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(71) Applicant: **Foxsail Societa' A Responsabilita' Limitata Semplificata**
23807 Merate (LC) (IT)

(72) Inventor: **VOLPE, Alessandro**
23807 MERATE (LC) (IT)

(74) Representative: **Baldi, Claudio**
Ing. Claudio Baldi S.r.l.
Viale Cavallotti, 13
60035 Jesi (Ancona) (IT)

(54) **FOLDING CATAMARAN**

(57) Folding catamaran (C) comprising a right hull (SD) and a left hull (SS); each hull (SD, SS); a folding frame (1) comprising crosspieces (11, 12, 13, 14) and a front connection assembly (G1) and a rear connection assembly (G2); each crosspiece (11, 12, 13, 14) is hinged to one of the two hulls (SD, SS) and to one of the two connection assemblies (G1, G2); wherein at least one of said connection assemblies (G1, G2) comprises a slider (3), an actuator (4) suitable for moving the slider (3) and two linkages (R1, R2), each one being interposed between the slider (3) and one of said crosspieces (11, 12, 13, 14).

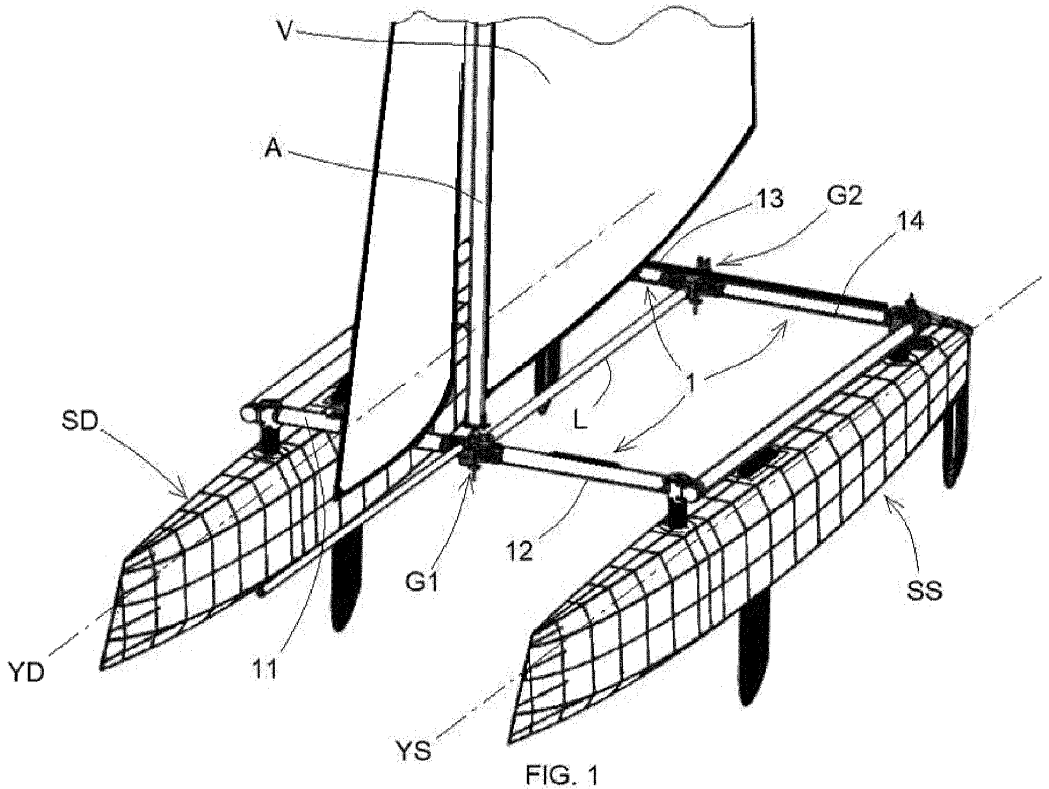

FIG. 1

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Description

[0001] The present application for industrial invention relates to a folding catamaran.

[0002] A catamaran is a boat consisting of two hulls connected by a frame whereon steering means and possibly a mast and a sail are mounted.

[0003] Catamarans are divided into two types, namely a first type of large catamarans and a second type of small transportable catamarans.

[0004] Folding frames have been devised over time for both types of catamarans, which allow for disposing said catamarans in an opening position, wherein the two hulls are spaced apart, and in a closing position, wherein the two hulls are moved close to each other.

[0005] In the case of large catamarans, the closing position reduces the volume occupied by said catamarans in the mooring dock.

[0006] In the case of small catamarans, the closing position allows to transport the catamaran on the roof of a vehicle or in a trailer, thus avoiding the need for the catamaran owner to rent a mooring dock.

[0007] In particular, the present invention relates to small catamarans and is devised to solve the problems that impair such small folding catamarans. In particular, the movement between the closing position and the opening position and the stable locking of said small catamarans in opening position are rather complicated operations.

[0008] In addition, such small folding catamarans are unsafe and unstable when in the opening position.

[0009] The purpose of the present invention is to devise a folding catamaran that allows the user to move the folding catamaran between the opening position and the closing position in a very simple and fast way.

[0010] Another purpose of the present invention is to devise a folding catamaran in which the elements of the folding catamaran are easy to be connected and disconnected.

[0011] A further purpose of the present invention is to devise a safe, efficient and inexpensive folding catamaran.

[0012] These purposes are achieved in accordance with the invention with the features listed in the attached independent claim 1.

[0013] Advantageous achievements appear from the dependent claims.

[0014] The folding catamaran according to the invention is defined by claim 1.

[0015] For the sake of explanatory clarity, the description of the catamaran according to the invention continues with reference to the attached drawings, which are for illustrative and non-limiting purposes only, wherein:

Fig. 1 is a diagrammatic axonometric view of the catamaran according to the invention;
Figs. 2, 3 and 4 are axonometric views of the catamaran of Fig. 1 without mast and without sail arranged in three different positions, respectively;
Figs. 2A, 3A, 4A are top views of the catamaran without mast and without sail arranged in the three different positions shown in Figs. 2, 3 and 4;
Fig. 5 is an enlarged view of a detail of the catamaran of Fig. 2 enclosed in circle J1 of Fig. 2;
Fig. 6 is an enlarged view of a detail of the catamaran of Fig. 4 enclosed in circle K1 of Fig. 4;
Fig. 7 is an enlarged view of a detail of the catamaran of Fig. 2 enclosed in circle J2 of Fig. 2;
Fig. 8 is an enlarged view of a detail of the catamaran of Fig. 4 enclosed in circle K2;
Figs. 9, 10 and 11 are detailed axonometric views of a front connection assembly of the catamaran according to the invention in three different positions;
Figs. 9A, 10A and 11A are detailed top views of the front connection assembly shown in Figs. 9, 10 and 11,
Fig. 12 is an exploded view of the front connection assembly shown in Figs. 9, 10 and 11;
Fig. 13 is an enlarged view of a detail of the catamaran of Fig. 2 enclosed in circle J3;
Fig. 14 is an enlarged view of a detail of the catamaran of Fig. 4 enclosed in circle K3;
Figs. 15, 16 and 17 are top views in three different positions of the hinge means that are hinged to an outer end of the crosspieces of the catamaran.

[0016] With reference to the appended figures, a catamaran according to the invention is described, which is comprehensively indicated with letter "C."

[0017] With reference to Figs. 1, 2, 3, 4, 2A, 3A, and 4A, the catamaran (C) comprises a right hull (SD) and a left hull (SS). Each hull (SD, SS) has a longitudinal axis (YD, YS).

[0018] The catamaran (C) also comprises a sail (V) and a mast (A) supporting the sail (V).

[0019] The catamaran (C) comprises a folding frame (1) connected to the two hulls (SD, SS) and to the mast (A).

[0020] The folding frame (1) comprises a right front crosspiece (11), a left front crosspiece (12), a right rear crosspiece (13), and a left rear crosspiece (14). Each crosspiece (11, 12, 13, 14) comprises an inner end (1a) facing the center of the catamaran (C) and an outer end (1b) facing the outside of the catamaran (1).

[0021] The catamaran (C) comprises hinge means (71, 72, 73, 74) for each crosspiece (11, 12, 13, 14) rotatably connecting the outer end (1b) of a crosspiece (11, 12, 13, 14) to one of the two hulls (SD, SS) around an axis of rotation (X71, X72, X73, X74) orthogonal to a plane on which the longitudinal axes (YD, YS) of the two hulls (SD, SS) lie.

[0022] Specifically, the catamaran (C) comprises:

- right front hinge means (71) rotatably connecting the outer end (1b) of the right front crosspiece (11) to the right hull (SD) around the axis of rotation (X71);

- left front hinge means (72) rotatably connecting the outer end (1b) of the left front crosspiece (12) to the left hull (SS) around the axis of rotation (X72);
- right rear hinge means (73) rotatably connecting the outer end (1b) of the right rear crosspiece (13) to the right hull (SD) around the axis of rotation (X73);
- left rear hinge means (74) rotatably connecting the outer end (1b) of the left rear crosspiece (14) to the left hull (SS) around the axis of rotation (X74).

[0023] Referring to Figs. 13 and 14, each one of said hinge means (71, 72, 73, 74) comprises a fixed pin (7a) that rises from the hull (SD, SS) and a cylinder (7b) rotatably mounted at the top of the fixed pin (7a). The outer end (1b) of the crosspiece (11, 12, 13, 14) is radially fixed on the side wall of the cylinder (7b). In particular, a bushing for the insertion of the outer end (1b) of the crosspiece (11, 12, 13, 14) protrudes radially from the side wall of the cylinder (7b).

[0024] Referring to Figs. 5 and 6, the catamaran (C) also comprises a front connection assembly (G1) comprising a frame (T1) and pivoting means (81, 82), one for each front crosspiece (11, 12). Each one of said pivoting means (81, 82) connects the inner end (1a) of each front crosspiece (11, 12) to the frame (T1) of the front connection assembly (G1) around an axis of rotation (X81, X82). Specifically, said pivoting means (81, 82) comprise a right pivoting means (81) that pivotally connects the inner end (1a) of the right front crosspiece (11) to the frame (T1), and a left pivoting means (82) that pivotally connects the inner end (1a) of the left front crosspiece (12) to the frame (T1).

[0025] Referring to Figs. 7 and 8, the catamaran (C) also comprises a rear connection assembly (G2) comprising a frame (T2) and pivoting means (83, 84), one for each rear crosspiece (13, 14). Each one of said pivoting means connects the inner end (1a) of each rear crosspiece (13, 14) to the frame (T2) of the rear connection assembly (G2) around an axis of rotation (X83, X84). Specifically, said pivoting means (83, 84) comprise a right pivoting means (83) rotatably connecting the inner end (1a) of the right rear crosspiece (13) to the frame (T2) and a left pivoting means (84) rotatably connecting the inner end (1a) of the left front crosspiece (14) to the frame (T2).

[0026] The crosspieces (11, 12, 13, 14) all have the same length. In addition, the crosspieces (11, 12, 13, 14) are all equal to each other in terms of material and shape. Each crosspiece (11, 12, 13, 14) comprises a tubular body, and the first end (1a) of the crosspieces (11, 12, 13, 14) is provided with a plug (15), as shown in Figs. 5 and 7.

