Dec. 2, 1930. G. M. MARR ET AL 1,783,251

RUDDER ANGLE INDICATING DEVICE

Filed Oct. 23, 1929

Fig. 1

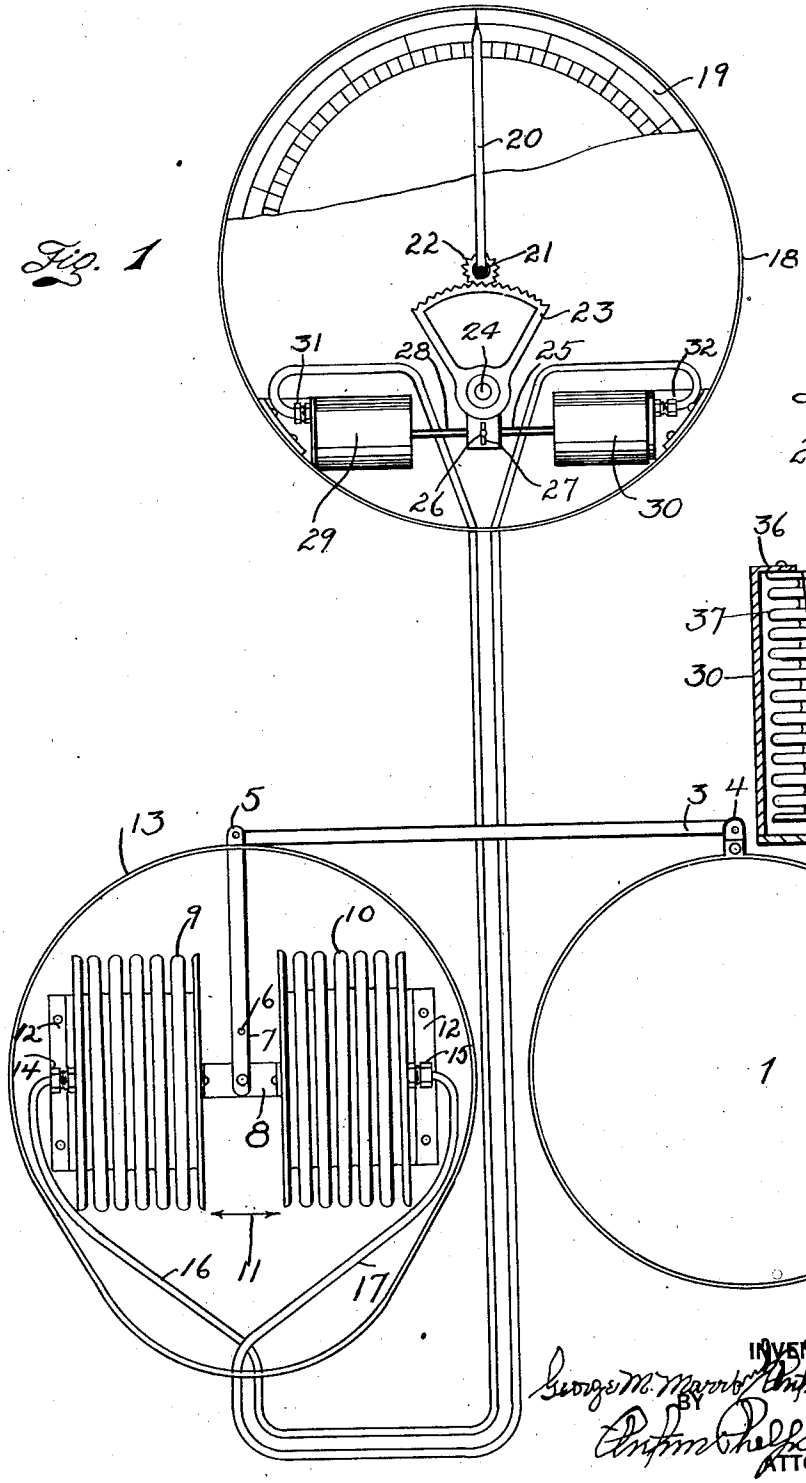
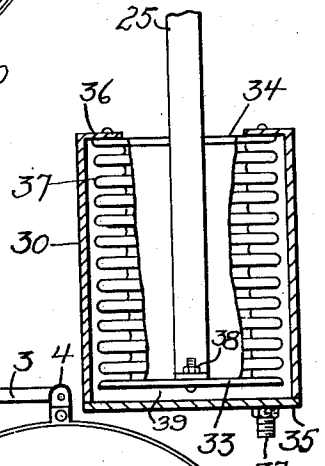


Fig. 2



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RUDDER-ANGLE-INDICATING DEVICE

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The device, the subject of this invention, is, as the name implies, a rudder angle indicator, a mechanism intended to indicate at a remote point, the exact position of the rudder of a ship.

