

May 7, 1935.

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2,000,746

AUTOMATIC SUBMARINE SAFETY APPARATUS

Filed April 21, 1934

2 Sheets-Sheet 1

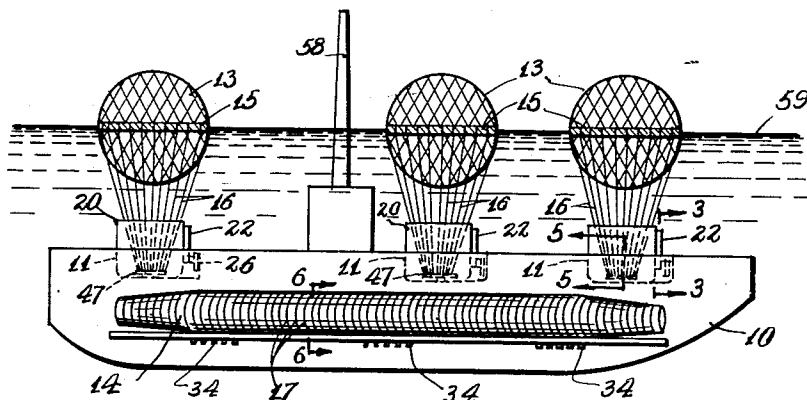


Fig. 1.

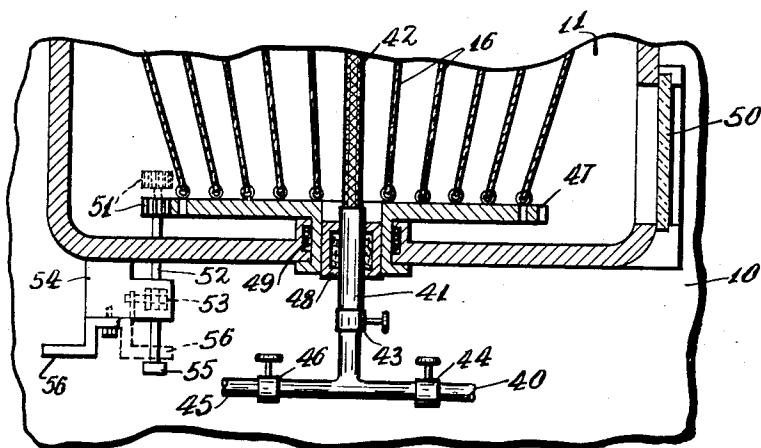


Fig. 5.

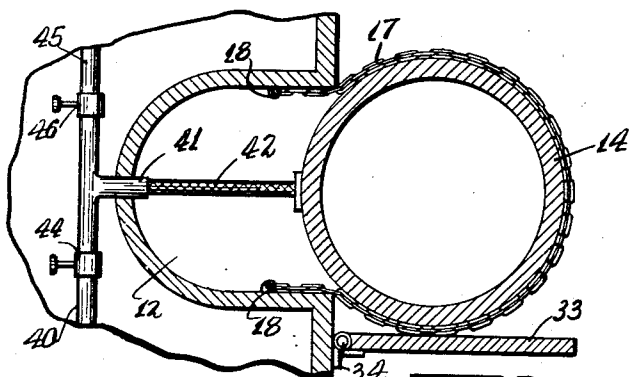


Fig. 6.