[0027] With reference to Figs. 5, 7 and 12, said pivoting means (81, 82, 83, 84) of each connection assembly (G1, G2) comprise two eyes (8a, 8b) disposed one above the other and arranged on the inner end (1a) of the crosspiece (11, 12, 13, 14), an eyelet (8c) obtained on the frame (T1, T2) of the connection assembly and a pin (8d) inserted into said eyes (8a, 8b) and into said eyelet (8c). In particular, said eyes (8a, 8b) are obtained in the plug (15) connected to the inner end of the crosspiece (11, 12, 13, 14).

[0028] The crosspieces (11, 12, 13, 14) connected to the hulls (SD, SS) on one side and to the connection assemblies (G1, G2) on the other side can move between an extended position shown in Figs. 4 and 4A, wherein the two hulls (SD, SS) are spaced apart, and a contracted position shown in Figs. 2 and 2A, wherein the two hulls (SD, SS) are close to each other in a minimum volume arrangement.

[0029] When the crosspieces (11, 12, 13, 14) are in the extended position, said crosspieces (11, 12, 13, 14) are orthogonal to the hulls (SD, SS). Specifically, the two front crosspieces (11, 12) are aligned with each other and the two rear crosspieces (13, 14) are aligned with each other, as shown in Figs. 4, 4A, 6 and 8.

[0030] When the crosspieces (11, 12, 13, 14) are in the contracted position, the two front crosspieces (11, 12) converge forward, defining an angle lower than 180°, preferably lower than 90°, and the two rear crosspieces (13, 14) converge forward, defining an angle lower than 180°, preferably lower than 90°, as shown in Figs. 2, 2A, 5 and 7.

[0031] Referring to Figs. 9, 10, 11, 9A, 10A, 11A, and 12, each of the two connection assemblies (G1, G2) comprise a slider (3) suitable for sliding along an axis (Y) coincident with or parallel to the longitudinal axis of the catamaran (C). The slider (3) has a central body (30) and two lateral appendages (31), one facing the right hull (S1) and the other one facing the left hull (S2). Each connection assembly (G1, G2) also comprises an actuator (4) connected to the slider (3) to move the slider (3) in translation along the axis (Y).

[0032] Each connection assembly (G1, G2) also comprises two linkages (R1, R2), one for each lateral appendage (31), namely a right linkage (R1) and a left linkage (R2).

[0033] Each linkage (R1, R2) connects one of the two lateral appendages (31) of the slider (3) to one of the crosspieces (11, 12, 13, 14) in such a way as to transfer the motion of the slider (3) to the crosspieces (11, 12, 13, 14).

[0034] With reference to Figs. 9, 10, 11, 9A, 10A, 11A and 12, each linkage (R1, R2) comprises a toggle crank mechanism comprising:

- a crank (5) integral with the crosspiece (11, 12, 13, 14),
- a connecting rod (6) hinged to one of the lateral appendages (31) on one side and to the crank (5) on the other side,
- first rotatable connection means (61) rotatably connecting the connecting rod (6) to the lateral appendage (31) and having an axis (X61) orthogonal to the plane on which the longitudinal axes (YD, YS) of the hulls (SD, SS) lie;

- second rotatable connection means (62) rotatably connecting the connecting rod (6) to the crank (5) and having an axis (X62) orthogonal to the plane on which the longitudinal axes (YD; YS) of the hulls (SD, SS) lie.

[0035] With reference to Fig. 12, the crank (5) consists of a plate (50) having a first portion that protrudes laterally from the crosspiece 11, 12, 13, 14) and is hinged to the crank (6) via the second rotatable connection means (62), and a second portion that is arranged between said two eyes (8a, 8b) of the pivoting means (81, 82, 83, 84) and is provided with a hole pierced by the pin (8d) and a lateral face abutting against a wall arranged between said two eyes (8a, 8b).

[0036] Again, with reference to Fig. 12, the connecting rod (6) comprises two plates (60) disposed one above the other, each one comprising a first end (60a) and a second end (60b).

[0037] The lateral appendage (31) of the slider (3) is disposed between the two first ends (60a) of the two plates (60) of the connecting rod (6). The first portion (51) of the crank (5) is disposed between the two second ends (60b) of the two plates (60) of the connecting rod (6). Said first rotatable connection means (61) comprise a pin inserted into holes drilled on the first ends (60a) of the two plates (60) of the connecting rod (6) and on the lateral appendage (31). Said second rotatable connection means (62) comprise a pin inserted into holes drilled on both the second ends (60b) of the plates (60) and on the first portion of the plate (50) of the crank (5). Preferably, when the crosspieces (11, 12, 13, 14) are in extended position, the connecting rod (6) of the right linkage (R1) is aligned with the connecting rod (6) of the left linkage (R2) of the connection assembly (G1, G2) and they are both perpendicular to the longitudinal axis (YD, YS) of the hulls (SD, SS).

[0038] Referring to Figs. 5, 6, 7, 8, 9, 10, 11, 9A, 10A, and 11A, it should be noted that the movement of the slider (3) transmits the motion to the linkages (R1, R2) and thus to the crosspieces (11, 12, 13, 14).

[0039] In particular, Figs. 5, 7, 9 and 9A show the slider (3) in forward position, which, by means of the linkages (R1, R2), arranges the left and right crosspieces in converging position, so as to bring the hulls (SD, SS) close to each other.

[0040] Figs. 6, 8, 11, and 11A show the slider (3) in backward position, which, by means of the linkages (R1, R2), arranges the right and left crosspieces in aligned position, so as to arrange the hulls (SD, SS) at a maximum distance.

[0041] Fig. 10 and 10A show the slider (3) in an intermediate position between the forward position and the backward position.

[0042] In the preferred embodiment of the invention, said actuator (4) of each connection assembly (G1, G2) comprises a worm screw (40) coupled with a threaded hole (30a) of the central body (30) of the slider (3). An actuation head (41) with a polygonal cross-section is integrally connected on the end of each worm screw (40), said actuation head (41) being coaxial to the worm screw (40) and being configured in such a way as to be actuated by means of an appropriate tool.

[0043] Transmission means (L) are coupled to the actuator (4) of the front connection assembly (G1) with the actuator of the rear connection assembly (G2). Specifically, said transmission means (L) consist of a bar having ends (L1, L2) where the worm screws (40) of the actuators (4) of the two connection assemblies (G1; G2) are fixed, in such a way that the two worm screws (40) rotate simultaneously and the sliders (3) slide simultaneously along the axis (Y) with the same speed.

[0044] Referring now to Figs. 4, 13 and 14, for each hull (SD, SS), the catamaran (C) also comprises a side-member (H) extending for the full distance between the front hinge means (71; 72) and the rear hinge means (73; 74). Each side-member (H) has a front end (H1) hinged to the cylinder (7b) of the front hinge means (71; 72) and a rear end (H2) hinged to the cylinder (7b) of the rear hinge means (73; 74).

[0045] Revolving connection means (9) are interposed between each end (H1; H2) of the side-member (H) and the respective cylinder (7b). Said revolving connection means (9) have an axis parallel to the axis of rotation of the hinge means (71, 72, 73, 74) and is arranged substantially tangent with respect to the side-member (H) with circular cross-section.

[0046] Said revolving connection means (9) comprise:

- a sleeve (91) protruding externally from the side-member (H);
- two perforated side elements (92) projecting radially from the cylinder (7b) of the hinge means (71, 72, 73, 74) and between which the sleeve (91) is arranged;
- a pin inserted into the perforated side elements (92) and into the sleeve (91).

[0047] Preferably, said sleeve (91) is composed of two coaxial cylindrical end sections of a clamp (910) embracing the side-member (H) with circular cross-section.

[0048] Referring to Figs. 13, 14, 15, 16, and 17, the catamaran (C) also comprises stop and end-of-travel means arranged between the hulls (SS, SD) and the crosspieces (11, 12, 13, 14) and configured so as to prevent the rotation of the crosspieces (11, 12, 13, 14) beyond the extended position.

[0049] Said stop and end-of-travel means comprise a counter plug (B) protruding externally and radially from the cylinder (7b) and an outer surface of said side-member (H) against which said counter plug (B) is engaged when the crosspieces (11, 12, 13, 14) are in extended position.

[0050] Figs. 15, 16 and 17 show the reciprocal position between the counter plug (B) and the side-member (H) when the catamaran (C) is in closing position with the

hulls close to each other (Fig. 15), when the catamaran (C) is in opening position with the hulls far apart (Fig. 17), and when the catamaran (C) is in an intermediate position (Fig. 16) between the opening position and the closing position.

[0051] Following the foregoing description, the advantages of the present invention are apparent.

[0052] With particular reference to the connection assemblies (G1, G2), attention should be drawn to the fact that, when the catamaran (C) is sailing, each connecting rod (6) is parallel to the relevant crosspiece (11, 12, 13, 14) and orthogonal to the axis (Y) on which the slider (3) runs, thus minimizing the stresses that would tend to move the slider from the crosspiece (11, 12, 13, 14) toward its forward position, closing the catamaran (C).

[0053] Because of such a structural arrangement, the pair of front crosspieces (11, 12) are stabilized and aligned with each other, as are the pair of rear crosspieces (13, 14), defining a frame apparently consisting of an articulated parallelogram structure having four hinge axes that coincide with the axes of rotation (X71, X72, X73, X74) of the hinge means (71, 72, 73, 74).

[0054] In view of the above, during navigation, the forces tend to rotate the aligned crosspieces, namely both front and rear crosspieces, forward relative to the hull that is not lifted from the water, it being obvious that the more a hull is lifted from the water the greater said forces will be. Thanks to the structural arrangement of the stop and end-of-travel means, said articulated parallelogram constantly maintains its attitude, in which the aligned pairs of crosspieces are orthogonal to the hulls (SD, SS).

[0055] In such an advantageous structural arrangement, it is possible to provide that during the very last traveling section of the slider (3), the counter plugs (B) are brought and pressed against the side-member(H); in this way, the folding frame has no clearance, is pre-tensioned and very stable.

[0056] Finally, it should be noted that the catamaran (C) is quite simple to both close and open. In fact, to open or close the catamaran (C), it will be simply necessary to rotate the worm screws so as to slide the sliders (3).

[0057] Lastly, it should be also pointed out that, although a catamaran (C) comprising two hulls (SD, SS) has always been described in the present description, the present invention can be advantageously used also on multihull catamarans.

[0058] Numerous detailed variations and modifications may be made to the present embodiment of the invention, within the reach of a person skilled in the art, and still within the scope of the invention as expressed by the appended claims.

