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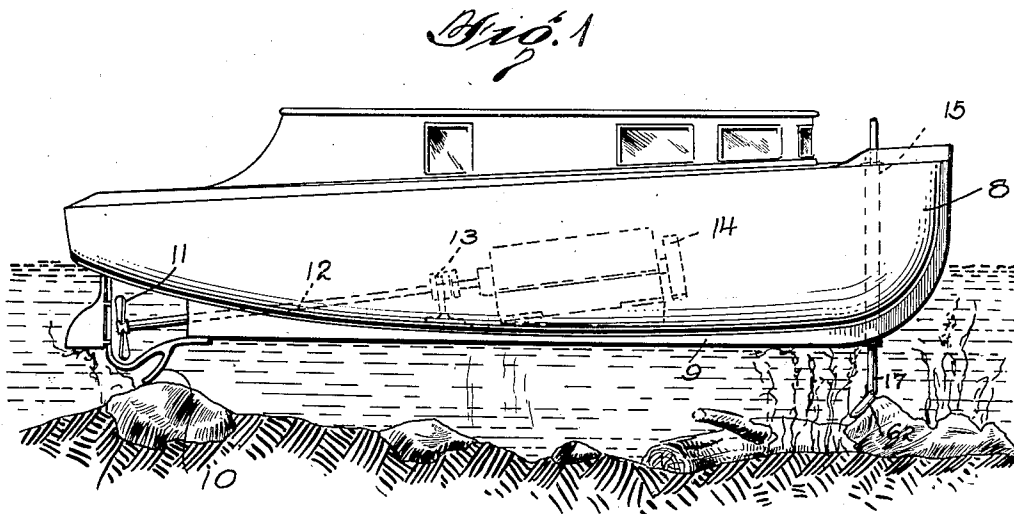
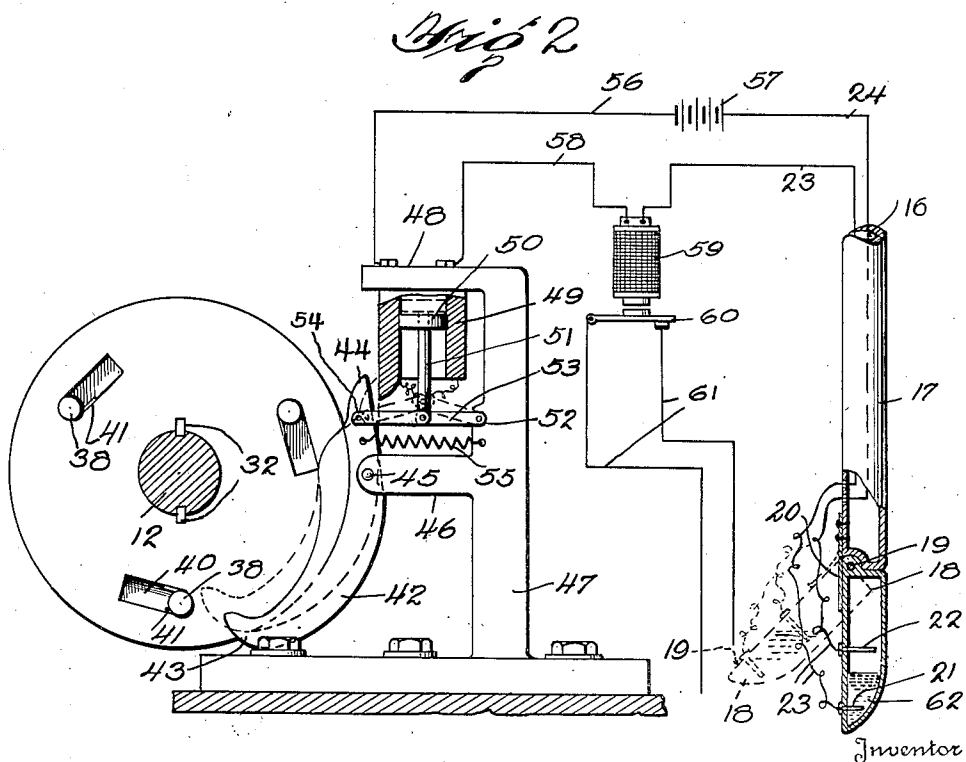
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SAFETY DEVICE FOR MARINE POWER PLANTS

