May 23, 1967 M. HUMMEL 3,320,698

APPARATUS FOR OPENING AND CLOSING, RESPECTIVELY, WINDOWS AND HATCHES ON BOATS

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FIG. 1.

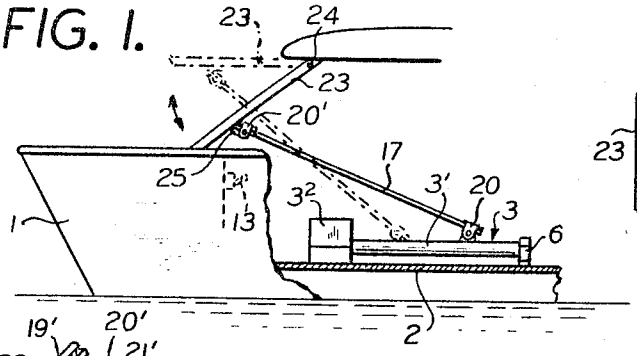
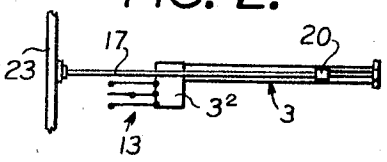


FIG. 2.



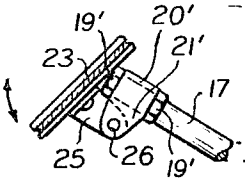
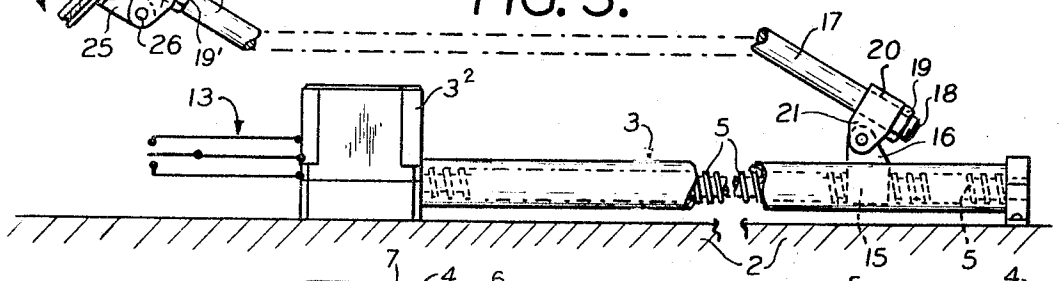


FIG. 3.



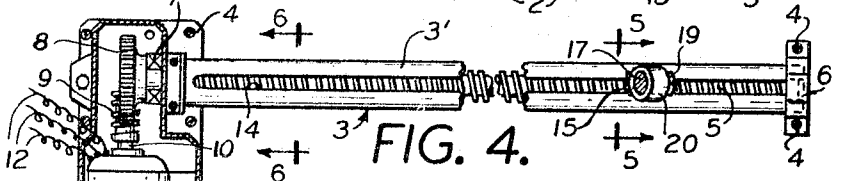


FIG. 5.

FIG. 4.

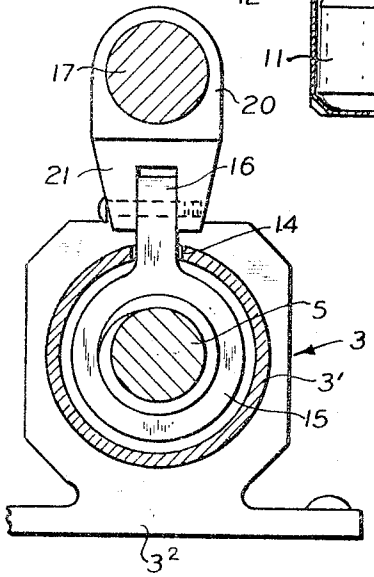
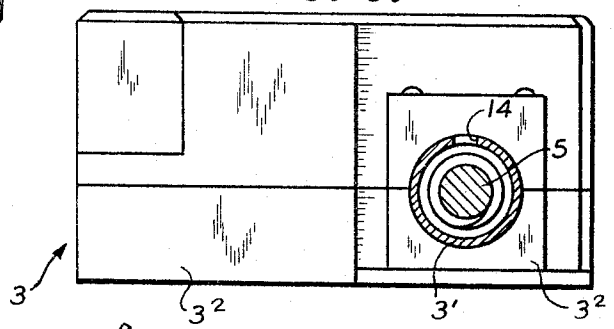


FIG. 6.