Claims

1. Folding catamaran (C) comprising:

- a sail (V);
- a mast (A) supporting the sail (V);
- a right hull (SD) and a left hull (SS); each hull (SD, SS) having a longitudinal axis (YD, YS);
- a folding frame (1) connected to the two hulls (SD, SS) and to the mast (A); wherein said folding frame comprises a right front crosspiece (11), a left front crosspiece (12), a right rear crosspiece (13) and a left rear crosspiece (14); each crosspiece (11, 12, 13, 14) comprising an inner end (1a) and an outer end (1b);
- hinge means (71, 72, 73, 74) for each crosspiece (11, 12, 13, 14) rotatably connecting the outer end (1b) of a crosspiece (11, 12, 13, 14) to one of the two hulls (SD, SS) around an axis of rotation (X71, X72, X73, X74) orthogonal to a plane on which the longitudinal axes (YD, YS) of the two hulls (SD, SS) lie;
- a front connection assembly (G1) comprising a frame (T1) and pivoting means (81, 82), one for each front crosspiece (11, 12); each one of said pivoting means (81, 82) rotatably connecting the inner end (1a) of each one of the front crosspieces (11, 12) to the frame (T1) of the front connection assembly (G1) around an axis of rotation (X81, X82) orthogonal to a plane on which the longitudinal axes (YD, YS) of the two hulls (SD, SS) lie so that the front crosspieces can go from a contracted position to an extended position;
- a rear connection assembly (G2) comprising a frame (T2) and pivoting means (83, 84), one for each rear crosspiece (13, 14); each one of said pivoting means (83, 84) rotatably connecting the inner end (1a) of each one of the rear crosspieces (13, 14) to the frame (T2) of the rear connection assembly (G2) around an axis of rotation (X83, X84) orthogonal to a plane on which the longitudinal axes (YD, YS) of the two hulls (SD, SS) lie so that the rear crosspieces can go from a contracted position to an extended position;

wherein at least one of said connection assemblies (G1, G2) comprises:

- a slider (3) comprising a central body (30) and two lateral appendages (31), one facing the right hull (S1) and the other one facing the left hull (S2); said slider (3) sliding along an axis (Y) coincident with or parallel to a longitudinal axis of the catamaran;
- an actuator (4) connected to said slider (3) to move said slider (3) in translation along said axis (Y);
- a right linkage (R1, R2) and a left linkage (R2), one for each lateral appendage (31); each linkage (R1, R2) connecting each lateral appendage (31) to one of said crosspieces (11, 12, 13, 14) in such a way as to transfer the motion of

the slider (3) to the crosspieces (11, 12, 13, 14).

2. The catamaran (C) according to any one of the preceding claims, wherein each linkage (R1, R2) comprises a toggle crank mechanism comprising:

- a crank (5) integral to the crosspiece (11, 12, 13, 14); and
- a connecting rod (6) hinged to one of the lateral appendages (31) on one side and to the crank (5) on the other side;
- first rotatable connection means (61) rotatably connecting the connecting rod (6) to the lateral appendage (31) and having an axis (X61) orthogonal to the plane on which the longitudinal axes (YD, YS) of the hulls (SD, SS) lie;
- second rotatable connection means (62) rotatably connecting the connecting rod (6) to the crank and having an axis (X62) orthogonal to the plane on which the longitudinal axes (YD; YS) of the hulls (SD, SS) lie.

3. The catamaran (C) according to claim 2, wherein, when said crosspieces (11, 12, 13, 14) are in extended position, the connecting rod (6) of the right linkage (R1) is aligned with the connecting rod (6) of the left linkage (R2) of the connection assembly (G1, G2).

4. The catamaran (C) according to any one of the preceding claims, wherein, when said crosspieces (11, 12, 13, 14) are in extended position, said crosspieces (11, 12, 13, 14) are orthogonal to the hulls (SD, SS).

5. The catamaran (C) according to any one of the preceding claims, wherein said actuator (4) comprises a worm screw (40) coupled with a threaded hole (30a) of the central body (30) of the slider (3).

6. The catamaran (C) according to claim 5, comprising an actuation head (41) which is integral and coaxial with the worm screw (40) and is configured so as to be actuated by means of a tool in order to drive the worm screw (40) into rotation.

7. The catamaran (C) according to any one of claims 1 to 6, comprising transmission means (L) coupling the actuator of the front connection assembly (G1) with the actuator of the rear connection assembly (G2).

8. The catamaran (C) according to claim 7, when dependent on claim 5 or 6, wherein said transmission means (L) consist of a bar having ends (L1, L2) where the worm screws (40) of the actuators (4) of the two connection assemblies (G1; G2) are fixed.

9. The catamaran (C) according to any one of the preceding claims, comprising stop and end-of-travel means for each crosspiece (11, 12, 13, 14) arranged between the hulls (SD, SS) and the crosspieces (11, 12, 13, 14) and configured so as to prevent the rotation of the crosspieces (11, 12, 13, 14) beyond the extended position.

10. The catamaran (C) according to any one of the preceding claims, wherein each one of said hinge means (71, 72, 73, 74) comprises a fixed pivot (7a) that stands out from the hull (SD, SS) and a cylinder (7b) rotatably mounted on the top of the fixed pivot (7a); said cylinder (7b) comprising a side wall to which the outer end (1b) of the crosspiece (11, 12, 13, 14) is radially fixed.

11. The catamaran (C) according to claim 10, comprising a side-member (H) for each hull (SD, SS) disposed above the hull (SD, SS); wherein said side-member (H) comprises a front end (H1) and a rear end (H2); wherein said catamaran comprises revolving connection means (9) connecting each end (H1, H2) of a side-member (H) to one of said cylinders (7b); said revolving connection means (9) having an axis parallel to the axis of rotation of the hinge means (71, 72, 73, 74).

12. The catamaran (C) according to claim 11, wherein said revolving connection means (9) comprise:

- a sleeve (91) protruding externally from the side-member (H);
- two perforated side elements (92) projecting radially from the cylinder (7b) of the hinge means (71, 72, 73, 74) and between which the sleeve (91) is arranged;
- a pin inserted into the perforated side elements (92) and into the sleeve (91).

13. The catamaran (C) according to claim 12 or 11 when dependent on claim 9, wherein said stop and end-of-travel means comprise:

- a counter plug (B) protruding externally from the cylinder (7b);
- an outer surface of said side-member (H) against which said counter plug (B) is engaged when the crosspieces are in extended position.

14. The catamaran (C) according to any one of claims 5 to 13, wherein said pivoting means (81, 82, 83, 84) of each connection assembly (G1, G2) comprise:

- two eyes (8a, 8b) disposed one above the other and connected to the inner end (1a) of the crosspiece;
- an eyelet (8c) obtained on the frame (T1) of the connection assembly;
- a pin (8d) inserted into said eyes (8a, 8b) and

into said eyelet (8c);

wherein said crank (5) consists of a plate (50) having a first portion on which the connecting rod (6) is hinged, and a second portion disposed between the two eyes (8a, 8b); said second portion comprises a hole crossed by the pin (8d) and a side face abutting against a counter wall (10a) disposed between the two eyes (8a, 8ab);
wherein said connecting rod (6) comprises two plates (60) overlapped to each other and each one comprising a first end (60a) and a second end (60b); wherein said lateral appendage (31) is interposed between the first ends (60a) of the two plates (60) of the connecting rod (6); wherein said first portion of the plate (50) of the crank (5) is interposed between the second ends (60a) of the two plates (60) of the connecting rod (6); wherein said first rotatable connection means (61) comprise a pin inserted into holes drilled in the first ends (60a) of the plates (60) of the connecting rod (6) and in the lateral appendage (31); wherein said second rotatable connection means (62) comprises a pin inserted into holes drilled in the second ends (60b) of the plates (60) of the connecting rod (6) and in the first portion of the plate (50) of the crank (5).