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2 Sheets-Sheet 2

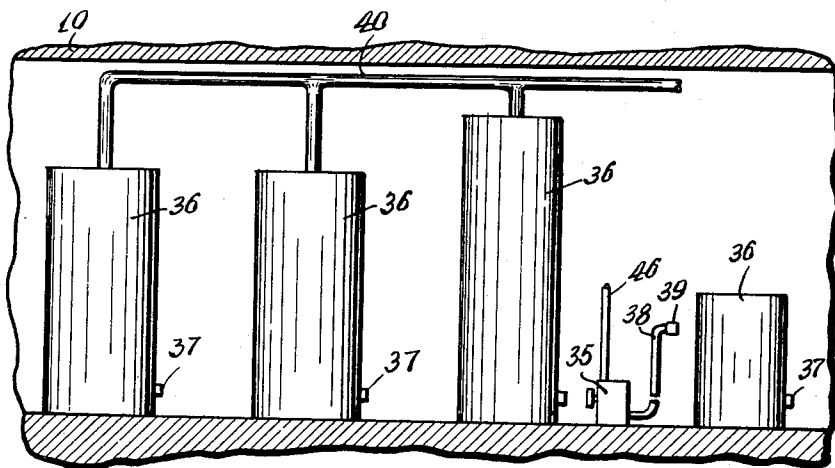


FIG. 4.

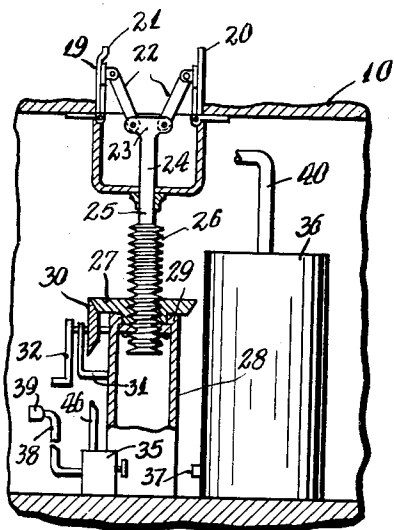


FIG. 5.

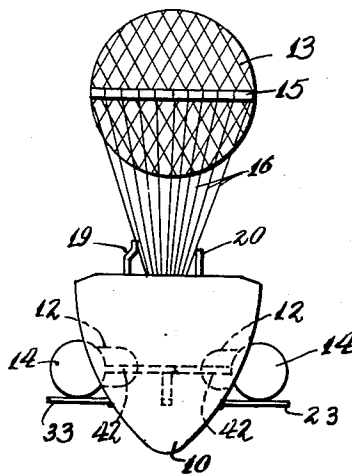


FIG. 6.

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2,000,746

AUTOMATIC SUBMARINE SAFETY
APPARATUS

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Application April 21, 1934, Serial No. 721,665

5 Claims. (Cl. 114-16.8)

This invention relates to new and useful improvements in an automatic submarine safety apparatus.

The invention has for an object the construction of an apparatus as mentioned which is characterized by the provision of a plurality of deflatable and inflateable bags arranged in a plurality of cavities in the top and sides of the body of a submarine and associated with means for inflating and deflating the bags from the interior of the submarine so that the submarine may be lifted when desired.

Still further the invention also proposes a novel arrangement of mounting the bags within the cavities so that they may be drawn back into the cavities when desired.

Still further as another object of this invention an arrangement is proposed whereby an air tube is mounted upon the top of the submarine and is adapted to project into the air when the inflated bags support the submarine near the surface of the water.

As another object of this invention it is proposed to arrange the deflatable bags in groups in which spherical bags are arranged at the top of the submarine and elongated bags completely along the sides of the submarine.

As another object of this invention it is proposed to arrange a rotatable disc in the cavities at the top of the submarine and associated with cables for holding the inflated bag, and also associated with an arrangement for rotating the discs for the purpose of "drawing in" the bags in deflated conditions.

Still further the invention proposes the construction of a device as mentioned which is simple and durable and which may be manufactured and sold at a reasonable cost.

For further comprehension of the invention, and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings, and to the appended claims in which the various novel features of the invention are more particularly set forth.

In the accompanying drawings forming a material part of this disclosure:—

Fig. 1 is a side elevational view of a submarine equipped with an automatic safety apparatus according to this invention, and illustrated supported by the apparatus a short distance below the water level.

Fig. 2 is an end elevational view of Fig. 1.

Fig. 3 is a fragmentary enlarged sectional view taken on the line 3-3 of Fig. 1.

