turning the coupling rod 6 is necessary to bring the end coupling element 11 into engagement with the receiving element 12. The receiving element 12 is fixed to an adjacent ship hull and essentially comprises a plate 13 with a vertically extending recess 14 and a main body 15. To engage the coupling element 11 of the ship coupling 1 in the receiving element 12 of an adjacent ship hull, the coupling rod 6 is rotated so that the coupling element 11 is oriented parallel to the recess 14 of the plate 13 and then the coupling element 11 is guided through the recess 14. Subsequently, the coupling rod 6 is rotated by 90 degrees so that the coupling element 11 is oriented perpendicular to the direction of the recess 14 and is thus engaged. The coupling element 11 can now move along the recess 14, i.e. in vertical direction, so that the two ship hulls coupled to each other can move vertically against each other, as is the case due to shaft movements. However, the two ship hulls cannot move away from each other in the coupled state, because the coupling element 11 of the coupling rod 6 abuts against the plate 13 of the receiving element 12 and cannot detach from the receiving element 12 in the given orientation.

The housing 4, which is firmly attached to the ship hull, is supported by two bearings 17, 18, which absorb forces acting on the housing. The bearings 17, 18 can be arranged in one or more holders which are firmly connected to the ship hull but can be moved on it, for example after loosening fastening screws or bolts.

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The ship coupling 1 according to the invention additionally features a shock absorbing device 20. The shock absorbing device 20 comprises a basic body 21, several absorbing elements 22 and several contact elements 23. The basic body 21 is firmly connected to the ship hull so that it can absorb forces acting
5 between the adjacent ship hulls due to impacts. The basic body 21 is made of a metal, such as steel. The contact elements 23 are also made of a metal, such as steel, and have a contact surface which comes into contact with the adjacent ship hulls in the event of impacts between the adjacent ship hulls. Between the basic body 21 and the contact elements 23 there is an absorbing element 22,
10 which is made of rubber and serves to dampen the noise generated by collisions between the adjacent ship hulls. The basic body 21 is arranged around the coupling rod 6 and has an opening 24 through which the coupling rod 6 is guided. In the opening 24, a bearing 25 is arranged which absorbs forces acting on the coupling rod 6 in a non-axial direction. Both the bearing 25
15 and the bearings 17, 18 are made of bronze.

The contact elements 23 are connected to the basic body 21 via pins 26, whereby the pin 26 are guided through openings in the basic body 21 and each have a bolt head whose cross-sectional area is larger than the cross-sectional
20 area of the respective opening in the basic body 21. The pins 26 are welded or screwed to the contact elements 23. The pins 26 hold the contact elements 23 in position in the vertical direction and allow a slight movement of the contact elements 23 in the axial direction, so that the contact elements 23 can transmit the impact effect to the absorbing elements 22, which are thereby compressed,
25 when adjacent ship hulls collide. The contact elements 23 are also U-shaped in cross-section, whereby the two wings of the U-shape receive the end faces of the basic body 21, so that the wings of the U-shape of the contact elements 23 serve as a guide for the relative movement between the basic body 21 and the contact elements 23.

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Figure 2 shows the ship coupling 1 of figure 1 in a disengaged state. For a decoupling process, the coupling element 11 is oriented parallel to the recess 14 of the plate 13, so that the coupling element 11 can move through the recess 14 in the direction of the hydraulic cylinder 2. The decoupling process is
5 terminated by retracting the piston rod 5. Accordingly, a coupling process is performed by moving the piston rod 5 out, whereby the coupling element 11 moves through the recess 14 of the plate 13 of the receiving element 12. Then the coupling rod 6 is rotated by 90 degrees so that the coupling element 11 is oriented perpendicular to the direction of the recess 14, thus completing the
10 coupling process.