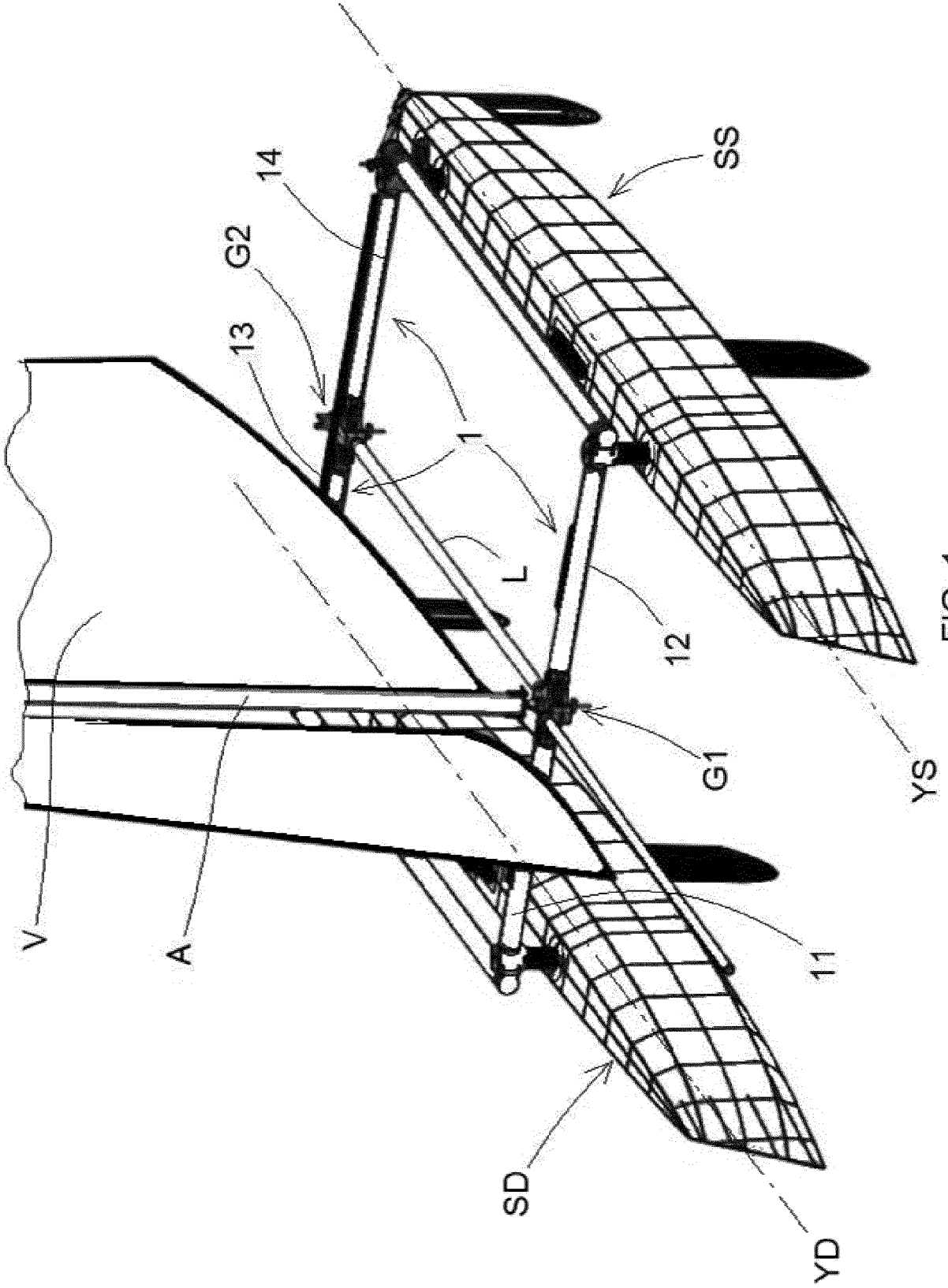

FIG. 1

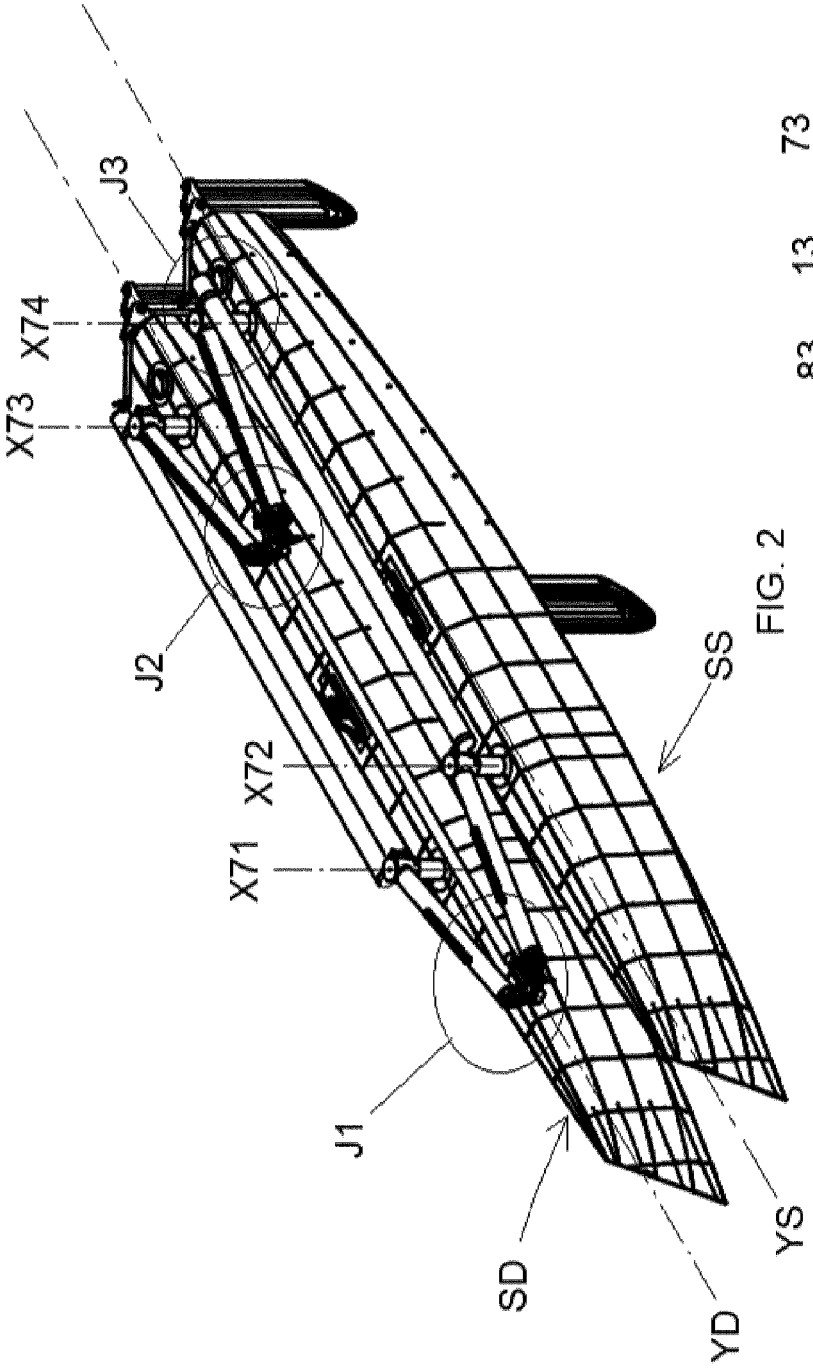
J3
X74
X73
J2
X72
X71
J1
SS
SD
YS
YD

FIG. 2

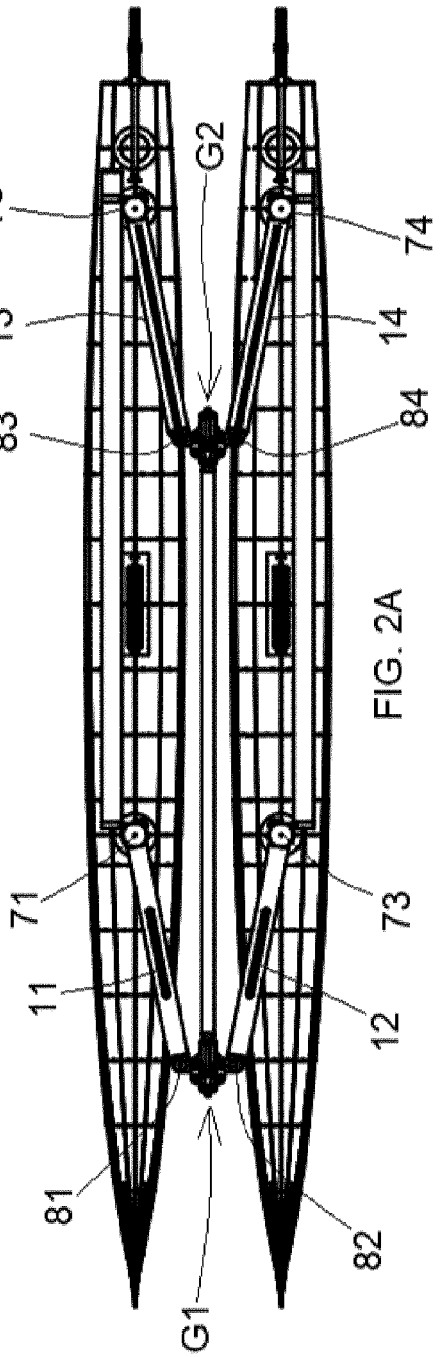
G2
73
74
13
14
83
84
71
73
11
12
81
82
G1

FIG. 2A

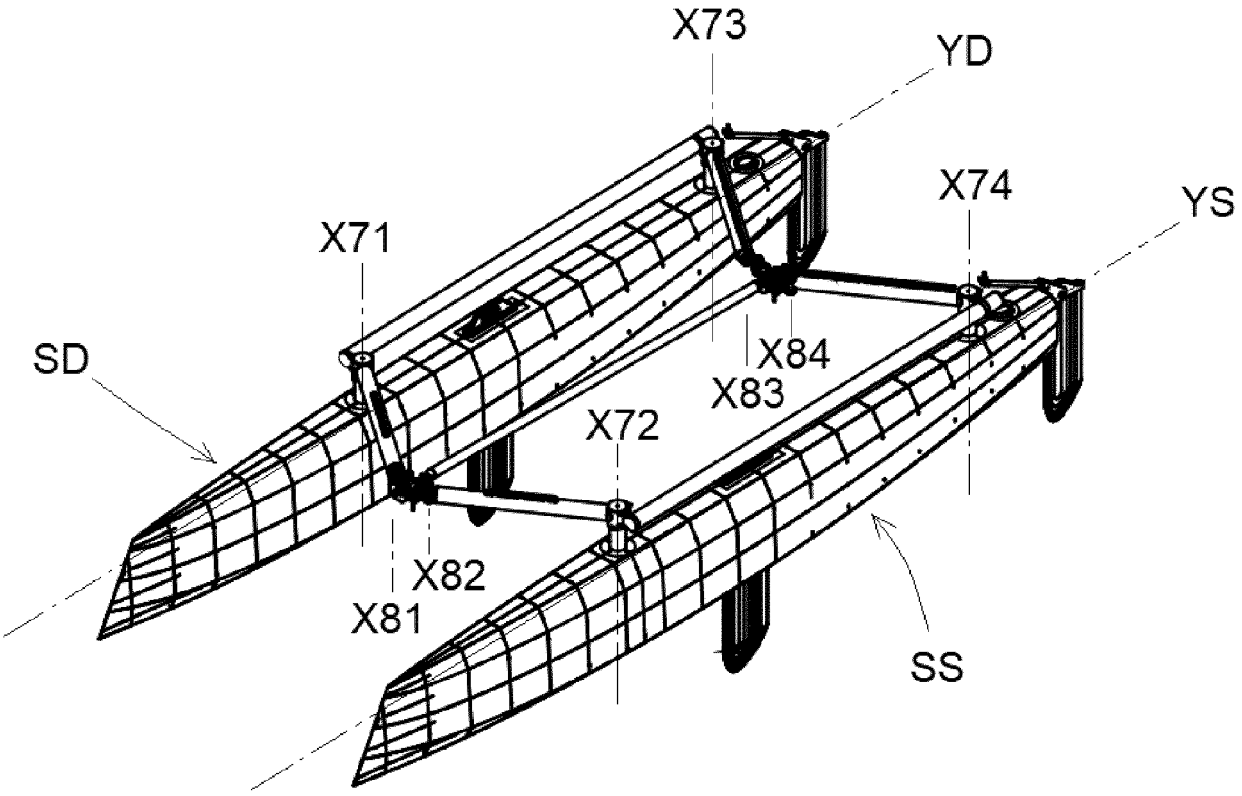
X73
YD
X74
YS
X71
SD
X84
X83
X72
X82
X81
SS

FIG. 3

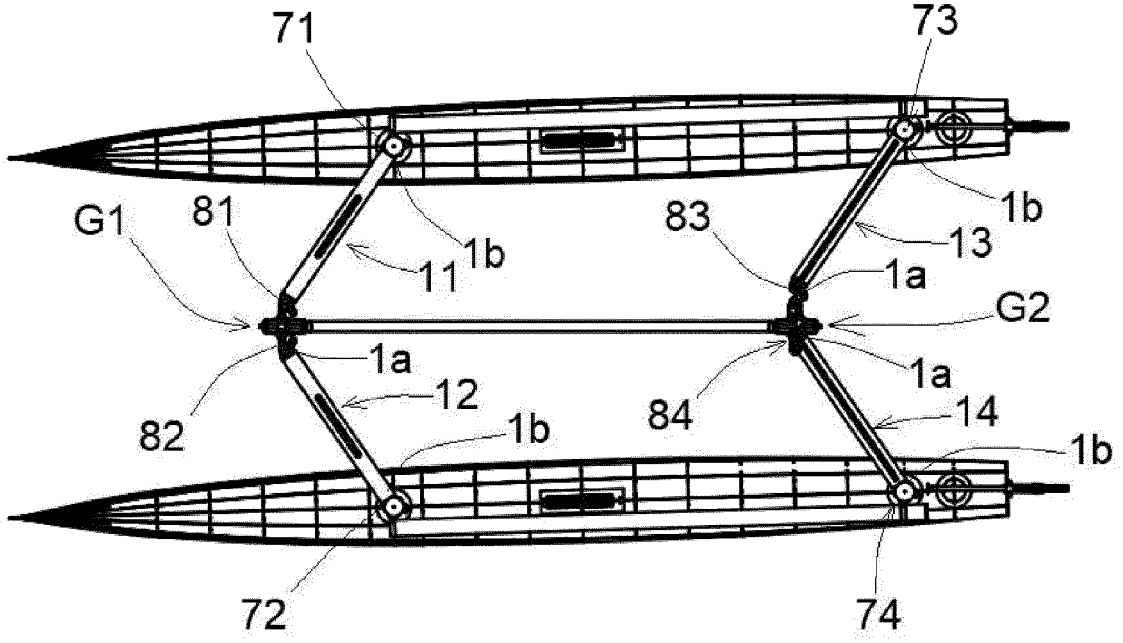
71
73
G1
81
1b
83
13
11
1b
1a
G2
1a
1a
12
84
14
82
1b
1b
72
74