Filed June 18, 1934

2 Sheets-Sheet 1



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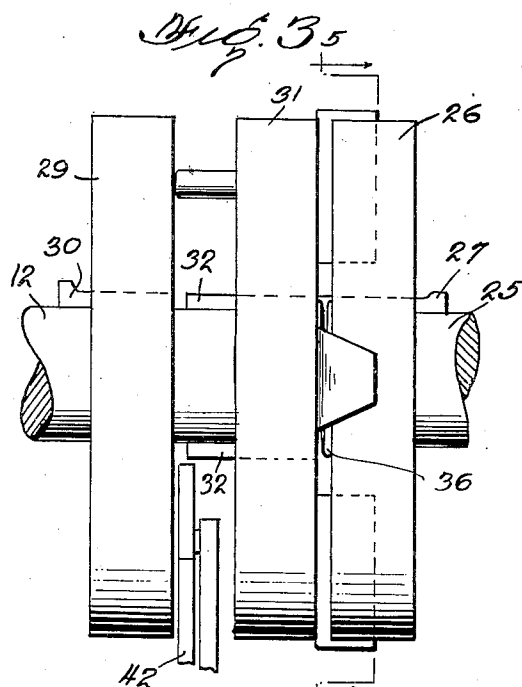
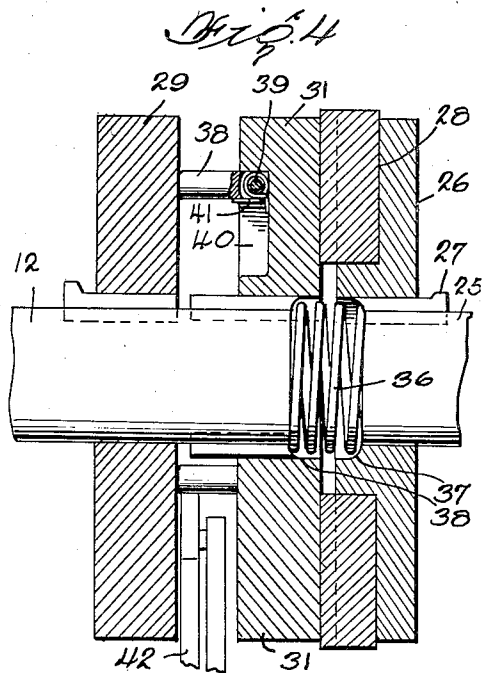
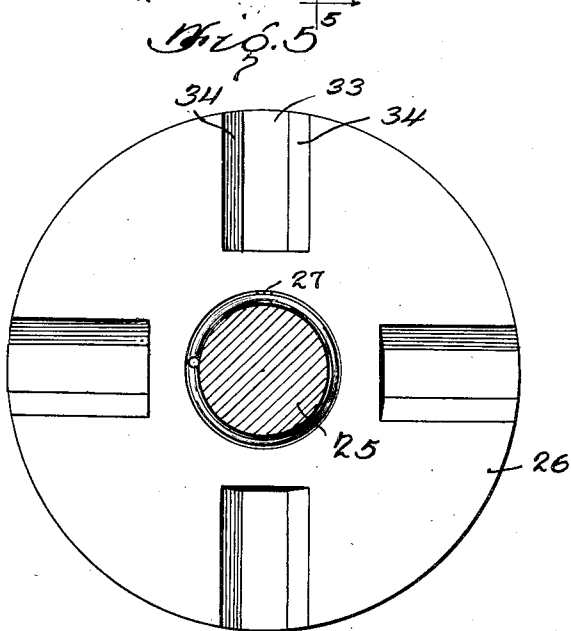
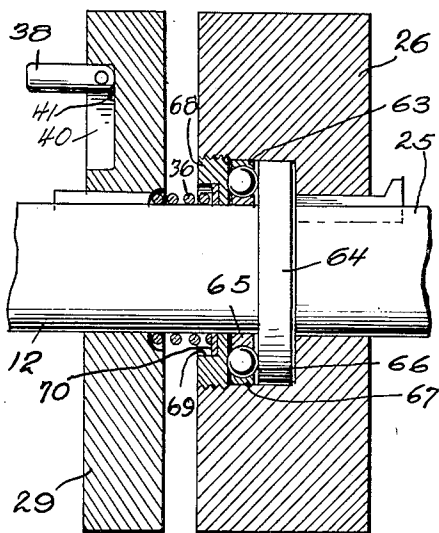


Fig. 6
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UNITED STATES PATENT OFFICE

2,124,497

SAFETY DEVICE FOR MARINE POWER PLANTS

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Application June 18, 1934, Serial No. 731,191

4 Claims. (Cl. 114—219)

This invention relates to safety devices for marine power plants or for analogous uses.

