United States Patent

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[31] **2774/68**

[54] **HEELING COMPENSATING TRIM PLATE ARRANGEMENT FOR MOTOR BOATS**
3 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **114/66.5,** 114/126
[51] **Int. Cl.** **B63b 1/22**
[50] **Field of Search** ..... 114/66.5 P, 144, 152, 126

[56] **References Cited**
UNITED STATES PATENTS
3,249,081 5/1966 Schuster 114/126

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ABSTRACT: A heeling preventing trim plate arrangement for motor boats in which a linkage is connected between the steering means of the boat and a pair of trim plates. The parts are constructed so that when the steering means is moved in either direction from its neutral position, the proper trim plate is moved in a manner to counteract the heeling tendency of the boat which is produced by the movement of the steering means.

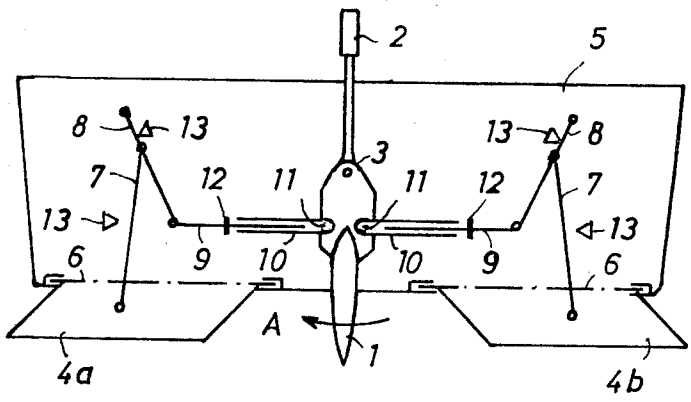


FIG. 1

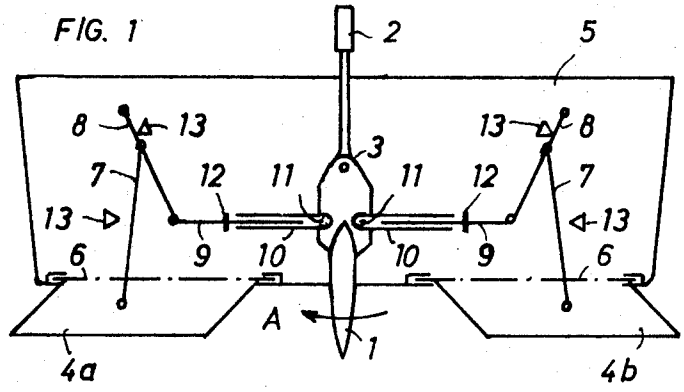


FIG. 2

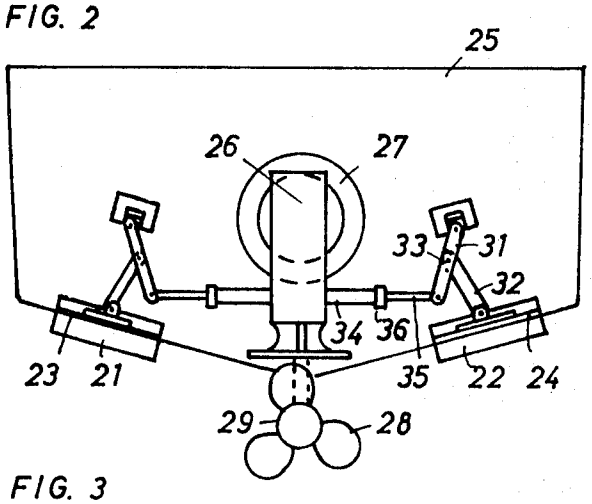


FIG. 3

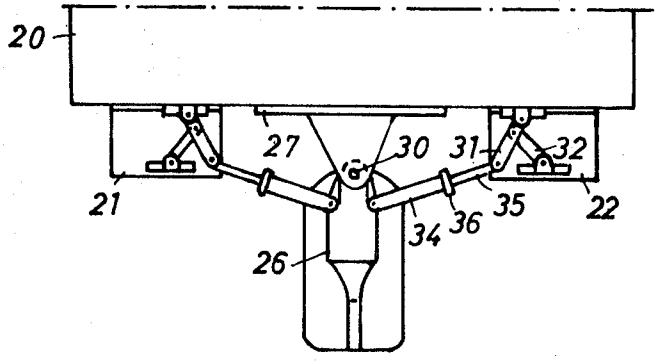
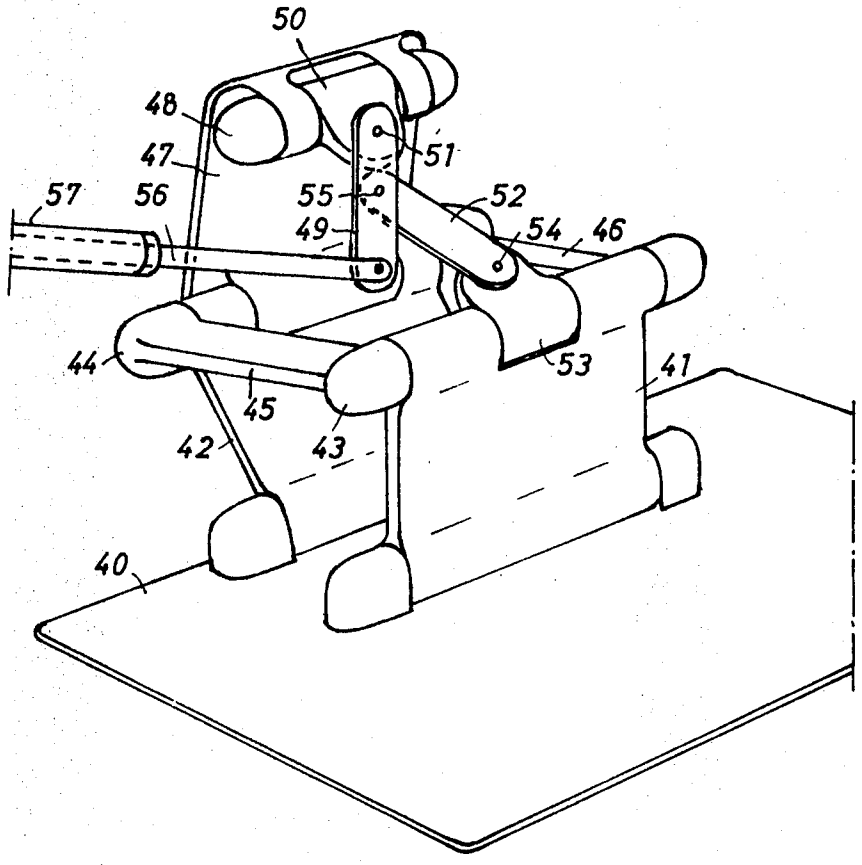


FIG. 4



HEELING COMPENSATING TRIM PLATE ARRANGEMENT FOR MOTOR BOATS

BACKGROUND OF THE INVENTION

The invention relates to a heeling compensating trim plate arrangement for boats.

When designing boats it is generally aspired to impart to the boat such a stable and secure run as possible by preventing heeling and pitching movements of the boat or making them totally impossible. Thus, it is more and more common practice to provide the boats with some kind of stabilizers. So-called trim boards or trim plates are especially employed for the purpose. These may be arranged either fixedly or oscillatingly about axes crossing the boat longitudinal direction (i.e. transverse axes). In the latter case the inclination of the trim plate towards the horizontal plane is made adjustable either manually or automatically. Normally, it is merely the pitching about axes crossing the boats longitudinal direction that is prevented by such trim plates, although, in addition, a certain stablilizing effect may be achieved as to the heeling about axes in the longitudinal direction of the boat. This action is particularly achieved if the boat is provided with individually movable trim plates arranged mirror symmetrically about the central or symmetry plane.

