**Hydraulic steering system for marine motors**  
**Hydraulisches Steuersystem für Bootsmotoren**  
**Système de gouverne pour moteurs de bateaux**

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Description

[0001] The present invention refers to a hydraulic steering system for marine motors. As is known, small craft, such as motor boats, rubber dinghies and small pleasure craft, generally use one or more outboard or inboard marine motors with power that can range from (29 to 221 Kw) 40 to 300 horsepower depending upon the type of boat.

[0002] This type of marine motor is generally mounted in the transom of the boat so as to be able to rotate around a horizontal axis to adjust the tilt of the stem of the motor and around a vertical axis to adjust steering of the boat. For this purpose a steering system is provided comprising a hydraulic cylinder mounted slidably on a shaft disposed in the transom transversely with respect to the longitudinal direction of the craft. A lever connected integrally to the front part of the motor casing is constrained to said hydraulic cylinder. Translation of the hydraulic cylinder thus causes a rotation of the motor.

[0003] Two oil supply hoses connected to an oil tank in which an oil pump is provided are mounted at the two ends of the moveable cylinder. The oil pump is controlled by the steering of the boat. In this manner, according to the steering given, the oil is fed into one end or the other of the cylinder. As a result the cylinder translates in one direction or the other on the transverse shaft, causing the front lever of the motor and thus also the motor to rotate around its vertical axis of pivoting.

[0004] Document US 5 997 370, which is considered to represent the closest prior art, describes such a hydraulic system.

[0005] Said steering system according to the prior art presents some drawbacks. In fact the movement of the cylinder on the transverse shaft also causes movement of the oil supply hoses which are connected to the ends of the cylinder. As a result, these oil supply hoses can bend excessively and create blockages which obstruct the passage of the oil, with the result of failure of the steering manoeuvre. Furthermore, the continuous bending of the oil hoses leads to a rapid deterioration and wear thereof.

[0006] Another drawback of steering systems of the prior art is represented by the type of constraint between the front lever of the motor and the hydraulic cylinder. In fact, when the hydraulic cylinder comes into proximity with the lateral end of stroke positions, because of the connection which constrains it to the front lever of the motor, it makes a partial rotation around the axis of the transverse shaft, together with the translation. Clearly said roto-translatation of the hydraulic cylinder leads to further bending of the oil supply hoses with the above mentioned drawbacks.

[0007] The object of the present invention is to overcome the drawbacks of the prior art, providing a steering system for a marine motor that is reliable, practical, versatile, inexpensive and simple to produce.

[0008] This object is achieved according to the invention with the characteristics listed in appended independent claim 1.

[0009] Advantageous embodiments of the invention are apparent from the dependent claims.

[0010] The hydraulic steering system for marine motors according to the invention comprises:

- a supporting rod designed to be disposed at the stem of the boat, in a transverse direction with respect to the longitudinal direction of the boat and designed to be supported by a flange in which a marine motor is pivoted.

- a hydraulic cylinder mounted slidably on a fixed shaft disposed parallel to said supporting rod and defining two chambers supplied with oil to allow translation of the cylinder on said fixed shaft, and

- an articulated connecting system that connects said hydraulic cylinder to a bar that protrudes forward from said marine engine.

[0011] The main characteristic of the invention is represented by the fact that ducts that feed oil respectively into said two chambers of the hydraulic cylinder are formed inside said supporting shaft.

[0012] In this manner the flexible oil supply hoses, connected to the oil pump, can be put into communication with the ducts formed inside the shaft to feed the chambers of the hydraulic cylinder. Since the shaft of the hydraulic cylinder is fixed, the flexible hoses do not undergo any bending during translation of the hydraulic cylinder. As a result, a greater reliability of steering is achieved and deterioration of the flexible oil supply hoses is avoided.

[0013] Further characteristics of the invention will be made clearer by the detailed description that follows, referring to a purely exemplifying and therefore non-limiting embodiments thereof, illustrated in the appended drawings, in which:

Figure 1 is a top plan view illustrating a steering system according to the invention and, diagrammatically exploded, a marine motor supported by a supporting flange illustrated partially in section;

Figure 2 is an axial sectional view of the steering system of Figure 1, in which, for greater clarity, some supporting elements have been omitted and the connecting ducts are illustrated on view;

Figure 2A is a sectional view, like Figure 2, illustrating a first variant in which the connecting ducts are formed in the supporting side brackets;