Small boats of the type known as cruisers generally are driven by high speed internal-combustion-engines connected with propellers either by direct drive or through gear reduction. Such boats are adapted for high speed so long as the power plant is operating but have equally quick deceleration when the propeller is stopped. In such boats the propeller extends beneath the level of the keel. The propeller is usually relatively high speed and subject to material damage if it strikes a submerged or floating obstruction. The damage to the propeller and its shaft is largely dependent upon the rate of rotation.

Some protection is afforded by the provision of a skag extending in front of the propeller and in the vertical plane of the keel but this will not afford protection for the full width of the propeller.

To meet the problem of protecting the power plant and propeller it has been proposed to interpose a frangible connection between the power plant and the driven propeller shaft and this may take the form of a shear-pin or the like. This, however, is open to the serious objection that it does not come into operation until the rapidly rotating propeller and driven shaft have sustained the full impact with the obstruction. In other words, the propeller may be bent out of true and the shaft thrown out of balance incidental to the very act of disconnecting the power.

One of the objects of my invention is to provide a means which may be dropped into the water beneath the forward part of the keel and will give a warning when the vessel approaches shallow water, a floating obstacle or a submerged object.

Incidental to this object, it is a purpose of my invention to establish operative connection between this warning device and the power plant so that the propeller and its driven shaft will be disconnected from the power plant before the propeller comes within striking distance of the obstruction. Under such circumstances the rapid rate of deceleration of the vessel and the resistance of the water to the propeller will cause the latter to come to such low rate of revolution as to avoid the risk of major damage to the propeller and its shaft.

A further object of my invention is to provide for stopping the power plant or engine simultaneously with the warning signal.

Among the objects of my invention is to provide brake means operated by the warning device and serving to disconnect the propeller shaft

from the power plant and at the same time to apply braking force to both of these mechanisms.

The novel arrangement of my warning device is one of the novel features of my invention.

This warning device and also the specific means for disconnecting the driven element from the power means and applying braking force are each severally novel features in my invention and adapted for separate use wherever their purposes may be found desirable and without limitation of their application to marine propulsion, which latter application I have hereinafter described and illustrated for the purpose solely of example.

In order that the features of my invention may be understood in their essential details, I have shown in the accompanying drawings a specific application of the invention and in these drawings:

Fig. 1 is a side view showing a small cruiser equipped with the warning means operating as a safety device for the power plant;

Fig. 2 is an enlarged view in elevation partly in section of the warning device, the combined trip and brake, and the associated wiring by which the trip is operated;

Fig. 3 is a side elevation of the shaft release or clutch;

Fig. 4 is a vertical axial section of the same;

Fig. 5 is a transverse vertical section on the line 5, 5 of Fig. 3 showing one clutch plate only; and

Fig. 6 is a vertical axial section of a modified form of clutch release and its bearing.

The vessel 8 shown in the drawings as a small marine cruiser is of the well known type in which the keel 9 terminates short of the stern and is equipped with the skag 10 extending downwardly and in front of the opening for the propeller.

The propeller 11 extends beneath and to each side of the keel 9 and is mounted for rotation on the end of the driven or propeller shaft 12.

The propeller shaft 12 at its front end is connected to the clutch device marked as a whole 13. The clutch 13 connects with the usual internal-combustion-engine 14.

In the bow of the boat there is provided a well 15 shown in dotted lines in Fig. 1 and this extends below the hull of the boat 8. This well may be located in the vertical plane of the keel 9 or, if more convenient, there may be one or more such wells passing through the hull in any desired part of the latter.

The well 15 is adapted to hold the warning device or sounding member 16. This sounding member can slide vertically in the well 15 and

is held at any desired depth by any suitable means.

The sounding device 16 comprises a hollow tube 17 the upper end of which is opened and the lower end of which is closed. A boot or compartment 18 is pivoted at the point 19 to the bottom end of the tube 17 and forms a continuation of the latter as to general form and shape. The boot 18 is held in line with the axis of the tube 17 by means of a leaf spring 20 attached to the tube and resting against one side of the boot. This spring is sufficiently strong to sustain the resistance of the water through which the boat travels and in fact the boot 18 and tube 17 may be streamlined to reduce this resistance. The spring, however, will permit boot 18 to be tilted backwardly on the pivot 19 as shown in dotted lines in Fig. 2 whenever the boot comes in contact with a floating or submerged obstruction.