Heeling movements of the boat are, among other things, caused by alterations of the course. When by switching over its steering device the boat is forced to follow a curved path in order to swing to one side or the other, the boat will heel more or less towards the curving center of the path. This is particularly the case if the change of course is achieved by altering the direction of the screw current, as is generally the case with boats having an outboard motor or a so called outboard drive. The boat will also heel if a course must be kept which runs more or less at an angle or perpendicular to the prevailing wind and water current.

The effect of such currents must hence be compensated for by more or less increasing the stroke of the steering member. Heeling of the latter kind may be counteracted by means of symmetrically arranged trim plates in that the trim plate disposed on the wind or water current side gets a steeper inclination than the other one to the horizontal plane. In arrangements of the kind known in prior art this implies that each trim plate must be provided with a device which can be operated from inside the sitting well of the boat to adjust the inclination of the trim board. For this purpose electrically, hydraulically or pneumatically driven devices have been proposed and employed, but for obvious reasons such devices will be both complicated, expensive and liable to damage, since they are subjected to forceful, continually reverting impacts and vibrations during the voyage.

Automatically functioning in one direction spring-loaded trim plates have also been proposed, the heeling compensating effects of which being mostly based on the difference in speed between the inner and outer trim plate with the boat moving in a curving path. Such differences are, however, so small that for practical purposes they cannot in a satisfactory manner prevent the boat from rolling and heeling. Such differences are totally lacking when the boat is moving along a straight path, which implies that the said trim boards will not be of any use whatsoever to compensate heeling caused by wind or water currents.