The objects of this invention are to provide a non-electrical device of this nature—a device simple in operation with a minimum number of wearing parts, and a device that operates on a known and accepted principle of power or movement transference.

The principle employed is sometimes termed "hydrostatic", but it is in truth, not a hydrostatic, but a fluid operated device, the fluid most commonly used being air.

Another object of the invention is to construct a device that will not be subject to variations, due to changes of temperature, either in the whole device, or in a part thereof; in other words, under such conditions where one part of the device, such as the indicator or transmitter is placed in position where the temperature differs from that surrounding the other part of the device.

Another object of the invention is, of course, to produce a device of this nature that after it has been properly installed, will require a minimum of supervision, inspection and/or upkeep.

The means of carrying out all of these objects, and others not specifically heretofore mentioned, will be fully set forth as the specification progresses. The accompanying drawing should be referred to for a complete understanding of the specification which follows.

In the drawing:—

Fig. 1, shows a general plan view of our device.

Fig. 2 is a fractured partly sectional view of a part removed.

Similar reference numerals indicate like parts in all the figures where they appear.

At 1, we show what may be termed a "rudder post". It is the shaft, or a continuation of the vertical shaft, upon which the rudder is mounted, and which therefore operates with every movement of the rudder.

Surrounding this rudder post, is a strap 2, the function of which is to provide a pivotal connection with a link 3. As the rudder post turns, so will the projection 4 from the strap 2 and the link 3 be moved in either of two directions with every movement of the rudder post. The link 3 is pivotally connected to a lever 5, which is fulcrumed at 6 upon the post or standard 7, and which is in turn, pivoted to a bar 8.

The bar 8 is secured to the adjacent closed ends of a pair of sylphons. These sylphons are really metallic accordion bellows members formed of thin sheet metal, and spun into the general shape, as shown at 9 and 10. The sylphons are capable of movement in either direction, as indicated by the arrow 11, and serve as a pulsating pump mechanism, there being no interior pistons; merely the compression of the bellows or sylphons, or the extension thereof serving to produce the pump action and we prefer to use this type of device, as they can be sealed, and no packing is required. Each of these sylphons is secured by means of brackets, such as shown at 12 to the base of a casing member 13, so that while the adjacent ends of the sylphons or bellows are free to move, the outer end of each of these members is anchored, so that any movement of the bar 8 will serve to either elongate or compress either of the bellows members 9 or 10.

At 14 and 15, we show connections to the bellows members 9 and 10, each of these connections supporting tubes. The tubes 16 and 17 are independent of each other, and may be of comparatively small diameter.

In our construction of this device, we have used drawn copper tubing of approximately one-quarter inch outside diameter. The tubes 16 and 17 extend to any desired point, and in our experiments, we have discovered that the point of termination of the tubes may be many hundred feet away from the sylphons or bellows 9 and 10.

At the extreme end of the tubes, we provide an indicator having a casing 18, a dial 19 suitably supported in relation thereto, a movable pointer 20 mounted upon a shaft 21, which also supports a gear 22. The gear 22 is in mesh with a sector 23. The sector 23 being pivoted at 24, is operated by a rod 25,

carrying a pin 26, which is movable in a slot 27 in the projection 28 from the sector 23. The rod 25 is connected to two additional bellows members or sylphons. It is our desire that these bellows members be of peculiar construction, and of smaller diameter or area than the members 9 and 10.

As each of the bellows members in the casing 18 is provided with an enclosing casing, we indicate the enclosing casings of these bellows members at 29 and 30. The casings are supported by suitable brackets 31 and 32, and now by referring to the structure shown in Fig. 2, the construction of these bellows members 29 and 30 will be discovered.