FIG. 3A

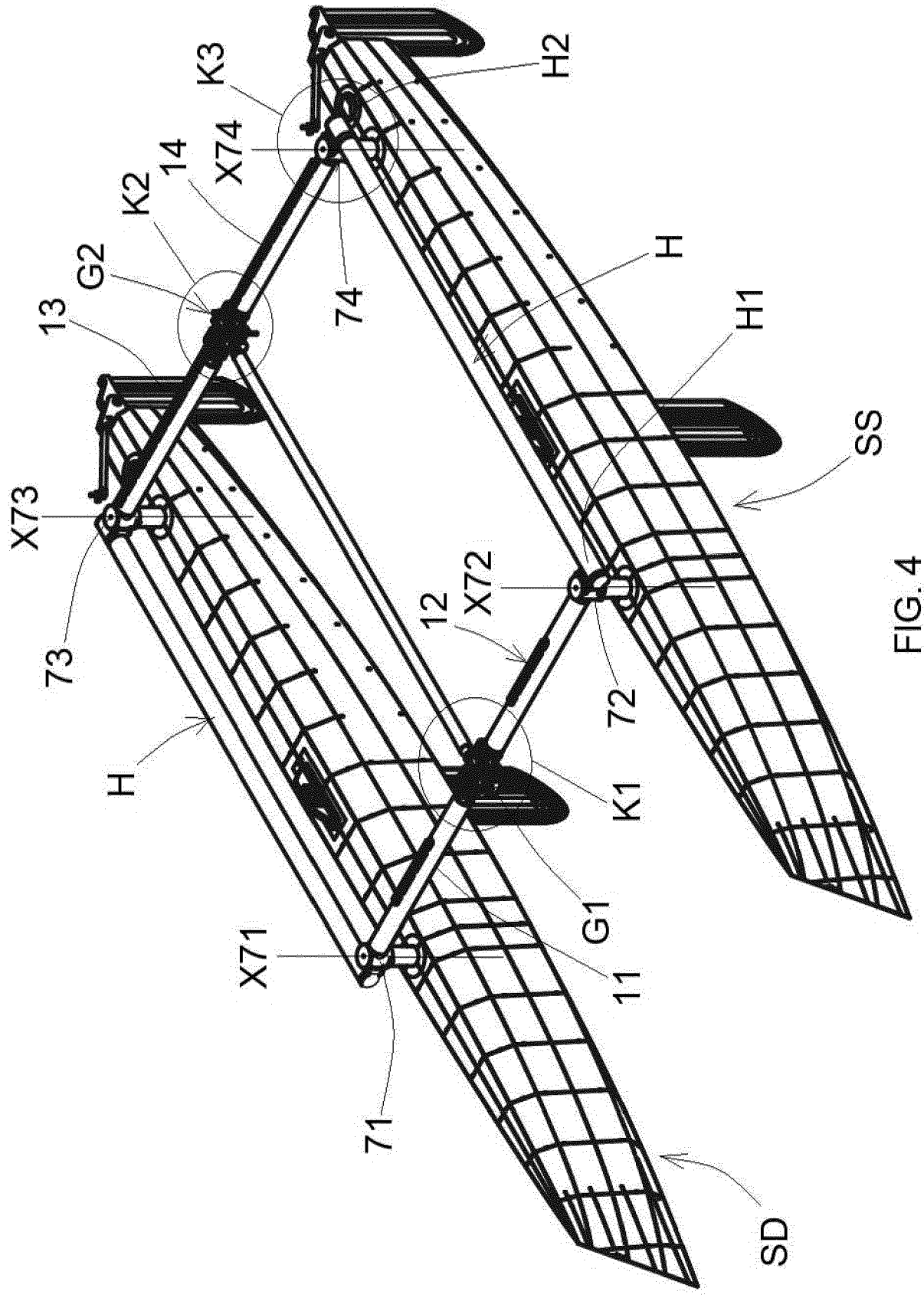

FIG. 4

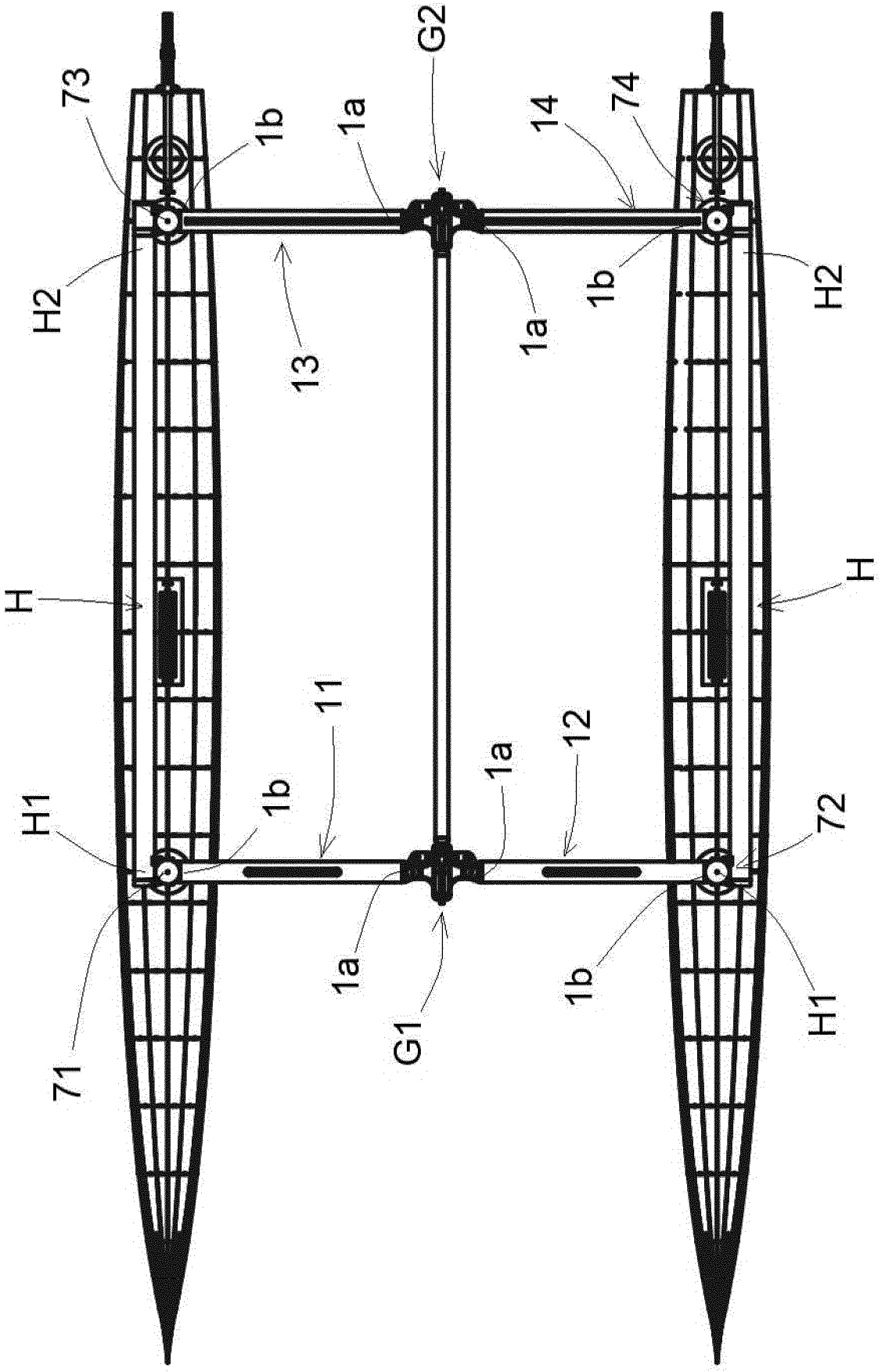

FIG. 4A

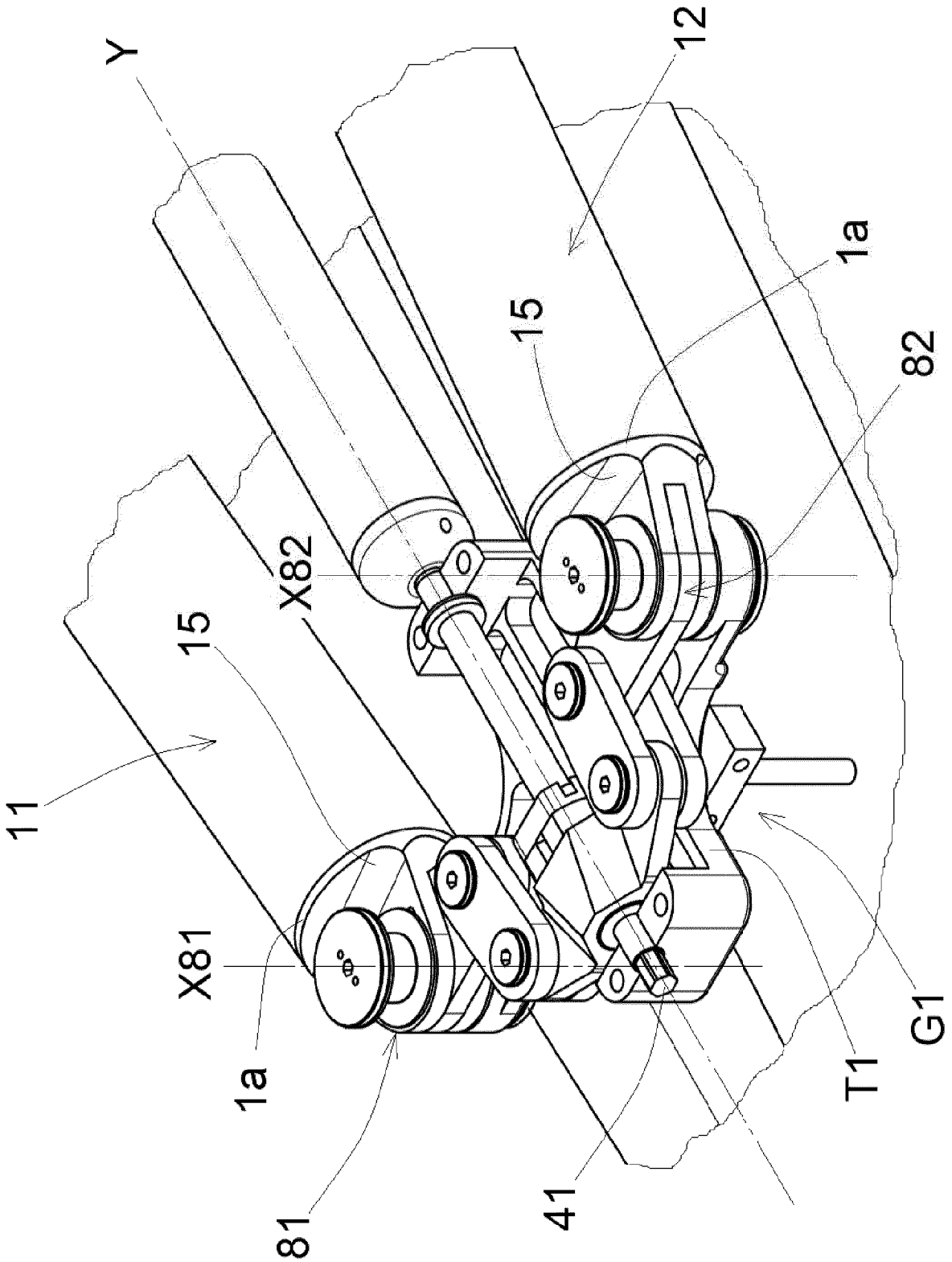

FIG. 5

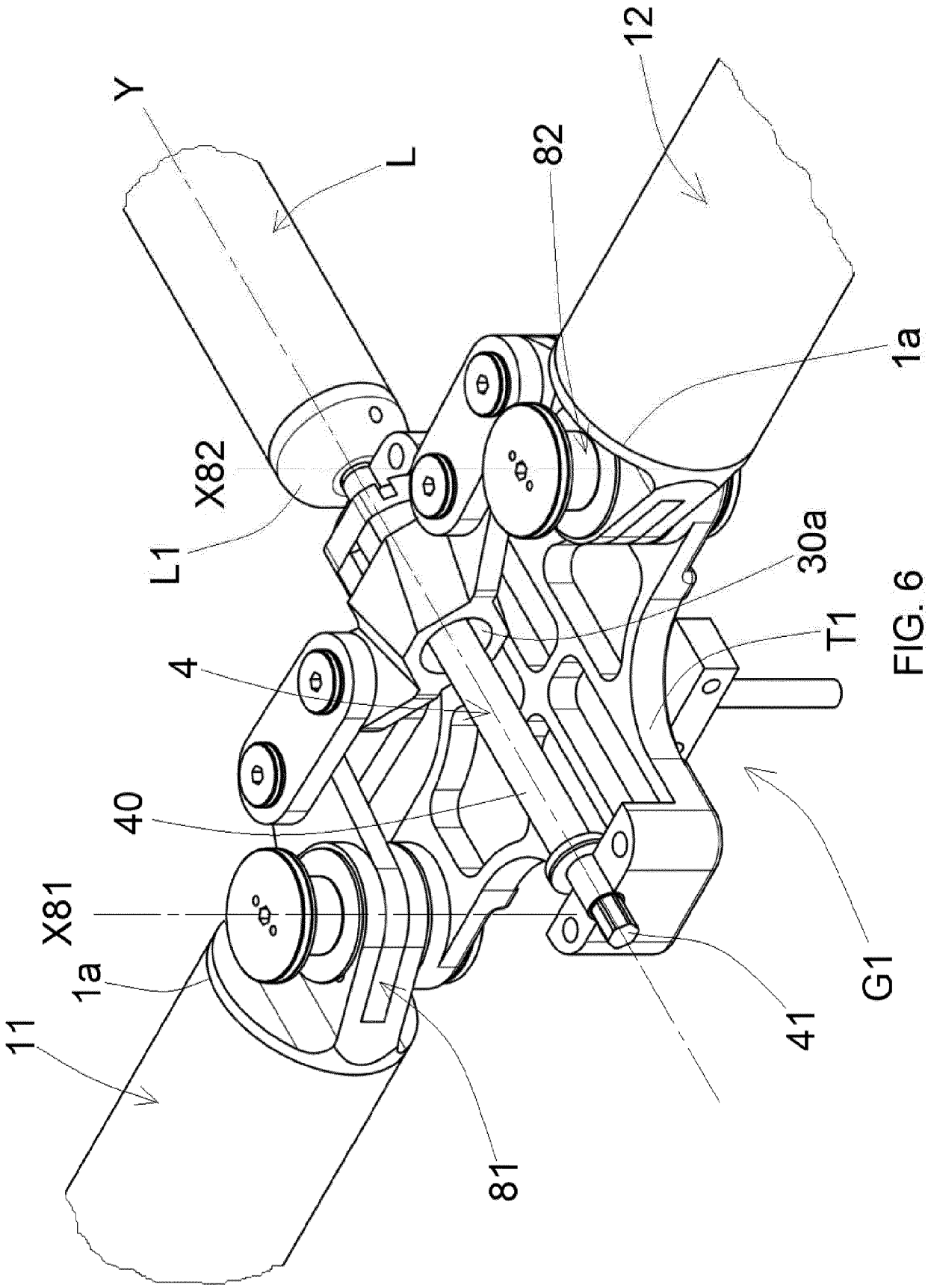

FIG. 6

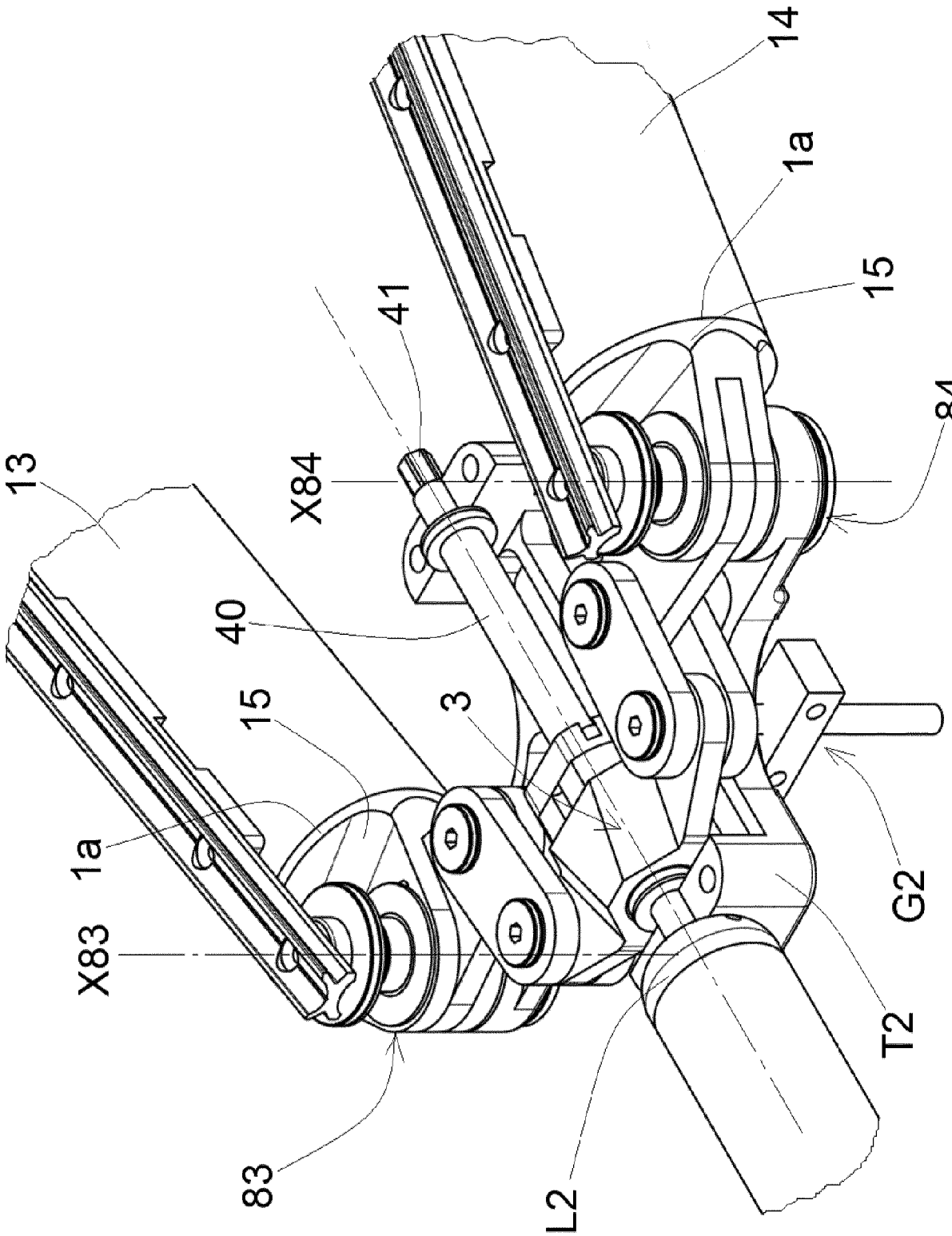

