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Sawaki

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[54] **SEAT FOR HIGH-SPEED WATER CRAFT**

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[52] **U.S. Cl.** **248/403,** 248/400, 248/418, 188/289

[51] **Int. Cl.** **F16m 11/30**

[58] **Field of Search** 248/399, 400, 403, 248/405, 418, 415, 425; 188/282, 284, 286, 288, 289, 279

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Primary Examiner—Marion Parsons, Jr.
Attorney—Holman & Stern

[57] **ABSTRACT**

A shock and vibration absorbing seat for high-speed boats, in which there is provided a base, a seat main body above the base, a plurality of slidably telescoping upper and lower cylinders constituting a pillar structure interposed between the base and the seat main body and containing a damping oil, an annular body rotatable disposed around the lower cylinder, a lock pin slidably supported by the annular body to be urged into any one of several holes provided in said base, a two-link knuckle joint interconnecting the seat main body can be moved only vertically relatively to the annular body without rotation relative thereto, and damping means for operating cooperatively with the damping oil to damp the movement of the seat main body relative to the base near the upper and lower extremities of the movement.

5 Claims, 3 Drawing Figures

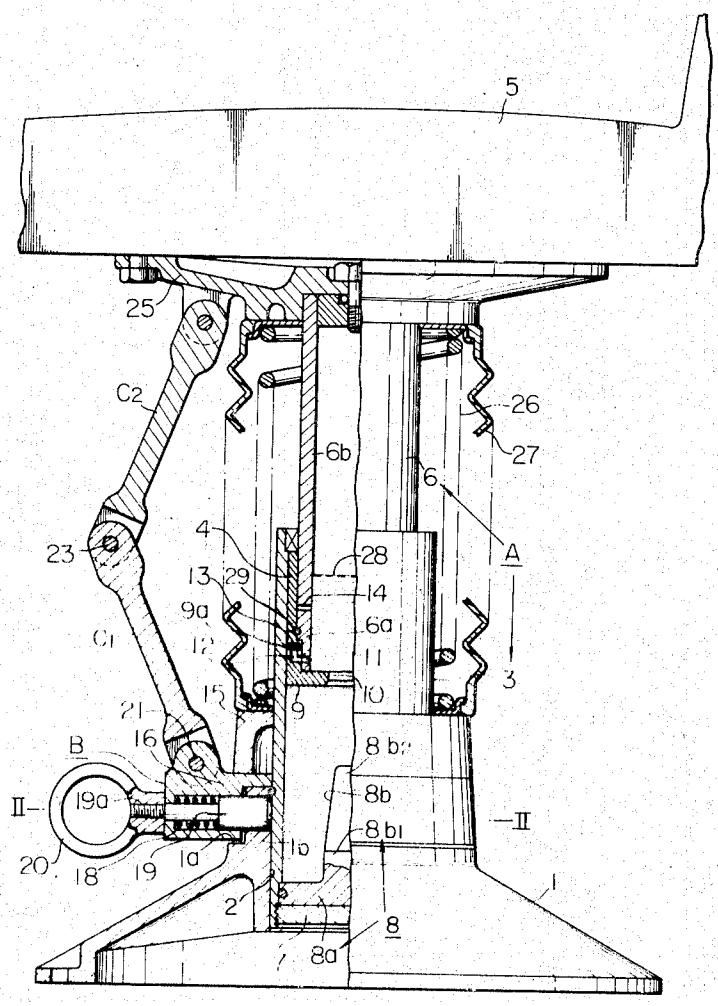


FIG. 1

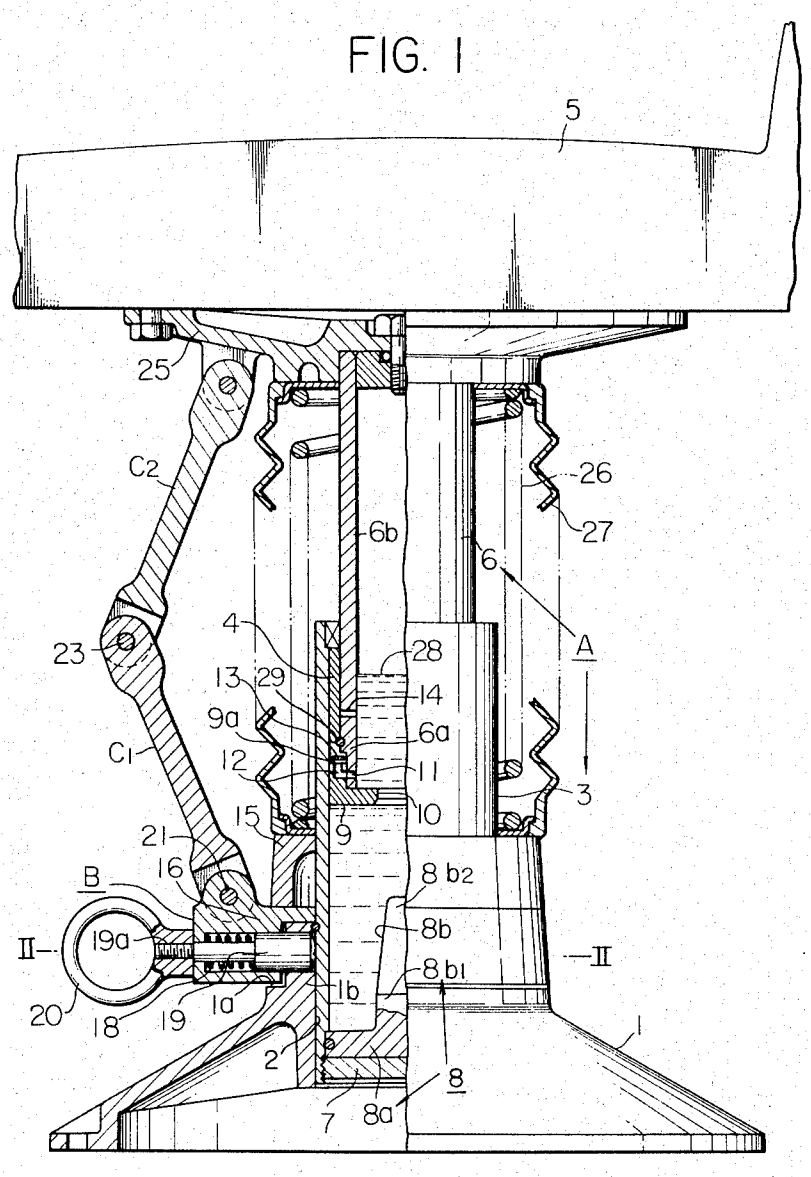

5
25
C2
26
27
6b
6
A
4
28
23
13
29
14
9a
6a
C1
12
11
3
15
10
21
9
16
8 b2
B
8b
II
19a
II
8 b1
1b
20
18
19
1a
1
2
8
7
8a

FIG. 2

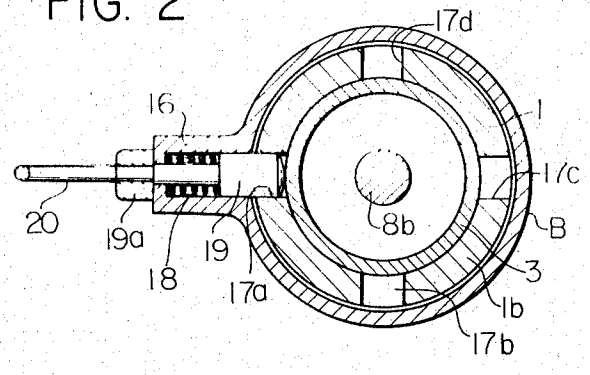
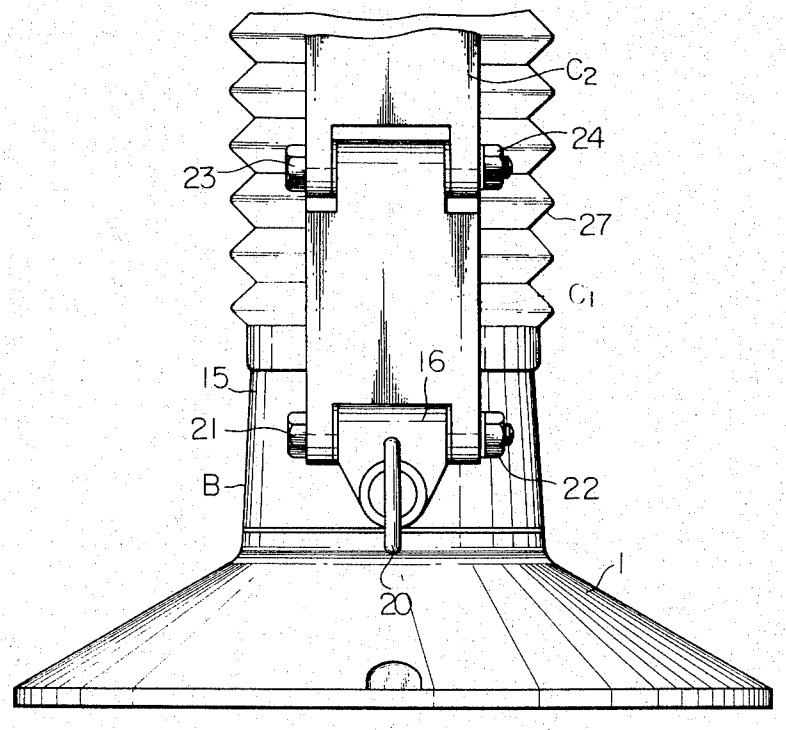