SUMMARY OF THE INVENTION

The present invention has for its object a heeling compensating trim plate arrangement by which the above-discussed drawbacks may be totally eliminated. Briefly stated, the device in accordance with the invention comprises a pair of trim plates disposed on opposite sides of the steering means of the boat, and a connecting mechanism between the steering means and the trim plates. The connecting mechanism is constructed and arranged so that when the steering means is moved in one direction or the other off its neutral position, the connecting mechanism causes the movement of the proper one of the trim plates in such a manner that the heeling tendency of the boat is counteracted.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagrammatic view illustrating the principle of the invention;

FIG. 2 is an elevation of the stern of a boat provided with one embodiment of the invention;

FIG. 3 is a plan view of the embodiment shown on FIG. 2; and

FIG. 4 is a perspective view of a second embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1, the reference numeral 1 designates a boat steering device which may be either a conventional helm comprising a rudder or an outboard drive. By means of a handle 2, the steering device 1 is swingable about an axle 3, which in an actual embodiment is preferably approximately vertical, but for the sake of simplicity is shown in FIG. 1 as being perpendicular to the plane of the figure. There are provided two trim plates 4 *a* and 4 *b* which are suitably arranged at the stern transom 5, to pivot about a horizontal axis 6 and to be adjustable to various inclining positions by means of a system of levers. The lever system comprises two pairs rods 7, 8 pivotally connected together. Each of rods 7 has one end articulated to one of the trim plates. Each of rods 8 has one end articulated to the stern transom 5 of the boat and the other end pivotally joined to the one end of a rod 9, the other end of which is projecting into a tube or sleeve 10. The sleeves 10 are, in turn, articulated to a point 11 on the steering device 1. At the rod 9 there is provided a stop 12 displaceable along the rod and fixable in any desirable position. The swinging of the trim plates in one or both directions may be limited by stops 13, which may be disposed at the stern transom of the boat and, optionally, also adjustable.

The trim plate arrangement shown in FIG. 1 operates as follows. When the steering device 1 as turned by means of the handle 2 in the direction of the arrow A (and assuming that the boat will then swing to the left of the figure), this would normally result in the boat heeling over to the same side, so that the trim board 4 *a* on the said side would stand lower than the trim board 4 *b* on the opposite side. According to the invention this is prevented by the fact that the left sleeve 10, by the displacement of the steering device 1 in the direction of arrow A, is moved to the left stop 12 and then displaces the associated rod 9 outwards away from the central plane of the boat. The levers 7, 8 will thus be turned so that the distance between their extreme ends will increase. The associated trim board 4 *a* will then be forced to turn downwards, so that the heeling of the boat will be reduced or totally prevented. The sleeve 10 on the opposite right side will likewise be displaced to the left but will then slide along the associated rod 9 without affecting its position and will thus in this direction form an idle run or lost motion connection with the rod 9. Thus the associated trim board 4 *b* has the opportunity to move freely upwards, until the stop 12 on this end abuts the sleeve 10 or in any cause moves as far as allowed by the stop 13.

The embodiment of a practically realized arrangement according to the invention is shown in FIGS. 2 and 3, wherein 20 designates the stern portion of a motor boat having a V-shaped bottom. The boat is provided with two trim plates 21, 22 disposed mirror symmetrically on either side of its central plane, which boards are mounted to swing about axes 23, 24 at the stern transom 25. The boat is assumed to be provided with a so-called outboard drive 26 supported by a fixing plate 27 arranged at the transom 25, and including an associated screw and gear house 28 and 29, respectively. The outboard drive is in the usual manner revolvable about a preferably vertical axis 30 by means of a steering wheel or the like and the associated transmission members (not shown in the drawing). The trim plates 21, 22 are mounted to be set in an inclination

backwards-downwards suitable to the respective type of boat, so that at normal speed and load the boat's stem will be pressed downwards to a desirable extent. Each trim plate is maintained in its desirable inclination by means of two links **31**, **32** pivoted together by means of a pivot **33** or the like and forming a lever system between the transom **25** of the boat and the trim plate, the inclination of which may thus be varied by altering the angle between the links **31**, **32**. The links **31** are, by means a sleeve **34** and a plunger **35** displaceable within the sleeve, connected to the outboard drive **26** in such a manner that, while turning the latter about the axis **30** in one direction, the said angular displacement between the links **31**, **32** will be achieved and the trim plate inclination increased or decreased in the manner described with reference to FIG. **1**. The rods or levers **35** are provided with stops **36** arranged to cooperate with bushings located in the ends of the sleeves **34** and displaceable, for example, by means of screw threads, thus making it possible to set the maximal angular displacement of the trim plates to a desired value.