Figure 2B is a sectional view, like Figure 2, illustrating a second variant in which the oil is supplied laterally into the two side brackets;
The shaft 4 leads to the application of a force on the front bar of the motor through the hydraulic cylinder 5, which engages in the hole 65 of the front bar 64. The motor assembly 6 is fixed to the transom of the boat and comprises a supporting flange 60 in which the motor 61 is pivoted so as to be able to rotate forward with respect thereto. As shown in Figure 2, the hydraulic cylinder 5 is mounted on the shaft 4 and the sides bushes 54 are closed, the fixed piston 40 of the shaft 4 divides the chamber 50 of the cylinder into two lateral chambers 57 and 58, that is to say a first chamber 57 and a second chamber 58, disposed respectively on the left and on the right with respect to the piston 40, with reference to Figure 2.

A first axial duct 42 which extends to the left with respect to the piston 40 and a second axial duct 44 extends to the right with respect to the piston 40 and the second ducts 42 and 44 of the shaft 4 extend to the ends of the shaft 4 and are tightly closed by end bolts 41. The first and second ducts 42 and 44 of the shaft 4 extend to the ends of the shaft 4 and are tightly closed by end bolts 41. The first and second ducts 42 and 44 of the shaft 4 extend to the ends of the shaft 4 and are tightly closed by end bolts 41. The first and second ducts 42 and 44 of the shaft 4 extend to the ends of the shaft 4 and are tightly closed by end bolts 41.

Each bush 54 has an axial through hole 55 in which is provided a cylindrical gasket 56 which allows slidable tight coupling with the outside lateral surface of the shaft 4. With reference to Figure 2, the shaft 4 has, in a central position, a piston 40 with a larger diameter that provides in its side surface gaskets 40' which allow a sliding watertight coupling with the inner side surface of the cylinder 5.

In this manner, when the hydraulic cylinder 5 is closed, the fixed piston 40 of the shaft 4 divides the chamber 50 of the cylinder into two lateral chambers 57 and 58, that is to say a first chamber 57 and a second chamber 58, disposed respectively on the left and on the right with respect to the piston 40, with reference to Figure 2.

With reference for now to Figure 1, the steering system according to the invention, denoted as a whole with reference numeral 1, is described with the aid of the figures. Each bush 54 has an axial through hole 55 in which is provided a cylindrical gasket 56 which allows slidable tight coupling with the outside lateral surface of the shaft 4.

The steering system of Figure 1; and

is hollow on the inside and has a cylindrical axial chamber 50 open on both ends. Near the ends, in the axial chamber 50 of the cylinder 5, inner threads 51 designed to engage tightly with outer threads 53 formed in respective side closing bushes 54 of the hydraulic cylinder 5 are formed.

With reference to Figure 2, the shaft 4 has, in a central position, a piston 40 with a larger diameter that provides in its side surface gaskets 40' which allow a sliding watertight coupling with the inner side surface of the cylinder 5.

In this manner, when the hydraulic cylinder 5 is closed, the fixed piston 40 of the shaft 4 divides the chamber 50 of the cylinder into two lateral chambers 57 and 58, that is to say a first chamber 57 and a second chamber 58, disposed respectively on the left and on the right with respect to the piston 40, with reference to Figure 2.

A first axial duct 42 which extends to the left with respect to the piston 40 and a second axial duct 44 extends to the right with respect to the to the piston 40 and the second ducts 42 and 44 of the shaft 4 extend to the ends of the shaft 4 and are tightly closed by end bolts 41. The first and second ducts 42 and 44 of the shaft 4 extend to the ends of the shaft 4 and are tightly closed by end bolts 41.

A first axial duct 42 which extends to the left with respect to the piston 40 and a second axial duct 44 extends to the right with respect to the piston 40 and the second ducts 42 and 44 of the shaft 4 extend to the ends of the shaft 4 and are tightly closed by end bolts 41.

With reference to Figure 2, the shaft 4 has, in a central position, a piston 40 with a larger diameter that provides in its side surface gaskets 40' which allow a sliding watertight coupling with the inner side surface of the cylinder 5.

Near the ends of the shaft 4 a first L-shaped (to the left) connector 46 communicating with the first axial duct 42 of the shaft 4 and a second L-shaped (to the right) connector 49 communicating with the second axial duct 44 of the shaft 4 are provided. The first L-shaped connector 46 is connected, by means of another L-shaped connector 47 to a first flexible oil supply hose 48 which extends to the left (with reference to Figure 2) to connect to the oil pump.