17d
16
1
17c
20
19a
19
8b
B
18
17a
3
1b
17b

FIG. 3


C2
24
23
27
C1
15
16
21
22
B
1
20

SEAT FOR HIGH-SPEED WATER CRAFT

BACKGROUND OF THE INVENTION

This invention relates generally to seats or chairs and water-surface craft, and more particularly to seats of impact-absorbing construction which can be safely employed on board boats.

Since a vessel, particularly a boat, traveling at a high speed is subjected to severe impacts or shocks on the hull, a seat to be fixed to the hull of the boat or a part fixed thereto should be of a kind capable of effectively absorbing these shocks or impacts so that any harmful transmission of these shocks through the seat to the bodies of the passengers can be substantially eliminated. Furthermore, the seat must be stabilized in the horizontal direction, and any stray rotation around its vertical axis should be prevented. Otherwise, the seat is not only uncomfortable to the user but may be even dangerous.

PRIOR ART

A seat in a boat having a fore-and-aft swingable link or a seat supported by a crosslink and springs or those further provided with an oil damper are known. However, when the soft comfortable feeling of the cushioning effect is emphasized, such a seat has been liable to undergo swinging oscillation in the lateral direction thereof when any vertical shock or impact is cushioned, or bumping to and jumping from the movable extremities of these swingable link and cross-link have occurred in the such cases.

OBJECTS AND SUMMARY OF THE INVENTION

Therefore, a primary object of the present invention is to provide a seat which can effectively absorb any impact of vibration ordinarily caused in a high-speed boat.

Another object of the present invention is to provide a seat for absorbing impact or vibration wherein the above mentioned stray rotation can be effectively prevented.

Still another object of the present invention is to provide a seat for absorbing shock or vibration wherein the facing direction of the seat can also be changed freely.

These and other objects of the present invention can be achieved by a novel construction of a seat adapted to be used on a high-speed boat which comprises a base, a seat main-body provided above the base, a plurality of cylinders constituting a pillar structure interposed between the base and the seat main-body, the plurality of cylinders being telescopically arranged with one slidable within another and containing damping oil, an annular body rotatable coaxially around the plurality of cylinders at the upper portion of the base, a lock pin included in the annular body to be urged into any one of several holes provided in and around the base, guide means interconnecting the seat main-body to the annular body in such a manner that the seat main body can be moved only vertically relative to the annular body but cannot be moved rotationally relative to the latter, resilient means urging the seat main body apart from the annular member and base, and damping means provided in said plurality of cylinders for restricting the flow of the oil at the upper and the lower extremities of the vertical movement of the seat main body.

The nature, principle, and utility of the present invention will be more clearly understood from the following detailed description of the invention when read in conjunction with the accompanying drawings, in which like parts are designated by like reference numerals and characters.

BRIEF DESCRIPTION OF DRAWINGS

In the drawings:

FIG. **1** is a left side elevational view, partly in vertical section, showing the essential parts of a seat according to the present invention for a high-speed boat;

FIG. **2** is a sectional view taken along the line II—II in FIG. **1**; and

FIG. **3** is a fragmentary front elevational view showing the base portion of the seat shown in FIG. **1**.

DETAILED DESCRIPTION

Referring now to FIGS. **1** and **2**, there is illustrated a seat according to the present invention adapted to be fixed on board a high-speed boat. The seat has a pillar assembly A comprising a lower cylinder **3** which is forced into and fixed to a central hole **2** of a base **1** fixed to the boat hull, an annular bearing metal **4** which is inserted in the upper part of the lower cylinder **3** and fixed thereto, for instance, by brazing, and an upper cylinder **6** on which is mounted a seat main body **5**, and the lower end of which is inserted through the bearing metal **4** freely slidably along the vertical axis of the pillar A.