List of references

	1	ship coupling
	2	hydraulic cylinder
5	3	elastic element
	4	housing
	5	piston rod
	6	coupling rod
	7	connecting element
10	8	flange collar
	9	section
	10	flange
	11	coupling element
	12	receiving element
15	13	plate
	14	recess
	15	main body
	17	bearing
	18	bearing
20	20	shock-absorbing device
	21	basic body
	22	absorbing element
	23	contact element
	24	opening
25	25	bearing
	26	pin

P A T E N T K R A V

1. Skibskobling (1) til forbindelse af to skibsskrog, især et skubbende fartøj og et skubbet fartøj, omfattende en koblingsstang (6) med et koblingselement (11) og en hydraulikcylinder (2) med en stempelstang (5), som føres ind i hydraulikcylinderen (2), hvor
5 stempelstangen (5) og koblingsstangen (6) er forbundet med hinanden,

kendetegnet ved,

at hydraulikcylinderen (2) er monteret aksialt bevægeligt i et hus (4), som er forbundet til et skibsskrog, i hvilket er anbragt et forspændt elastisk element (3), som trykker hydraulikcylinderen (2) i sin aksiale retning mod huset (4), således at tilbageføringskraften af det
10 forspændte elastiske element (3) bevirker, at ved normallast holdes hydraulikcylinderen (2) stationært i huset og kun ved spidsbelastninger, som er større end tilbageføringskraften af det forspændte elastiske element (3) modtager denne en del af lasten.

2. Skibskobling (1) ifølge krav 1,

kendetegnet ved,

15 **at** huset (4) er svingbart monteret om en horisontal akse.

3. Skibskobling (1) ifølge krav 1 eller 2,

kendetegnet ved,

at det elastiske element (3) trykker hydraulikcylinderen (2) i retningen som vender væk fra koblingsstangen (6) eller i retningen som vender mod koblingsstangen (6).

20 4. Skibskobling (1) ifølge et af kravene 1,2 eller 3,

kendetegnet ved,

at det elastiske element (3) udøver en kraft på hydraulikcylinderen (2) på $5 \cdot 10^5$ N eller mere.

5. Skibskobling (1) ifølge et af kravene 1 til 4,

25 **kendetegnet ved,**

at stempelstangen (5) og koblingsstangen (6) er forbundet med hinanden via et forbindelseselement (7), som er fast forbundet med stempelstangen (5) og griber fat om en flangekrave (8) af koblingsstangen (6), således at koblingsstangen (6) er drejeligt modtaget af forbindelseselementet (7).

30 6. Skibskobling (1) ifølge et af kravene 1 til 5,

kendetegnet ved,

at koblingsstangen (6) er monteret i det mindste i et første leje (25), hvilket forhindrer bevægelser af koblingsstangen (6) i en ikke-aksial retning.

7. Skibskobling (1) ifølge krav 6,

35 **kendetegnet ved,**

at det første leje (25) består af bronze i det mindste på overfladen som vender mod koblingsstangen (6), eller **at** det første leje (25) består fuldstændigt af bronze.

8. Skibskobling (1) ifølge et af kravene 1 til 7,

kendetegnet ved,

40 **at** huset (4) er forbundet med skibsskroget via i det mindste ét andet leje (17, 18).

9. Skibskobling (1) ifølge krav 8,

kendetegnet ved,

at det andet leje (17, 18) består af bronze i det mindste på overfladen som vender mod huset (4), eller **at** det andet leje (17, 18) består fuldstændigt af bronze.

5 **10.** Skibskobling (1) ifølge et af kravene 1 til 9,

kendetegnet ved,

at skibskoblingen (1) omfatter en støddæmpningsanordning (20), som omfatter et grundlegeme (21), i det mindste ét kontaktelement (23) med en kontaktflade, som vender mod et tilstødende skibsskrog, og i det mindste ét ikke-metallisk dæmpningselement (22), hvor
10 dæmpningselementet (22) er anbragt mellem grundlegemet (21) og kontaktelementet (23), og grundlegemet (21) er fast forbundet med et skibsskrog.

11. Skibskobling (1) ifølge krav 10,

kendetegnet ved,

at dæmpningselementet (22) består af et elastisk materiale, og/eller at dæmpningselementet (22) består af gummi eller et plast.
15

12. Skibskobling (1) ifølge et eller flere af kravene 10 til 11, **kendetegnet ved,**

at kontaktelementet (23) og/eller grundlegemet (21) består af et metal.

13. Skibskobling (1) ifølge et eller flere af kravene 10 til 12, **kendetegnet ved,**

at kontaktelementet (23) er forbundet med grundlegemet (21) via en aksialt ført bolt (26),
20 således at kontaktelementet (23) er bevægelig i forhold til grundlegemet (21).