The boot 18 is hollow to contain the mercury of the switch and the rear face thereof carries two well insulated water-proof conductors which extend forwardly to within a short distance of the front wall of the compartment. The lower conductor 21 is insulated where it passes through the rear wall of the compartment but the free end is not insulated.

The upper conductor 22 is also insulated from the compartment 18 but free from insulation at its forward end. Suitable wires 23 and 24 are carried vertically upwardly along the rear wall of the compartment 18 and may be suitably shielded or housed therein. The conductors 23 and 24, however, are flexible to permit the tilting of the compartment 18. The two conductors 23 and 24 are carried into the tube 17 and extend out of the top of the latter.

The engine or power shaft 25 may be the crank shaft of the engine 14. As shown in Fig. 3 this power shaft carries a clutch disk 26 attached to the shaft 25 by means of key 27 thus providing that the clutch disk 26 will rotate with the driving shaft at all times. The rear face of the disk 26 has recesses 28 as shown in Fig. 4. These recesses have rearwardly flaring or sloping side walls by which engagement is had with the other clutch disk. The driven or propeller shaft 12 has an abutment disk 29 keyed thereto by means of key 30 and spaced from the clutch disk 26.

The forward end of the driven shaft 12 is extended beyond the abutment disk 29 and carries at its forward end a second clutch disk 31. This clutch disk is slidable along shaft 12 on keys 32, 32. Any equivalent form of sliding engagement such as a squared shaft or the like may be used in place of the keys 32, 32.

The second clutch disk 31 has upon its forward face a series of radially extending bosses 33. These bosses may vary in number but are uniformly distributed around the disk and are adapted for simultaneous engagement in the corresponding recesses 28 on the forward disk 26. The bosses 33 have oppositely inclined side walls 34 conforming to the inclined walls of the recesses 28.

A coil spring 36 has its front end resting against the disk 26 and its rear against the front face of the disk 31. As shown in Fig. 4 the disk 26 is hollowed out at 37 and the disk 31 is correspondingly hollowed out at 38 to provide seats for the coil spring 36. In this way the second clutch disk 31 is urged by the spring 36 away from the front disk 26 and the bosses 34 held clear from the recesses 28. This movement continues until the disk 31 approaches the abutment 29 as near

as possible, being prevented from contact only by an intervening element which is a combined trip and brake. Thus a braking effect is given to the propeller and its shaft.

In order to engage the clutch disks 26 and 31, I have provided a series of two or more lugs 38 equally distributed around the rear face of the clutch disk 31. The front edges of these lugs 38 are pivoted at 39 in radial recesses 40 as shown in Fig. 4. Suitable spiral springs 41 are mounted around the pivots 39 and serve to urge the lugs 38 into a position parallel to the axis of the shaft 12.

When the lugs 38 are bent inwardly toward the center and the springs 41 overcome, then the lugs will occupy the recesses 40 within the surface of the disk 31 and thus permit the spring 36 to force the clutch disk 31 back in the direction of the abutment disk 29.

In order to displace the lugs 38, I have provided a trip 42 which is adapted to project within the space between the plates 29 and 31. The trip 42, as shown in Fig. 2, comprises a lever the long end of which 43 is curved and projects inwardly into the path of the lugs 38 whenever the upper or shorter end 44 of the lever is retracted. The lever is pivoted at 45 to the lateral arm 46 on the support 47. The support 47 is suitably mounted upon the frame or other part of the vessel so that the trip 42 may be moved into and out of the path of the lugs 38.

The means for operating the trip 42 is mounted upon an upper extension or arm 48 on the support 47. This means comprises an electromagnet 49 with its armature or solenoid 50 movable vertically. The shaft 51 of the armature 50, at its lower end is pivoted as at 52 to the links 53 and 54 forming a toggle. The link 53 is pivoted at its opposite end to the support 47 while the link 54 is pivoted to the short end 44 of the trip 42.

A spring 55 connected between the support 47 and the short end of the trip 42 serves to urge the latter normally into the path of the lugs 38.