Fig. 4 is a fragmentary enlarged longitudinal sectional view of a portion of the submarine body.

Fig. 5 is a fragmentary enlarged sectional view taken on the line 5-5 of Fig. 1.

Fig. 6 is a fragmentary enlarged sectional view taken on the line 6-6 of Fig. 1.

The submarine safety apparatus according to this invention is used in conjunction with a submarine having a body 10 formed with a plurality of cavities 11 at the top and cavities 12 along the sides. Deflatable bags 13 are associated with the top cavities 11 and are adapted to be engaged in and stored in the cavities when deflated. Other deflatable bags 14 are associated with the side cavities 12 and are adapted to assume positions within the cavities when deflated. Means are associated with all of the bags for the purpose of holding these bags in extended positions from the cavities. These means, as respects to the bags 13, comprise bands 15 fixed upon the horizontal circumference of the bags 13 and connected with chains 16 extended down into the cavities 11 and attached as hereinafter further described. As respecting the side bags 14, a plurality of chains 17 are extended over the bags and are attached at their inner ends 18 upon the top and bottom walls of the cavities.

Doors are provided for closing the cavities. As respecting the top cavities 11, the doors for each of the cavities comprise a pair of door sections 19 and 20 arranged on opposite sides of the cavity and hingedly supported so as to be adapted to assume closed positions or to be moved into open positions as clearly illustrated in Fig. 3. The door section 19 is formed with a lip 21 adapted to be engaged beneath the free edge of the door 20 as is customary in door constructions. A mechanism is provided whereby from the interior of the submarine the doors may be opened and closed and this mechanism comprises a pair of links 22 pivotally connected at one of their ends upon the side edges of the door sections 19 and 20 and pivotally connected at the other of their ends upon a bracket 23 fixed on a rod 24 extending into the interior of the submarine. A waterproof packing 25 is arranged upon the wall through which the rod 24 extends so as to prevent leakage of water through the submarine.

The inner end of the rod 24 is provided with threads 26 threadedly engaging a bevel gear 27 rotatively supported on a base member 28.

This base member is formed with an inturned top flange 29 engaging a circumferential groove in the hub of the bevel gear 27 to provide a rotative support. Another gear 30 meshes with the bevel gear 27 and is rotatively supported with a bracket 31 and is provided with a handle 32 by which it may be turned. The arrangement is such that the handle 32 may be turned for causing rotation of the bevel gear 27 in one or the other direction and causing the raising and lowering of the screw 26 for moving the rod 24 to open and close the door sections.

Each of the side cavities 12 are adapted to be closed with doors 33. These doors are hingedly mounted along the bottom sides of the cavities 12. Several springs 34 are arranged upon the hinged points of the doors 33 and act between the side wall of the submarine body and the doors 33 normally urging the doors into closed positions. When the bags 14 expand they automatically open the doors, into the position as illustrated in Fig. 6.

A means is provided within the submarine for inflating the bags when desired. This means comprises several air pumps 35 associated with a plurality of air holding tanks 36. These tanks 36 are of various sizes and arranged in various portions of the submarine. Each of the tanks 36 are provided with one way valves 37 through which air may be injected. Each of the air compressors 35 are provided with flexible discharged hoses 38 equipped at their ends with connections 39 adapted to engage over the valves 38 for the purpose of opening the valves to allow the discharge of air by the compressors into the tanks. The construction is very similar to that of the inflating of automobile tires equipped with the self closing valves, and therefore, complete details of the construction will not be given.

The tanks 36 are connected by pipes 40 through which a supply of air may be discharged into the bags. Examining Fig. 5 it should be noticed that the pipe line 40 connects with a branch pipe 41 extending into the cavity 11 and connected with a flexible hose 42 connected with the bag 13 for the purpose of inflating the bag. The branch 41 is provided with a valve 43. The air supply 40 is provided with a valve 44. A take-off pipe 45 provided with a valve 46 connects with the branch 41 and connects with the inlets to the compressors 35 as clearly illustrated in Figs. 3 and 4. The arrangement is such that after the bags 13 have been inflated they may be deflated by proper operations of the valves 43 and 46 and proper operation of the compressors.