14. Skibskobling (1) ifølge krav 13,

kendetegnet ved,

at bolt (26) i en ende er fast forbundet med kontaktelementet (23) og i en anden ende omfatter et bolthoved, hvor bolt (26) er monteret i et hul af grundlegemet (21), hvilket
25 grundlegeme har et tværsnitsareal som er større end tværsnitsarealet af hullet.

15. Skibskobling (1) ifølge et eller flere af kravene 10 til 14, **kendetegnet ved,**

at grundlegemet (21) omfatter en åbning (26), i hvilken koblingsstangen (6) er ført, og/eller at det første leje (25) er anbragt i åbningen (24) af grundlegemet (21).

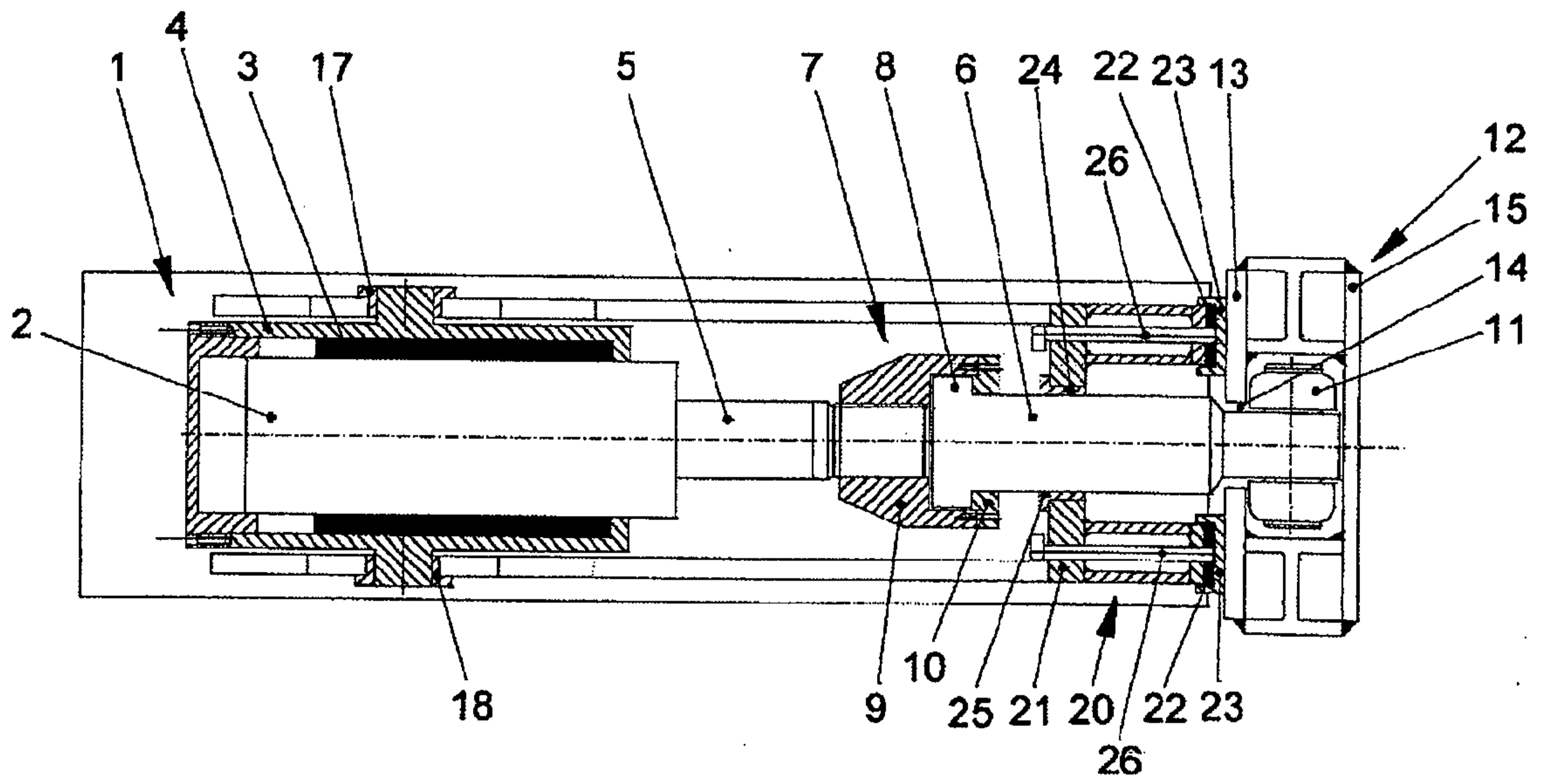


Fig. 1

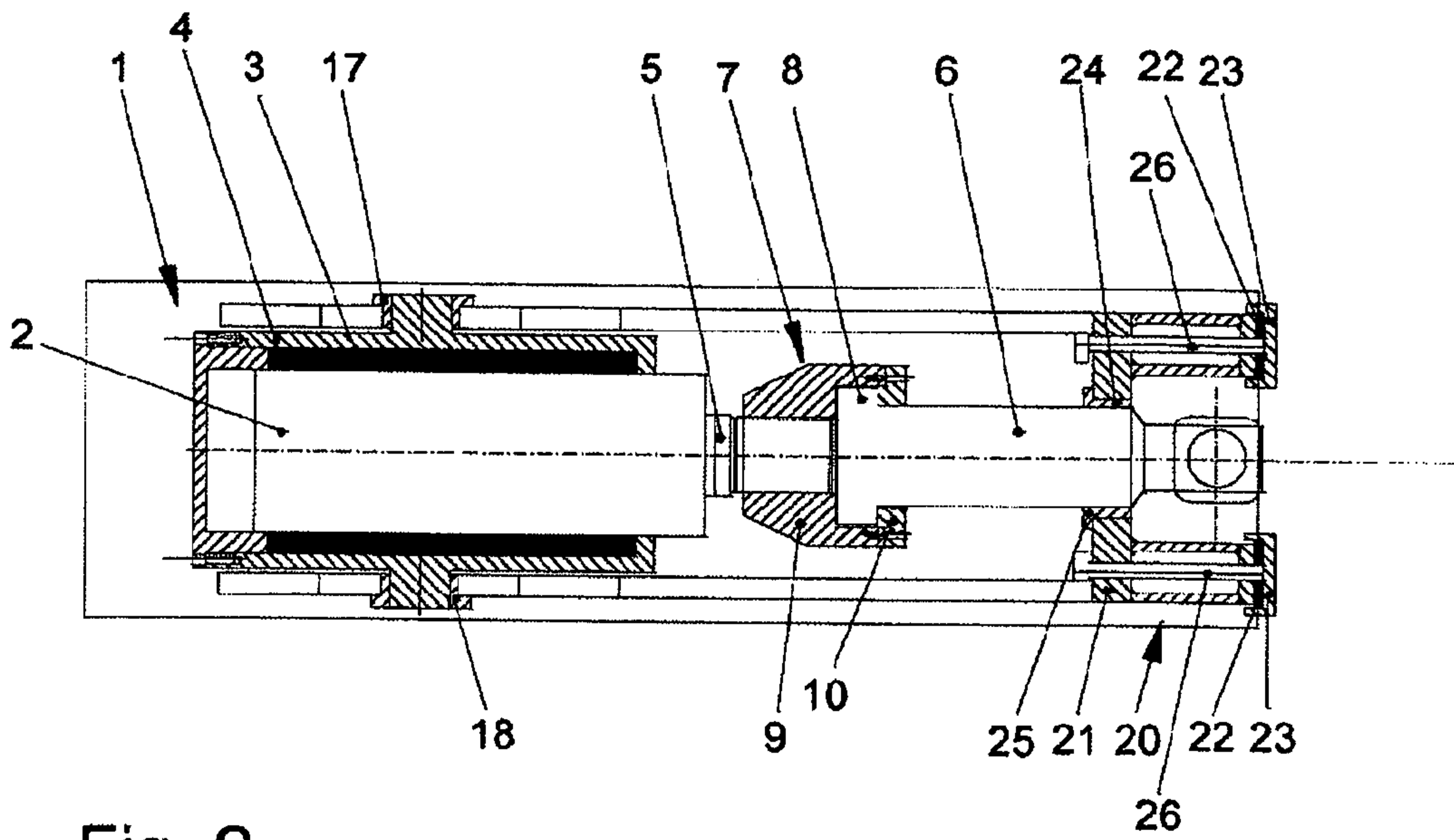


Fig. 2