The second L-shaped connector 49 is connected, by means of a double L-shaped connector 32, to an axial duct 34 formed in the transverse rod 3. The axial duct 34 extends for the whole length of the transverse rod 3 so as to communicate with a second flexible oil supply hose 33 which extends to the left (with reference to Figure 2) to connect to the oil pump.

In Figures 1 and 2, external connectors 32, 49, and 46 are shown by way of example; however, these connectors can be eliminated, forming connecting ducts directly inside the brackets 2.

As shown in Figure 2A, a duct 147 communicating with the first duct 42 of the shaft 4 is formed in the left-hand bracket 2 and a duct 132 which puts the second duct 44 of the shaft 4 into communication with the duct 34 of the rod 3 is formed in the right-hand bracket 2. A first connector 148 communicating with the duct 147 of
the bracket to receive the oil supply hose 48 and a second connector 133 communicating with the duct 34 of the rod 3 to receive the oil supply hose 33 are provided in the outer side of the left-hand bracket 2.

[0030] Even if a lateral supply in which the oil supply hoses 48 and 33 are both disposed on one side (the left-hand side) of the steering system 1 has been illustrated in Figures 1 and 2, it must be considered that a lateral supply on both sides of the steering system 1 can also be provided. In this case passage of the oil inside the rod 3 is not necessary.

[0031] As shown in Figure 2B, in this case a duct 232 communicating only with the second duct 44 of the shaft 4 is formed in the right-hand bracket 2. Thus a connector 233 communicating with the duct 232 and designed to receive the oil supply hose 33 is provided in the outer side wall of the right-hand bracket 2.

[0032] Furthermore, according to a variant of the present invention, a front supply can be provided, in which the oil supply hoses 48, 33 supply the steering system 1 frontally from one side and from the other.

[0033] As shown in Figure 3C, in this case two ducts 147 and 232 communicating respectively with the ducts 42 and 44 of the shaft 4 can be provided in the brackets 2. Thus connectors 348 and 333 communicating with the ducts 147 and 232 to receive frontally the oil supply hoses 48 and 33 are provided in the front part of the brackets 2.

[0034] With references to Figure 2, when the pump supplies oil into the first hose 48, the oil flows through the left-hand connectors 47 and 46 into the first duct 42 of the shaft and fills the first chamber 57 of the cylinder, causing a translation of the cylinder 5 towards the left in the direction of the arrow S. On the other hand, when the pump supplies oil into the second hose 33, the oil flows into the axial duct 34 of the transverse rod 3 and flows through the right-hand connectors 32 and 49 into the second duct 44 of the shaft and fills the second chamber 58 of the cylinder, causing a translation toward the right of the cylinder 5 in the direction of the arrow D.

[0035] It should be noted that during the translational movement of the cylinder 5, the oil hoses 48 and 33 are immobile because they are constrained at the left-hand ends of the shaft 4 and of the transverse rod 3.

[0036] With reference to Figures 1, 4 and 5 an articulated system 7 is described which constrains the front bar of the motor 64 to the hydraulic cylinder 5.

[0037] Two upward protruding blocks 72 are formed on the lateral surface of the cylinder 5 near the ends. The blocks 72 have respective coaxial holes 73 disposed along the horizontal axis parallel to the axis of the cylinder 5. Respective flanges 75 are fixed integrally to the blocks 72 by means of pins 74 placed in the holes 73.

[0038] An arm 77 is pivoted to the other end of each side flange by means of a pin 76 with a vertical axis. The other ends of the two arms 77 are pivoted, by means of respective pins with a vertical axis 78, to the central flange 70. Thus the arms 77 behave as connecting rods and can rotate around the vertical pins 76 and 78 disposed at their ends.

[0039] The central flange 70 is pivoted, by means of the central pin 71 with a vertical axis, to the front bar 64 of the motor. In the central flange 70 the pin 71 of the front bar of the motor is disposed in a central position and the two pins 78 of the two arms 77 are disposed in diametrically opposite directions with respect to the axis of the central pin 71.

[0040] As a result, the central flange 70 can perform a movement in an arc of a circle on a horizontal plane thanks to the constraints of the vertical pins 76 and 78, without requiring any rotation of the cylinder 5. Consequently, this configuration of the articulated system 7 allows a rotation of the motor 61 following translation of the cylinder 5 on the shaft 4, avoiding any rotation of the cylinder 5 around the shaft 4.