FIG. 7

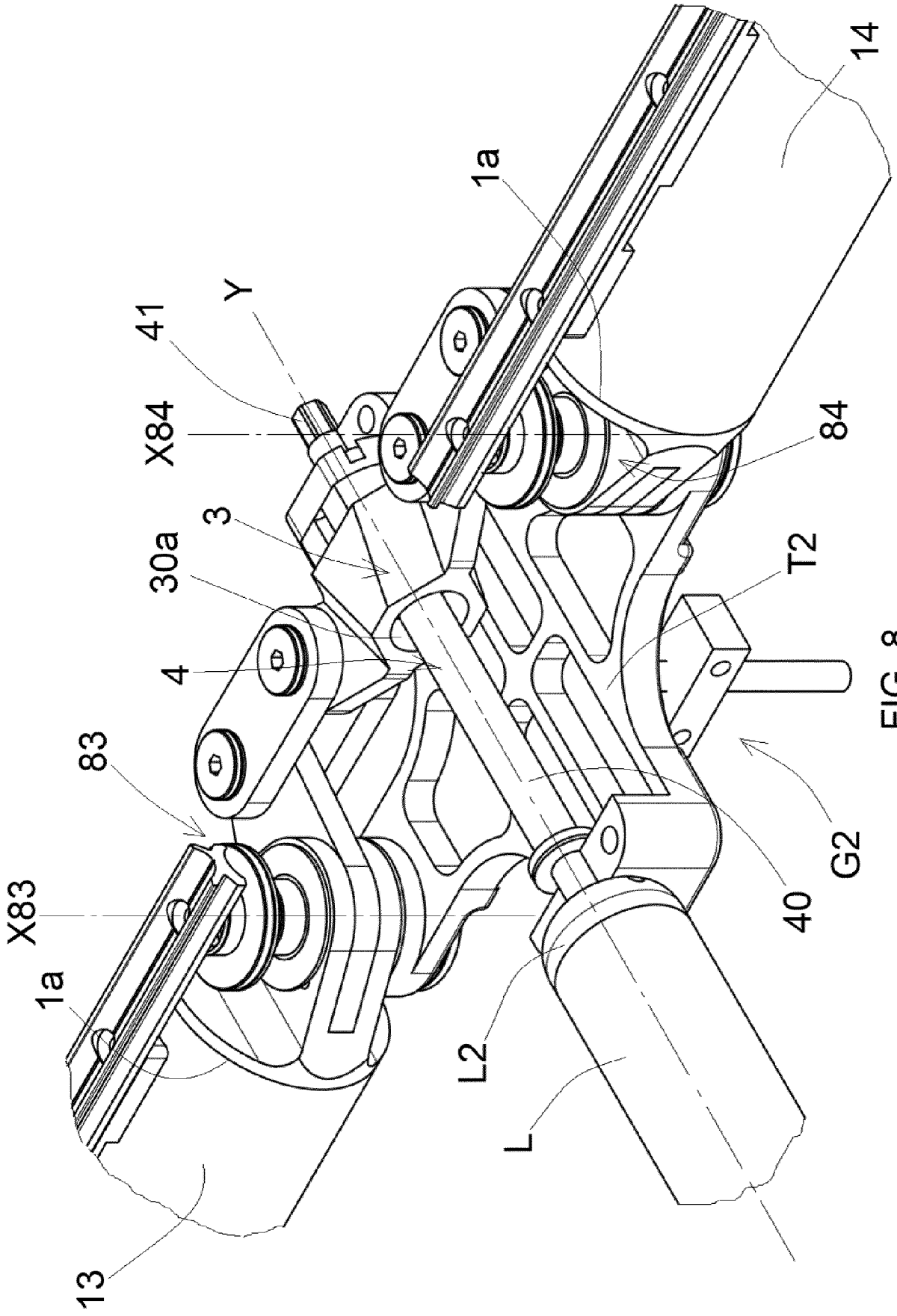

FIG. 8

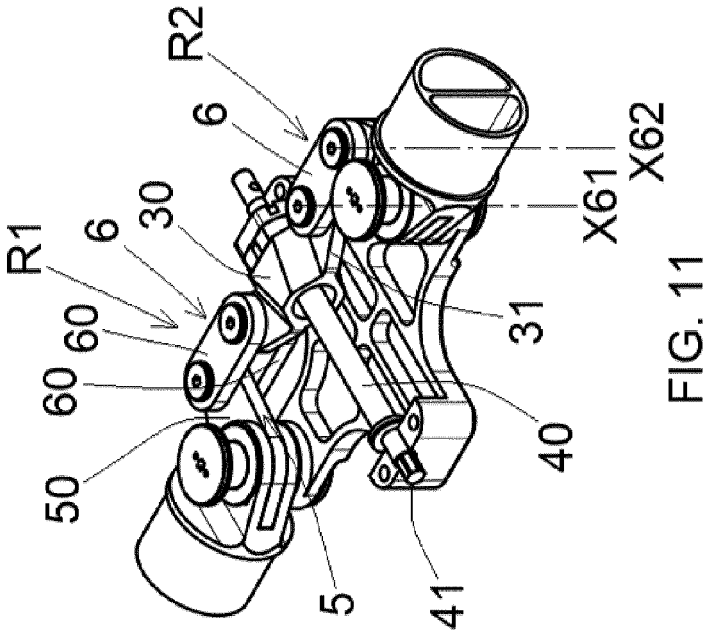

FIG. 11

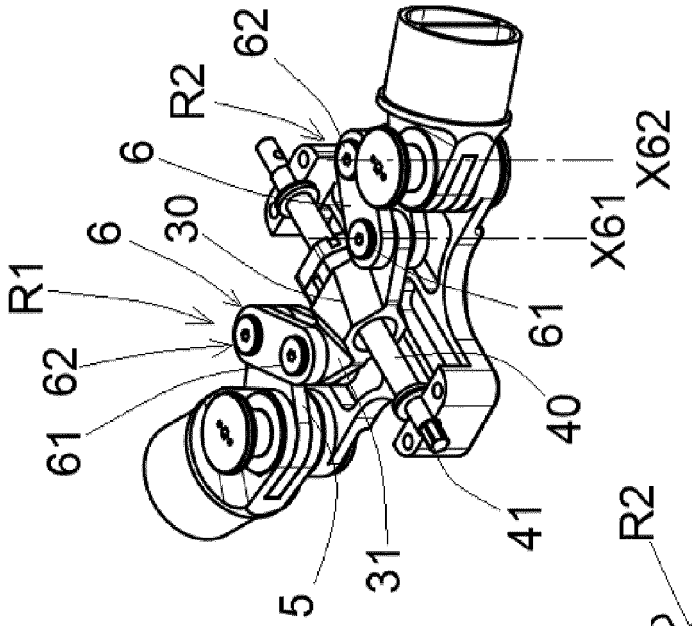

FIG. 10

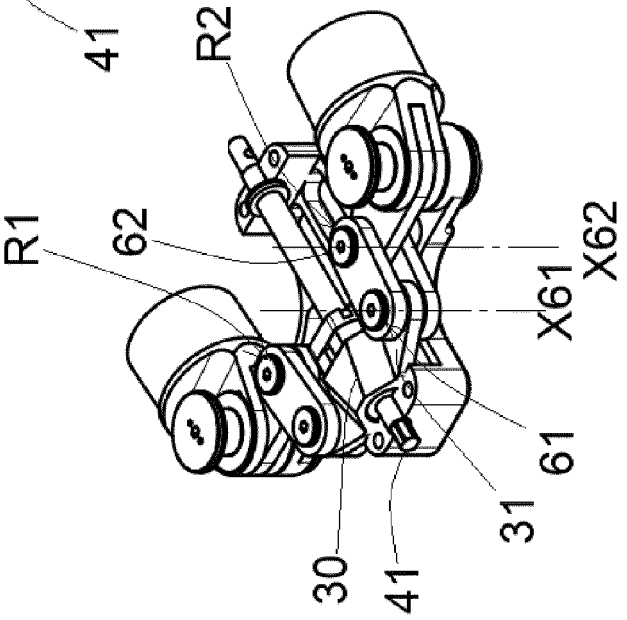

FIG. 9

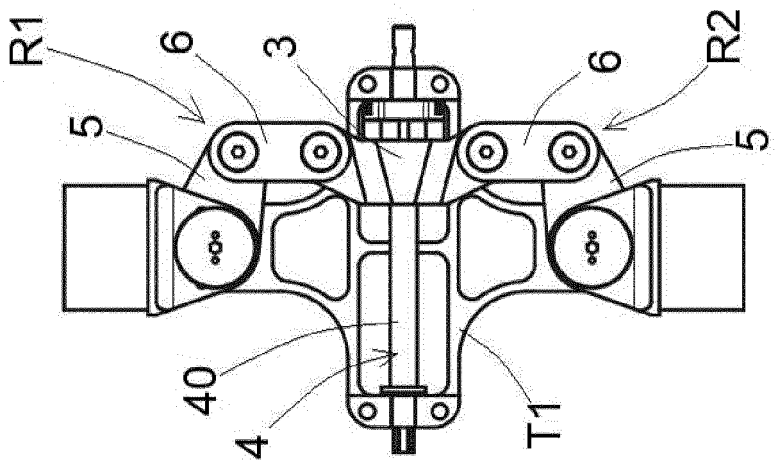