As previously stated, it is our desire to minimize the area or the content of the small bellows members in the indicator, and to accomplish this, we close one end of such bellows member by means of a plate or disk 33. This disk may be secured in any suitable manner such as by means of solder.

At the other end of the bellows member, we arrange a flat ring 34, which is also secured to the bellows member.

We then provide a casing as shown at 30, and introduce the bellows member into the casing with a ring 33 quite close to the lower end 35 of the casing 30. The ring 34 is then secured to the flange portion 36 of the casing 30, care being taken that this connection is also air-tight.

At 37, we show a fitting by means of which the pipe or tube 16 or 17 is connected to this device, and the rod or bar 25 previously referred to, is secured to the disk 33 by any suitable means, such as the bolt 38. The fluid space, then, of this device is exterior of the bellows member, and is the space 39 between the casing 30 and the bellows member.

It will be noted that we provide two large bellows or sylphons 9 and 10, and two small bellows or sylphons as connected by the casing 29 and 30, and that we provide independent pipes one extending from the bellows 9 to the casing 29; the other part from the bellows 10 to the casing 30, and therefore the fluid passages are isolated one from the other. This is the means for all compensations, such as the compensation for temperature and for pressure, we preferring not to depend upon suction only to obtain a motion of the pointer 20 in one direction.

In the operation of our device, the rudder is turned by any suitable means. The rudder post causing the movement of the rudder, is also rotated to certain limited extents. The movement of the rudder post will move the lever 5. This will cause a compression of one of the bellows 9 or 10, and an extension of the other bellows. The bellows which is compressed, will cause a pressure in its pipe line. The bellows that is extended, will cause the suction in its pipe line, and this combined suction and pressure will cause the smaller bellows members to respond, with the result that the needle or pointer 20 is moved to the extent that the rudder post is moved, or the movement may be multiplied by a changed relation of the sector 23 and the gear 21.

Of course, it will be understood that the device may be changed at will, and that other modifications may be made within the scope of the appended claims without departing from the principle or sacrificing the advantages of this invention.

Of course, this mechanism may be employed for many other purposes than that of merely indicating the movement of a rudder post. As it is a signalling transmitting means, it may be employed for general purposes of transmitting signals or indicating mechanical movements.

Having carefully and fully described our invention, what we claim and desire to secure by Letters Patent is:—

1. A rudder angle indicator comprising a plurality of accordion bellows members, and means for connecting them to a rudder post, and a plurality of accordion bellows members and an indicating means connected thereto, and means for transferring fluid pressure from the first bellows members to the second bellows members.

2. A rudder angle indicator comprising a plurality of compressible and expansible members arranged in pairs, means for operating one said pair to cause said pair to operate the second said pair and indicating means connected with the second said pair.

3. In a device of the character described, a plurality of accordion metallic bellows members arranged opposed, means between said bellows members for operating both said bellows members in unison, a second pair of accordion bellows members and means for transferring a fluid pressure between said bellows members, means connecting the second bellows members and an indicating means operated by said connecting means.

4. A rudder angle indicator comprising a casing, a plurality of metallic bellows arranged therein, and having their outer ends supported, and their inner ends free for movement, a bar connecting the inner ends of said bellows members, levers for operating said bar, pipes extending through said bellows members, a second pair of bellows members of lesser area and located remote from first said pair of bellows member and connected to said pipes, a casing and an indicating means arranged therein and operated by said second pair of bellows members.

5. A rudder angle indicator, comprising a plurality of bellows members, a casing for each said member, a second plurality of bellows members, a conduit extending from each said second bellows members to a casing of

the first said bellows members, means for operating the second bellows members, and an indicator operated by the first bellows members.

6. In a device of the character described, a pair of accordion bellows members of relatively large diameter, and having their ends closed, a bar arranged between adjacent ends of said bellows members, and a fulcrumed lever for operating said bar to alternately compress and expand said bellows member, a second pair of bellows members, casings for said bellows members, and in which said bellows are secured, a bar extending between the innermost ends of said bellows members, and an indicating means operated by said bar, and a tubular connection between the larger bellows member, and the casing of a smaller bellows member, for transferring fluid from said larger bellows members to said smaller bellows members.

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