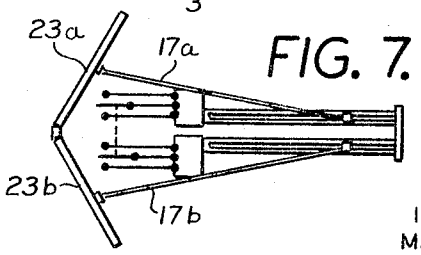


FIG. 7.

INVENTOR
MAX HUMMEL
BY
ATTORNEY.

May 23, 1967 M. HUMMEL 3,320,698

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FIG. 8.

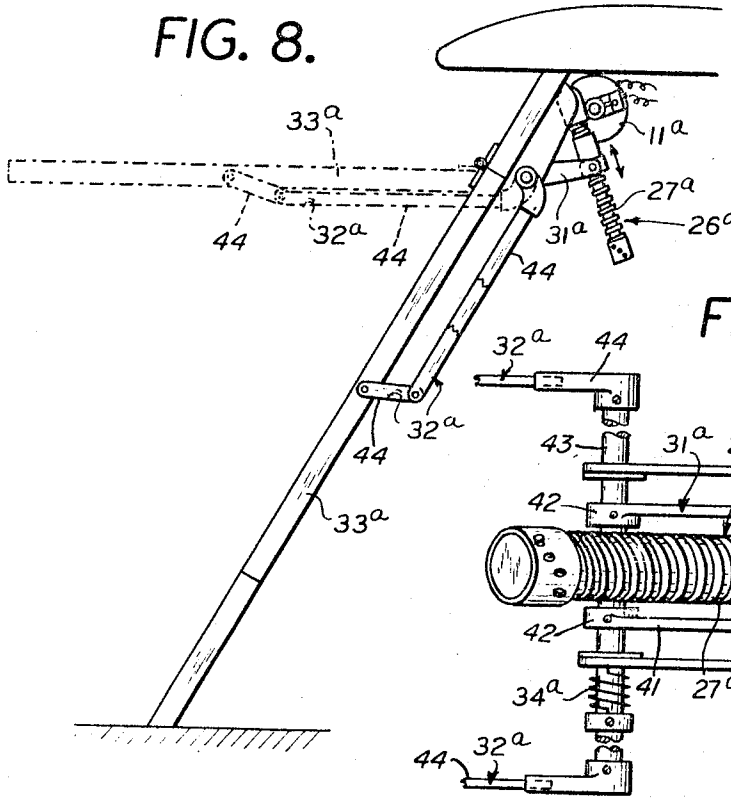


FIG. 10.