[0041] Numerous changes and modifications of detail within the reach of a person skilled in the art can be made to the present embodiments of the invention without thereby departing from the scope of the invention as set forth in the appended claims.

Claims

1. A hydraulic steering system (1) for marine motors comprising:

   - a supporting rod (3) designed to be disposed at the stem of the boat, in a transverse direction with respect to the longitudinal direction of the boat and designed to be supported by a flange (60) in which a marine motor (61) is pivoted,
   - a hydraulic cylinder (5) mounted slidably on a fixed shaft (4) disposed parallel to said supporting rod (3) and defining two chambers (57, 58) supplied by oil to allow translation of the cylinder on said fixed shaft, and
   - an articulated connecting system (7) which connects said hydraulic cylinder (5) to a bar (64) that protrudes forward from said marine motor (61),

   characterised in that
ducts (42, 43, 44, 45) which supply oil respectively in to said two chambers (57, 58) of the hydraulic cylinder (5) are formed inside said supporting shaft (4) of the cylinder (5) and said transverse supporting rod (3) has a duct (34) for passage of the oil connected to a duct (44) of said shaft (4), to allow supply on one side only.

2. A hydraulic system according to claim 1, characterised in that said ducts (42, 44) formed inside said shaft (4) are supplied with oil by means of flexible hoses (48, 33) connected to an oil pump.

3. A hydraulic system according to claim 1 or 2, char-
acterised in that said shaft (4) of the cylinder is connected to said supporting rod (3) by means of brackets (2) and said brackets have inner ducts (147, 132; 232) communicating with said ducts (42, 44) of said shaft.

4. A hydraulic system according to claim 1 or 2, characterised in that said shaft (4) comprises:

- a first axial duct (42) connected by means of connectors (46, 47) to a first flexible oil supply hose (48) and
- a second axial duct (44) connected by means of connectors (49, 32) to said duct (34) formed in the supporting through rod (3) which in turn is connected to a second flexible oil supply hose (33).

5. A hydraulic system according to any one of the preceding claims, characterised in that said shaft (4) comprises:

- a fixed piston (40) disposed in a central position so as to divide said two oil chambers (57, 58) and said ducts (42, 44) formed in said shaft (4) open respectively into said two chambers (57, 58) by means of respective radial ducts (43, 45) disposed near said piston (40).

6. A hydraulic system according to any one of the preceding claims, characterised in that said articulated connecting system (7) comprises:

- two side flanges (75) fixed integrally to two protrusions (72) of said hydraulic cylinder (5),
- two arms (77) pivoted with first vertical pivoting axes (76) to said side flanges (75) and with second vertical pivoting axes (78) to a central flange (70),

wherein said central flange (70) is pivoted with a vertical axis of pivoting (71) to said front bar (64) of the motor.

Patentansprüche

1. Hydraulisches Steuersystem (1) für Bootsmotoren mit:

- einer Haltestange (3), die am Heck des Boots in einer Querrichtung bezogen auf die Längsrichtung des Boots angeordnet werden soll und durch einen Flansch (60), in welchem ein Boots- motor (61) schwenkbar gelagert ist, gehalten werden soll,
- einem Hydraulikzylinder (5), gleitbar auf einer fest angebrachten Welle (4) parallel zur Haltestange (3) angeordnet und zwei Kammern (57, 58), die mit Öl versorgt werden, definierend, um eine gleichförmige geradlinige Bewegung des Zylinders auf der fest angebrachten Welle zu ermöglichen und
- einem beweglichen Verbindungssystem (7), welches den Hydraulikzylinder (5) mit einem Gestänge (64), das aus dem Boots motor (61) vorwärts gerichtet hervorstellt, verbindet,
dadurch gekennzeichnet, dass Kanäle (42, 43, 44, 45), welche jeweils die zwei Kammern (57, 58) mit Öl versorgen, innerhalb der Haltestange (3) gebildet sind, und die Haltestange in Querrichtung (3) hat einen Kanal (34) für den Durchlauf des Öls, der mit einem Kanal (44) der Welle (4) verbunden ist, um die Versorgung nur auf einer Seite zu ermöglichen.

2. Hydraulisches System nach Anspruch 1 oder 2, dadurch gekennzeichnet, dass die Welle (4) des Zylinders mittels Schlauchleitungen (48, 33), die mit einer Ölpumpe verbunden sind, mit Öl versorgt wird.