It may be of advantage for the safe functioning of the lever system to make the joints of the links **31**, **32** with the trim plates and the transom of the boat as ball and socket joints or inter se perpendicular axles acting as universal joints. In order to improve the operation of the lever system further, the rods **35** may, along with their displacement in the axial direction inside the sleeves **34**, also be rotatable about their longitudinal axis relative to the sleeves.

It is obvious that the manner of operation of the arrangement as illustrated in FIGS. **2** and **3** totally corresponds to the one described herein before with reference to the arrangement shown in FIG. **1**.

The invention may also find use in other kinds of trim plate arrangements, such as the totally automatically adjusting type, for example of the kind described in U. S. Pat. No. 3,370,561. The embodiment of the trim plate arrangement may in this case be the same as the one illustrated in the perspective view of FIG. **4**. The trim plate proper is herein designated **40**. It is supported by two links **41**, **42** articulated to the same and at their upper ends pivoting about two axles **43** and **44**, which are, at their ends, held together by two other link arms **45**, **46** forming a rigid link or frame with the same. This link or frame is, by means of the axle **44**, arranged to pivot on a plate **47** provided to be disposed on and supported by the boat's stern transom. At the upper edge of the plate **47** there is arranged another axle **48**, onto which is joined a link arm **49** in a universal joint with a link head **50** and a pivot **51** crossing the axle **48** at a right angle. Still another link arm **52** is in a similar way suspended on the axle **43** by a link head **53** and a pivot **54**. The link arms **49**, **52** are also pivoted together by means of a pivot **55**. The link arm **49** is at its extreme end articulated to a plunger rod **56** which is in a telescopelike manner insertable in a tube **57** directly corresponding to the sleeve **10** of FIGS. **2** and **3**, and which thus with its other end (not shown) is articulated to the boat's steering member. The distance between the axles **43** and **44** is greater than the one between the axles connecting the links **41**, **42** to the plate **40**. As long as the angle between the link arms **49** and **52** is maintained unchanged the mode of operation of this trim plate arrangement is completely analogous to the one of the trim plate arrangement described in the above-mentioned patent. However, by means of the boat steering member, the rod **56** and the tube **57** will function to change the angle between the link arms **49** and **52**, when turning said steering member about its axis in the manner as described herein before with respect to the arrangement illustrated in FIGS. **2** and **3**. Accordingly, when the boat moves along curved paths, the trim plates are forced into such inclining positions as to counteract or totally prevent the heeling of the boat. In case two trim plate arrangements of the kind shown in FIG. **4** are employed and disposed mirror symmetrically to the central plane of the boat, a completely automatic control of all undesirable pitching and heeling movements of the boat is achieved.

Other embodiments of the invention than those described herein before may obviously be considered. Thus, the lever system required for transferring the movement between the steering member and the trim plates may be arranged in another way. The arrangement as described herein before may likewise be employed in combination with the conventional outboard motors and boats having a motor disposed within the boat in the conventional way. In the latter case the helm should obviously be connected to the lever system, so that the movements of the helm will be transferred to the lever system and the trim plates.

I claim:

1. A heeling preventing means for boats having a steering means, such as a helm-type, an outboard drive or the like, comprising a pair of swingable trim plates disposed on opposite sides with respect to the boat's steering means, means mounting said trim plates for swinging movement about an axis substantially parallel to the bottom of the boat and transverse to the longitudinal axis of the boat, and means connecting the steering means to each of said trim plates, said connecting means being constructed and arranged to be actuated by movement of the steering means in one or the other direction from its neutral position to cause movement of the proper one of the trim plates in such a manner that the heeling tendency of the boat produced by the steering means movement is counteracted by the trim plate movement.

2. A heeling preventing means for boats having a steering means, such as a helm type, an outboard drive or the like, comprising a pair of swingable trim plates disposed on opposite sides with respect to the boat's steering means, and means connecting the steering means to each of said trim plates, said connecting means being constructed and arranged to be actuated by movement of the steering means in one or the other direction from its neutral position to cause movement of the proper one of the trim plates in such a manner that the heeling tendency of the boat produced by the steering means movement is counteracted by the trim plate movement, the inclination of the trim plate being determined by rods forming a lever system and disposed between the respective trim plate and the boat, said rods being connected to the steering means by lost motion connections in such a manner that they may be actuated by steering means movement only in one direction.

3. A heeling preventing means according to claim **2**, wherein each lost motion connection consists of one sleeve member and one plunger member displaceable therein, one of said members being connected to the associated trim plate and the other one to the steering means.