The lower end of the lower cylinder **3** is closed by a plug member **8** which is driven into the end by means of a circular bottom plate **7** screw engaging with internal threads on the lower inner surface of the lower cylinder **3**. The lower cylinder **3** contains an oil up to a level near the upper end of the lower cylinder **3**. The plug member **8** comprises a disc part **8***a* and a centrally located upward projection **8***b*, which is further divided into a cylindrical portion $8b_1$ and a frustoconical part $8b_2$ located thereabove. The outer diameter of the cylindrical portion $8b_1$ is a little smaller than the inner diameter of a central hole **10** of a separating plate **9** fixed to the lower end of the upper cylinder **6**.

The outer surface of the separating plate **9** slidably fits the inner surface of the lower cylinder **3**. Through the separating plate **9**, there is provided a bent hole **12**, the lower end of which opens at **11** in the peripheral wall near the lower end of the upper cylinder **6**, and the upper end of the bent hole **12** is opened at a position on upper surface **9***a* of the separating plate **9**, which is bound by the inner surface of the lower cylinder **3** and the outer surface of a reduced diameter part **6***a* of the upper cylinder **6**.

In a space defined by the inner cylindrical surface of the lower cylinder **3**, the reduced diameter part **6***a* of the upper cylinder **6**, and the upper surface of the separating plate **9**, there is provided an annular valve plate **13** which can be freely shifted in the vertical direction along the axis of the pillar assembly A. The inner diameter of the annular valve plate **13** is selected to be slightly greater than the outer diameter of the reduced diameter part **6***a* of the upper cylinder **6**, and the outer diameter of the valve plate **13** is selected to be slightly smaller than the inner diameter of the lower cylinder **3** which is substantially equal to the outer diameter of the separating plate **9**. In other words, the radial breadth of the valve plate **13** is selected to be sufficient to close

the upper end of the bent hole **12** provided through the separating plate **9**.

At a position slightly above the reduced diameter part **6***a* of the upper cylinder, a hole **14** is bored through the wall of a cylinder part **6***b* which is not reduced in diameter, and this hole **14** is closed by the bearing metal **4** when the upper cylinder **6** is near the upper limit position thereof, at a position between the reduced diameter part **6***a* and the hole **14**, there is rigidly provided a stopper ring **29** which limits the upward movement of the upper cylinder **6**.

Outwardly of the lower cylinder **3** and between a stepped part **1**a of the base **1** and a ring **15** fitted around the lower cylinder **3**, an annular body B is provided in such a manner that it is allowed to rotate around a cylindrical portion formed at the upper end of the base **1**. The annular body B is provided with a boss part **16** projecting from one side of the annular body B and containing a lock pin **19**. This lock pin **19** is urged by a spring **18** into any one of four holes **17***a*, **17***b*, **17***c*, and **17***d* of the same diameters which are arranged 90° apart from each other around the periphery of the cylindrical portion **1***b* of the base **1**. The outer end of the lock pin **19** is provided with a threaded portion **19***a* on which a ring-shaped pulling handle **20** is engagedly mounted.

On the above mentioned boss portion **16**, the lower end of a link C_1 is coupled by a horizontally extending bolt **21** and a nut **22**, and the upper end of the link C_1 is coupled by another bolt **23** and nut **24** to the lower end of another link C_2. The upper end of the link C_2 is coupled also by means of a bolt and nut to a seat-support member **25** fixed to the lower surface of the seat main body **5**, which is thereby supported.

The seat-support member **25** is a strength member which is fixed to and supported on the upper end of the upper cylinder **6**. Between the annular body B and the seat-support member **25**, a helical compression spring **26** is inserted in such a manner that the spring **26** surrounds the lower cylinder **3** and the upper cylinder **6**. Since static loads such as weights of the related members and of the body of the user and dynamic loads imparted at the time an impact is applied thereto are all applied to the spring **26**, the spring **26** should be designed to withstand all of these loads. Outside of the spring **26**, bellows **27** is provided for a water-tight construction of the seat. Numeral **28** in FIG. **1** designates the liquid level of the damper oil.

In the above described construction, although only one compression spring is employed for providing a resilient force to return the seat main body **5** to its initial position, it is apparent that a plurality of springs may also be employed, or, when it is required, opposingly acting springs may be employed for providing a desired feature of the resilience.