The side bags 14 may also be inflated and deflated as desired. More particularly, air supply pipes 40 are connected with branch pipes 41 extending into the cavities 12. A control valve 44 is arranged in the supply 40 for controlling the passage of air through the branch. A tough flexible hose 42 connects from the branch 41 with the bag 14. A take-off pipe 45 connects with the branch 41 and is controlled with a valve 46.

Each of the top cavities 11 are equipped with mechanism which allows the bags 13 to be drawn into the cavities when deflated. Each of these mechanisms comprises a disc 47 rotatively mounted through the base wall of the cavity. Packing boxes 48 are arranged between the branch 41 and the hub of the disc 40. Other packing boxes 49 are arranged outside

of the disc 40 and the base wall of the cavity. The cavity 11 is provided with a window 50 so that one of the men within the submarine can inspect the condition of the "drawn in" bag. Each of the chains 16 connect with the periphery of the disc 47. A pinion 51 meshes with teeth upon the periphery of the disc 47 and is fixed upon a shaft 52 extending through the bottom wall of the cavity into the interior of the submarine. This shaft 52 is provided with a gear 53 of a reduction mechanism connected with a motor drive 54.

The shaft 52 extends from the bottom of the casing of the reduction mechanism and is provided with a head 55 by which it may be manually raised. A bracket 56 is adjustably mounted upon the casing of the motor 54 and is adapted to assume a position indicated by the dot and dash lines in Fig. 5 in which position it is adapted to hold the head 55 raised so that the gear 51 is raised into the dot and dash position for the purpose of being out of mesh with the disc 47. It is desirable that the disc 47 be free to rotate when the bag 13 is inflated so as to be capable of unwinding the chains 16 to allow the expansion of the bag.

An inflated bag 13, such as illustrated in Fig. 1 may be drawn in by operating the motor 54 to rotate the shaft 52, the gear 51 and the disc 47. Since the hose 42 remains stationary and the disc is rotating the chains will be gradually wound around the stationary hose 42 and so the bag will be drawn inwards. Of course it is necessary that the bag be deflated during this operation which is possible by proper operation of the air compressors and the valves 43, 44 and 46. After the bag 13 has been completely drawn into the cavity 11, which condition may be seen from the inspection window 50, then the handle 32 of the door closing mechanism is operated for the purpose of closing the doors 19, 20. This constitutes the inoperative or closed condition of the safety device.

Normally the submarine functions with all of the bags collapsed and held within their cavities with the doors closed. In the event that trouble develops and the submarine cannot rise to the surface then the bags are operated to lift the submarine. If the submarine becomes grounded under water and cannot rise then the top bags 13 may be operated for the purpose of lifting loose the submarine. If the submarine is then released the top bags 13 may be redrawn and replaced into their cavities.

The side bags 14 are not provided by mechanism by which they can be redrawn, though of course they are provided with means by which they may be deflated. Upon being deflated the doors 33 will automatically close which usually will correctly place the bags 14 into the cavities 12. When the submarine reaches dry dock or docks, the bags 14 may be properly adjusted within the cavities 12. As previously described the bags 13 can be drawn into the cavities 11 into the proper conditions when desired. When the bags 13 and 14 are inflated the submarine will be lifted by these bags acting as floats, illustrated in Fig. 1.

The submarine is also equipped with an air tube 58 extending above the water level 59 so that air may be drawn into the submarine in its lifted position.