FIG. 11A

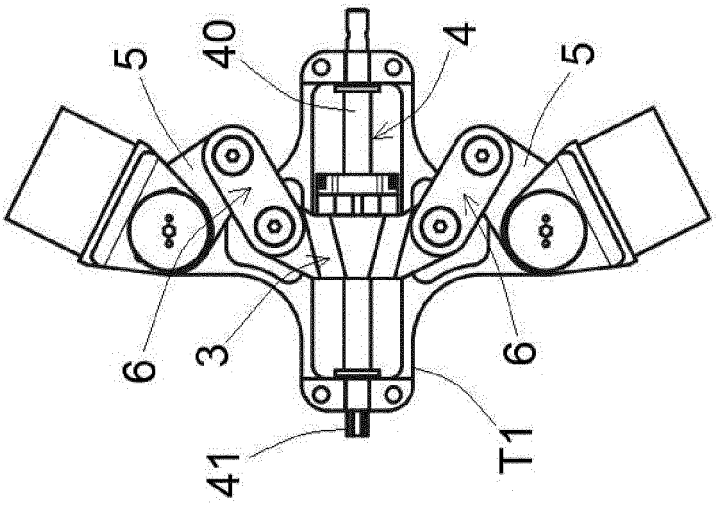

FIG. 10A

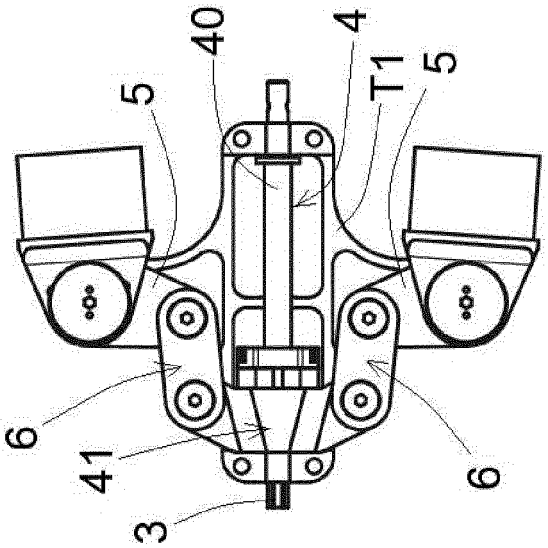

FIG. 9A

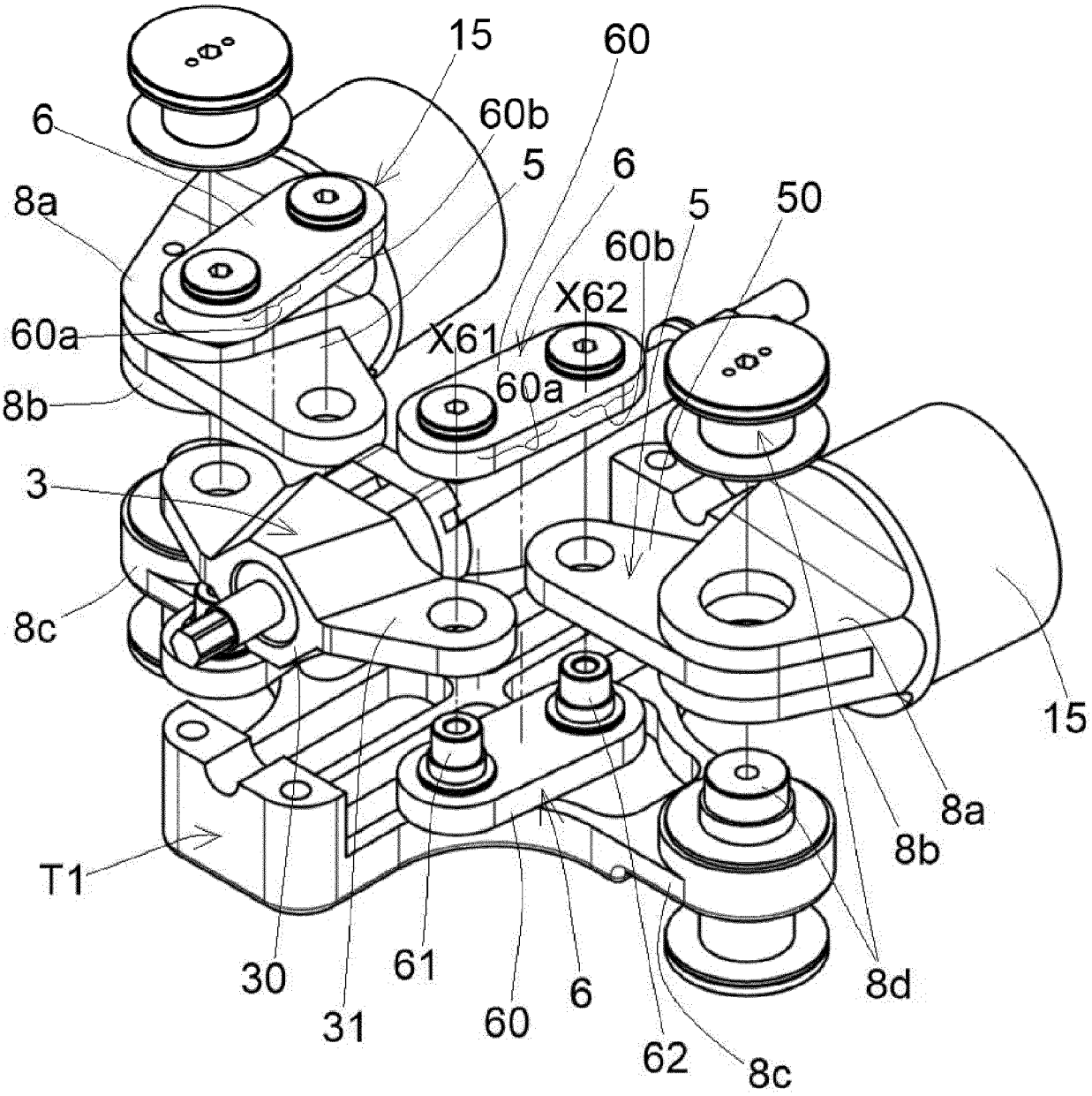
15
60
6
60b
5
6
8a
5
50
60b
X62
X61
60a
60a
8b
3
8c
15
8a
8b
T1
30
61
6
8d
31
60
62
8c