The seat according to the present invention operates as follows. When a vertical load is applied to the seat, the compression spring **26** is first compressed, and the upper cylinder **6** is forced into the lower cylinder **3**. During the relative movement of the upper and lower cylinders **6** and **3**, the articulated links C_1 and C_2 are folded toward each other, and since the lock pin **19** included in the boss portion **16** to which is coupled the link C_2 is fitted into one of the four holes **17***a*, **17***b*, **17***c*, and **17***d*, rotation of the seat main body **5** relative to the base **1** about the vertical axis of the latter can be effectively prevented.

When the upper cylinder is introduced into the lower cylinder **3** through a predetermined distance, the holes **14** provided in the upper cylinder **6** comes under the bearing metal **4** at the upper end of the lower cylinder **3**, whereby the oil contained in the cylinders flows, through the bent hole **12** and the hole **14**, into the annular space defined by the inner peripheral surface of the lower cylinder **3**, the reduced-diameter part **6***a*, and the upper surface of the separating plate **9**.

Upon further introduction of the upper cylinder **6** into the lower cylinder **3**, the upward projection **8***b* of the plug member **8** enters the central hole **10** of the separating plate **9**. Because the outside diameter of the frustoconical portion $8b_2$ gradually approaches that of the central hole **10** with the introduction of the plug member **8**, movement of the oil from the lower portion of the lower cylinder to the upper part thereof is restricted, and the function of an oil damper is thereby created.

The upper cylinder is returned to the original position by the compression spring **26**. However, when the hole **14** of the upper cylinder **6** is closed by the bearing metal **4**, the valve plate **13** acts to resist the evacuation of the oil captured in the space bounded by the inner surface of the lower cylinder **3**, the outer surface of the reduced-diameter part **6***a*, and the upper surface of the separating plate **9** through the bent hole **12**. In this case also, the function of an oil damper is thereby caused, and the rising movement of the upper cylinder, and hence that of the seat main body **5**, are thereby slowed down.

When it is desired to change the facing direction of the seat main body **5**, the lock pin **19** is pulled out outwardly against the resilient force of the spring **18**, so that the lock pin **19** is pulled out of engagement with the hole **17***a* and then after the seat has been turned, reengaged with another of the hole **17***b*, **17***c*, and **17***d*.

I claim:

1. In a boat seat of the type having a base, a seat support member carrying a seat and provided apart from and above said base, a pillar structure including slidably telescoping upper and lower cylinders interposed between the base and the seat support member and containing a damping fluid, a helical compression spring surrounding the pillar structure and urging the seat support member apart from the base, and damping means for cooperating with the damping fluid to damp the movement of the seat relative to the base, the improvement comprising means providing on the upper portion of said base, a cylindrical portion having a plurality of radial holes in the peripheral surface thereof in angularly spaced apart relationship and defining therein a central hole for fixedly receiving the lower part of said base, and annular member rotatably mounted on and around said cylindrical portion, a lock pin radially slidably supported in said annular member to fit into any one of said radial holes, and guide means disposed between said seat support member and base permitting said seat support member to move vertically without substantial angular displacement about the vertical axis of the pillar structure relative to said base, said helical compression spring being disposed between and resting on the upper surface of said annular member and the lower surface of said seat support member.

2. The boat seat as claimed in claim **1** in which said guide means is defined by a two-link knuckle joint interconnecting said seat support member and said base.

3. The boat seat as claimed in claim 1 in which said damping means include first means for damping the movement of said support member relative to said base near the upper extremity of said movement and second means for damping the movement of said seat support member relative to said base near the lower extremity of said movement.

4. The boat seat as claimed in claim 3 in which said first damping means includes means defining an annular space between the opposing inner and outer surfaces of the upper and lower telescoping cylinders, means providing a bent hole connecting said annular space and the interior of said inner cylinder at a position near the lower end of the upper cylinder and provided with a valve plate restricting flow of the damping fluid and a hole through the wall of said upper cylinder at a position slighty above said bent hole serving to communicatively connect the annular space to the interior of the upper cylinder when the upper cylinder is below a position near the upper extremity thereof.

5. The boat seat as claimed in claim 3, in which said second damping means includes a separating plate having a central hole fixed to the lower end of one of the cylinders, and a plug member fixed to the lower end of the cylinder, said plug member having a central projection for insertion in said central hole to restrict flow of the fluid for damping near the lower extremity of the movement of the main seat body.

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