The operation of the device may be understood from the following brief description. Normally compressed air is stored in the tanks 36

by operation of the compressors 35. In the event that the submarine runs into trouble, the valves 46 should be closed and the valves 43 and 44 open so that the compressed air from the tanks 36 engages into the bags and inflates the bags. The doors 19 and 20 must previously be open so as to allow the bags 13 to extend in their inflated conditions. Furthermore the gears 51 must be moved to their inoperative positions relative to the disc 47 so as to allow free turning of the discs and so allow the bags 13 to assume their natural extended positions.

While I have shown and described the preferred embodiment of my invention, it is to be understood that I do not limit myself to the precise construction herein disclosed and the right is reserved to all changes and modifications coming within the scope of the invention as defined in the appended claims.

Having thus described my invention, what I claim as new, and desire to secure by United States Letters Patent is:

1. A submarine safety apparatus, comprising a submarine having a body with a plurality of cavities in the top and the sides, deflatable and inflateable bags in said cavities, means for holding said bags in extended positions from said cavities when inflated, doors for said cavities, and means within the submarine for inflating and deflating said bags, comprising a plurality of storage tanks for storing compressed air and an air compressor for supplying air to said tanks, and a piping system including valves whereby air in the inflated bags may be removed by the air compressors and recharged into said storage tanks.

2. A submarine safety apparatus, comprising a submarine having a body with a plurality of cavities, a deflatable and inflateable bag in one of said cavities, a disc rotative in the base of the cavity, a stationary air pipe from the interior of the body extending through the center of said disc and connected with said bag for the inflation and deflation of the bag, a plurality of chains attached upon the periphery of said disc and to a band fixed around said bag, means for inflating and deflating said bag from the interior of said body, and means for releasably rotating said disc for drawing in the bag when deflated.

3. A submarine safety apparatus, comprising a submarine having a body with a plurality of cavities, a deflatable and inflateable bag in one of said cavities, a disc rotative in the base of the cavity, a stationary air pipe from the interior of the body extending through the center of said disc and connected with said bag for the inflation and deflation of the bag, a plurality of chains attached upon the periphery of said disc and to a band fixed around said bag, means for

inflating and deflating said bag from the interior of said body, and means for releasably rotating said disc for drawing in the bag when deflated, comprising a pinion meshing with teeth upon the periphery of said disc and mounted upon a shaft extending into the interior of the body, and an arrangement whereby said shaft may be moved to disengage the pinion with said teeth.

4. A submarine safety apparatus, comprising a submarine having a body with a plurality of cavities, a deflatable and inflateable bag in one of said cavities, a stationary air pipe from the interior of the body extending through the center of said disc and connected with said bag for the inflation and deflation of the bag, a plurality of chains attached upon the periphery of said disc and to a band fixed around said bag, means for inflating and deflating said bag from the interior of said body, and means for releasably rotating said disc for drawing in the bag when deflated, comprising a pinion meshing with teeth upon the periphery of said disc and mounted upon a shaft extending into the interior of the body, and an arrangement whereby said shaft may be moved to disengage the pinion with said teeth, said mechanism being connected with said shaft for rotating said pinion for rotating the disc to draw in the bag when desired.

5. A submarine safety apparatus, comprising a submarine having a body with a plurality of cavities, a deflatable and inflateable bag in one of said cavities, a disc rotative in the base of the cavity, a stationary air pipe from the interior of the body extending through the center of said disc and connected with said bag for the inflation and deflation of the bag, a plurality of chains attached upon the periphery of said disc and to a band fixed around said bag, means for inflating and deflating said bag from the interior of said body, and means for releasably rotating said disc for drawing in the bag when deflated, comprising a pinion meshing with teeth upon the periphery of said disc and mounted upon a shaft extending into the interior of the body, and an arrangement whereby said shaft may be moved to disengage the pinion with said teeth, said mechanism being connected with said shaft for rotating said pinion for rotating the disc to draw in the bag when desired, said mechanism including a bracket adjustably mounted and adapted to engage against one end of the shaft to hold the shaft raised so that the pinion disengages from said teeth.

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