FIG. 12

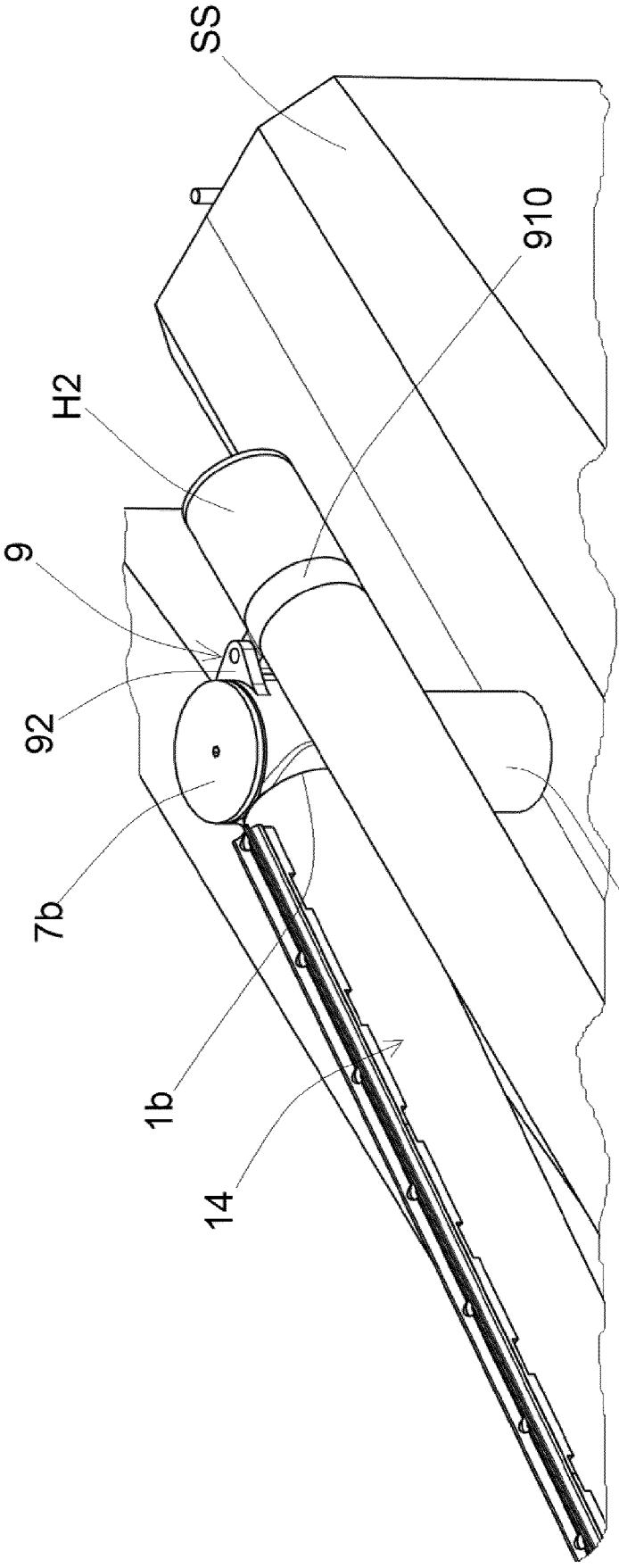

FIG. 13

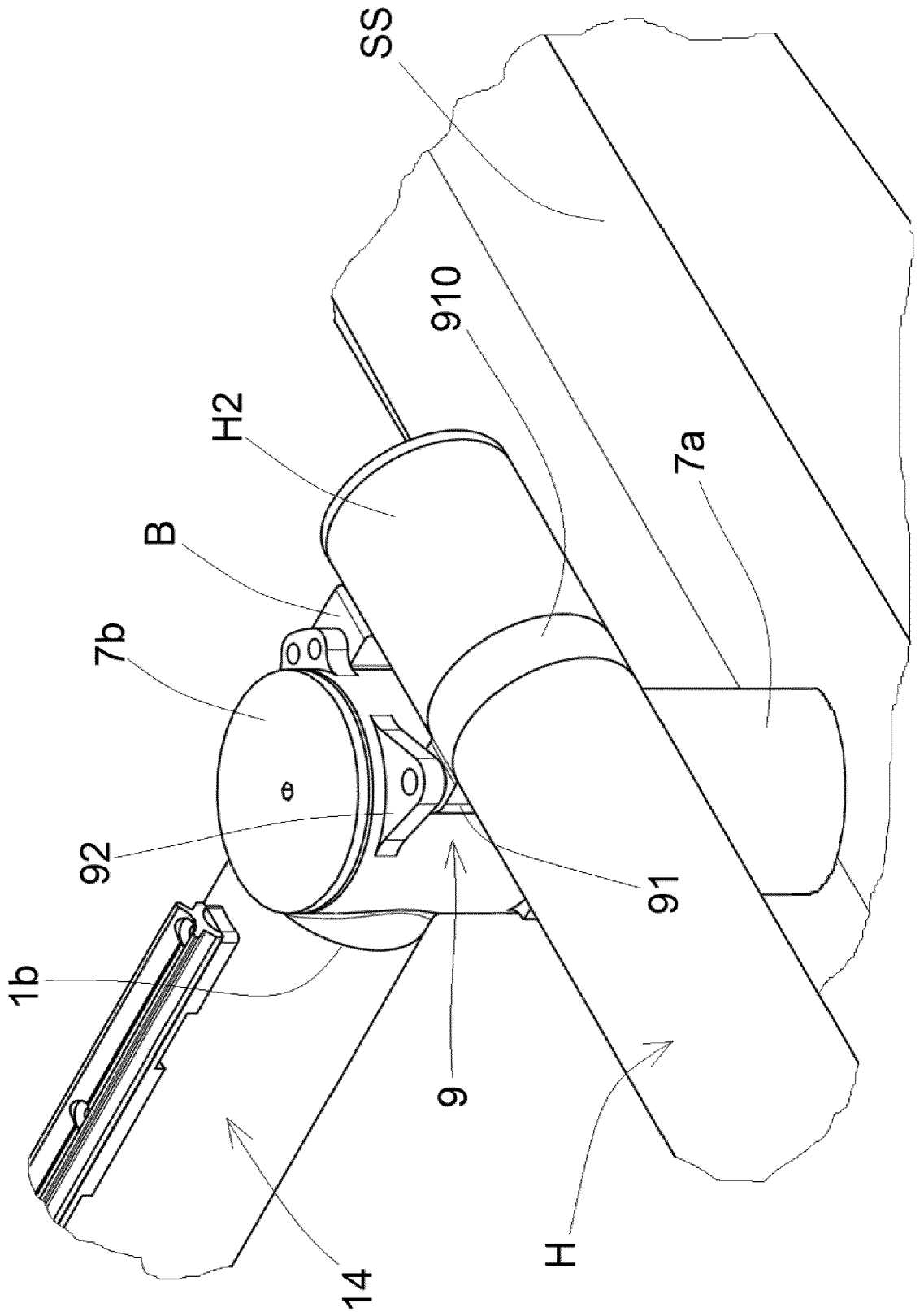

FIG. 14

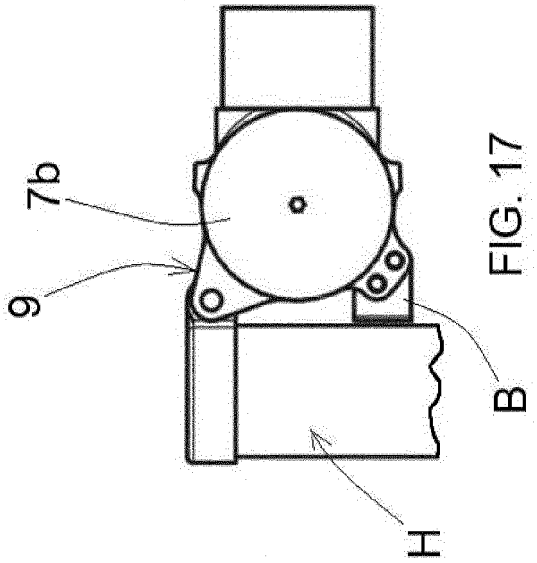

FIG. 17

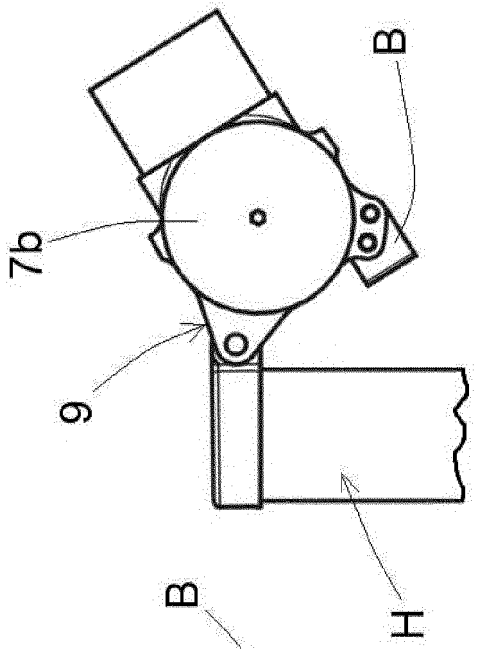

FIG. 16

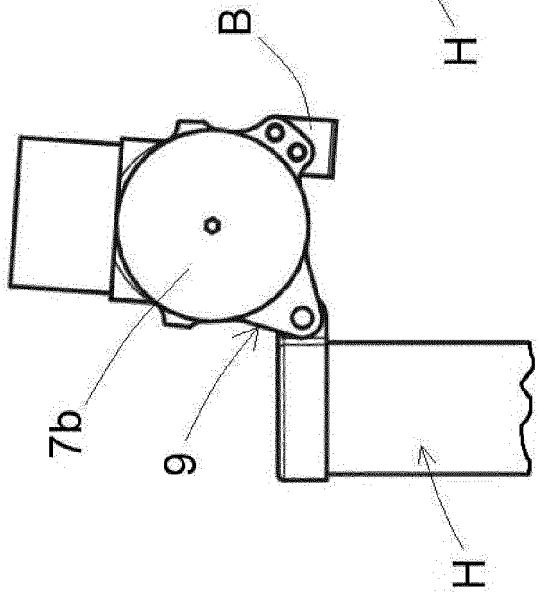

FIG. 15

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EUROPEAN SEARCH REPORT

Application Number
EP 24 16 6274

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2017/168169 A1 (WHITAKER DEREK [GB]) 5 October 2017 (2017-10-05) * page 11, line 27 - page 13, line 4; figures 8,9 *	1-14	INV. B63B1/12 B63B7/02
A	WO 2021/261958 A1 (MOTIONFIVE INC [KR]) 30 December 2021 (2021-12-30) * figures 4,5 *	1-14	
A	DE 10 2021 117048 A1 (BREUER HARALD [DE]) 5 January 2023 (2023-01-05) * figure 1 *	1-14	
A	DE 10 2021 103600 A1 (BREUER HARALD [DE]) 18 August 2022 (2022-08-18) * figures 7,8 *	1-14	
			TECHNICAL FIELDS SEARCHED (IPC)
			B63B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26 August 2024	Schmitter, Thierry

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26-08-2024

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