This spring, however, cannot function as long as the toggle links 53 and 54 extend in a straight line as shown in Fig. 2. As soon as the armature 50 of the electromagnet 49 rises to its dotted line position, the toggle linkage is broken and the spring advances the trip into the path of the lugs 38.

The electromagnet 49 is connected by one lead 56 to a battery 57 and through the latter to one lead 24 of the warning device.

The opposite lead 58 from the electromagnet is connected to the lead 23.

As indicated in Fig. 2 a relay 59 has been inserted in series between the conductors 23 and 58. The armature 60 of the relay 59 is shown as being in the ignition circuit 61 of the gas engine and biased to a closed position. In this manner the ignition circuit is broken by the rise of the armature 60 simultaneously with the actuation of the trip.

The compartment 18 carries a suitable amount of a liquid electric conductor such as mercury. This serves to completely submerge the electric terminal 21 in all positions of the compartment 18 but the upper terminal 22 is submerged only when the member 18 has been tilted in inclined position. When this happens the mercury or other suitable material closes the circuit between the terminals 21 and 22 and puts in operation the devices for warning of contact with a submerged obstruction and actuates the devices for

stopping the motor and disconnecting the propeller shaft.

The members 33 may be formed integrally with the disk or plate 31. However, in the example shown they are formed of separate portions bolted or otherwise attached to the face of the disk 31. The members 33 may be rubber, leather or other composition which by its nature will serve to minimize the shock or noise incidental to the engagement of the two clutch plates. It is to be understood that the driven propeller shaft 12 is of course supported by the usual thrust bearings or thrust blocks. In the modification shown in Fig. 6, I have illustrated one form in which this thrust block or bearing may be incorporated in the clutch assembly. In this case the clutch disk 26 is given sufficient additional thickness to permit the formation of a central recess 63. The driven shaft 12 is formed either integral or by attachment thereto with a flange 64 which conforms to the shape of the recess 63 and is adapted to be held within the latter.

An anti-friction bearing 65 fits within recess 63 and against the side wall of the flange 64. This bearing may be a roller bearing including a series of balls 66 in a cage 67 or any other suitable equivalent device.

A screw-threaded collar 68 fits within the recess 63 and holds the anti-friction bearing 65 in place against the flange 64. The collar 68 has a recess 69 within which there is the washer 70. Spiral spring 36 rests against the washer 70 and the slidable disk 29 in the manner already described.

The collar 68 serves not only to hold the thrust collar flange 64 in place but also furnishes a bearing surface for the anti-friction member 65 when the forces caused by the drag of the propeller or boat are reversed from the drive forces and shaft 12 would have a tendency to pull away from the driving shaft 25. Under all ordinary conditions, the two portions of the shaft 25 and 12 and all the members of the automatic clutch revolve as a unit and there is no friction within the device. Relative movement between the parts and possible friction arises only after the trip has operated to separate the members of the clutch and free shaft 12 from revolution with shaft 25. Even under these condi-

tions, friction will be generated to only a limited amount as the motor will be stopped promptly after the clutch parts are disconnected.

The above description serves to illustrate my invention, the scope of which is intended to be limited only by the following claims, due consideration being given to the possibility of the minor modification in details.

What I claim is:—

1. A device comprising a body member, an extension pivoted to the end of the body member, an electromagnetic relay, an electric circuit between said relay and spaced terminals in said extension, a spring on the body member for holding the extension with the circuit open and circuit closing means carried by said extension.

2. In combination with a boat having a propeller extending beneath the boat's keel, a propeller shaft journaled in fixed bearings, a motor and normally disengaged clutch members connecting the shaft with the motor, a trip for disengaging the clutch members and electromagnetically actuated means for actuating said trip, said means including a member mounted in the hull of the boat for vertical movement therein and partly extending beneath the keel thereof and in the line of travel of the propeller, with an electric circuit-closer on said extending part.

3. A protective device comprising an electromagnetic relay for an operative electric circuit, a jointed member having an extension pivoted to one end thereof, spaced circuit terminals in said extension, means on said extension for temporarily closing an electric circuit between said terminals and circuit connections simultaneously operative between both of said terminals and the relay.

4. A protective device comprising an electromagnetic relay for an operative electric circuit, a jointed member having an extension pivoted to one end thereof, vertically spaced circuit terminals in said extension, a liquid current conductor in said extension for closing the circuit between said terminals when the extension is tilted and an electric circuit between the relay and the terminals.

HAROLD W. SLAUSON.