3. Hydraulisches System nach Anspruch 1 oder 2, dadurch gekennzeichnet, dass die Welle (4) des Zylinders mit der Haltestange (3) mittels Bügeln (2) verbunden ist und dass die Bügel Innenkanäle (147, 132; 232) aufweisen, die mit den Kanälen (42, 44) der Welle in Verbindung stehen.

4. Hydraulisches System nach Anspruch 1 oder 2, dadurch gekennzeichnet, dass die Welle (4) umfasst:

- einen ersten Axialkanal (42), der mittels Verbindern (46, 47) mit einer ersten Schlauchleitung zur Ölversorgung (48) verbunden ist und
- einen zweiten Axialkanal (44), der mittels Verbindern (49, 32) mit dem in der durchgehenden Haltestange (3) gebildeten Kanal (34) verbunden ist, der wiedemitter mit einer zweiten Schlauchleitung zur Ölversorgung (33) verbunden ist.

5. Hydraulisches System nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass die Welle (4) einen fest angebrachten Kolben (40) umfasst, der in einer mittigen Position derart angeordnet ist, dass die zwei Ölkammern (57, 58) getrennt sind, und die in der Welle (4) gebildeten Kanäle (42, 44) öffnen sich jeweils in den zwei Kammern (57, 58) mittels jeweiliger Radialkanäle (43, 45), die in der Nähe des Kolbens (40) angeordnet sind.

6. Hydraulisches System nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass das bewegliche Verbindungssystem (7) umfasst:
Revendications

1. Système de gouverne hydraulique (1) pour moteurs de bateaux, comprenant :
- une tige support (3) conçue pour être disposée à la poupe du bateau, dans un sens transversal par rapport au sens longitudinal du bateau, et conçue pour être supportée par une aile (60) dans laquelle un moteur de bateau (61) pivote,
- un vérin hydraulique (5) monté de manière à pouvoir coulisser sur un arbre fixe (4) disposé parallèlement à ladite tige support (3) et définissant deux chambres (57, 58) alimentées en huile pour permettre la translation du vérin sur ledit arbre fixe, et
- un système de raccordement articulé (7) qui raccorde ledit vérin hydraulique (5) à une barre (64) qui est en saillie vers l'avant depuis ledit moteur marin (61),

2. Système hydraulique selon la revendication 1, caractérisé en ce que lesdites conduites (42, 44, 45) qui alimentent respectivement en huile les deux chambres (57, 58) du vérin hydraulique (5) sont formées à l'intérieur dudit arbre support (4) du vérin (5) et que ladite tige support transversale (3) comporte une conduite (34) permettant le passage d'huile et raccordée à une conduite (44) dudit arbre (4) de manière à permettre l'alimentation d'un seul côté.

3. Système hydraulique selon la revendication 1 ou 2, caractérisé en ce que ledit arbre (4) du vérin est raccordé à ladite tige support (3) à l'aide de consoles (2) et que lesdites consoles comportent des conduites intérieures (147, 132 ; 232) communiquant avec lesdites conduites (42, 44) dudit arbre.

4. Système hydraulique selon la revendication 1 ou 2, caractérisé en ce que ledit arbre (4) comprend :
- une première conduite axiale (42) raccordée au moyen de connecteurs (46, 47) à un tuyau flexible d'alimentation en huile (48) et
- une deuxième conduite axiale (44) raccordée au moyen de connecteurs (49, 32) à ladite conduite (34) formée dans la barre traversante support (3) et qui est son tour raccordée à un deuxième tuyau flexible d'alimentation en huile (33).

5. Système hydraulique selon l'une quelconque des revendications précédentes, caractérisé en ce que ledit arbre (4) comprend un piston fixe (40) disposé à une position centrale de manière à diviser lesdites deux chambres à huile (57, 58) et que lesdites conduites (42, 44) formées dans ledit arbre (4) ouvrent respectivement sur lesdites deux chambres (57, 58) par des conduites radiales respectives (43, 45) disposées près dudit piston (40).

6. Système hydraulique selon l'une quelconque des revendications précédentes, caractérisé en ce que ledit système de raccordement articulé (7) comprend :
- deux brides latérales (75) fixées en en faisant partie intégrante sur deux protubérances (72) dudit vérin hydraulique (5),
- deux bras (77) pivotant avec de premiers axes de pivotement vertical (76) vers lesdites brides latérales (75) et avec de deuxième axes de pivotement vertical (78) vers une bride centrale (70), dans lequel ladite bride centrale (70) pivote avec un axe vertical de pivotement (71) vers ladite barre frontale (64) du moteur.
REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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