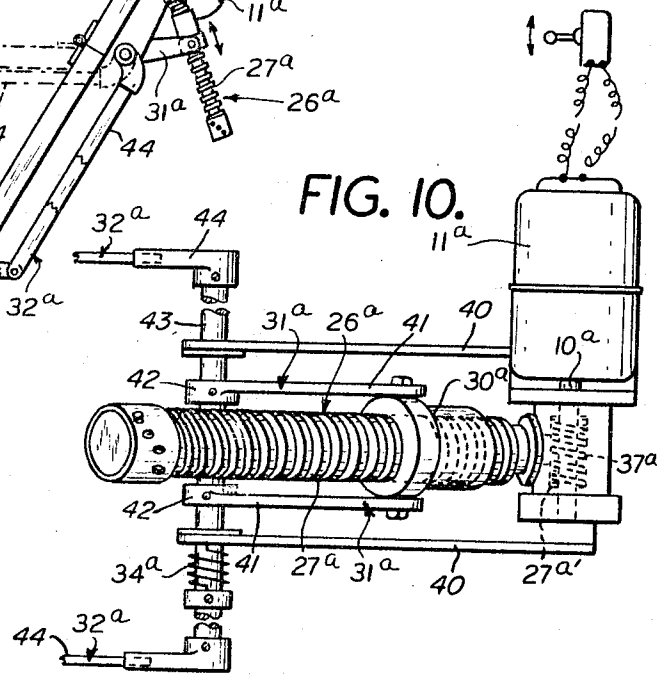


FIG. 9.

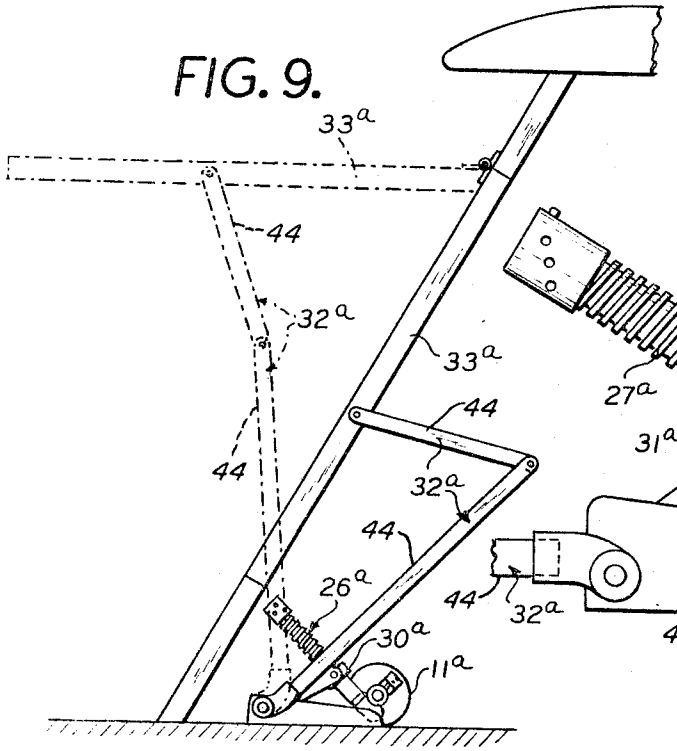


FIG. 12.

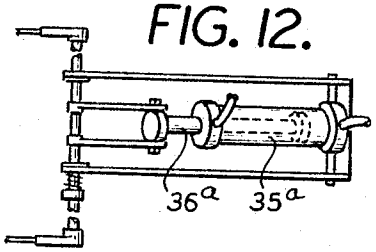
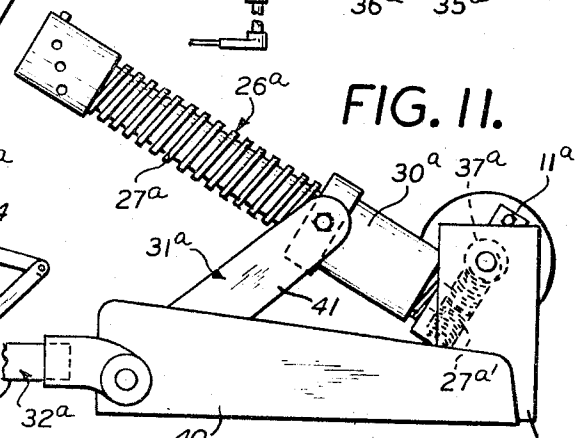


FIG. 11.



INVENTOR
MAX HUMMEL
BY Prescott & Montague
ATTORNEY.

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3,320,698

APPARATUS FOR OPENING AND CLOSING, RESPECTIVELY, WINDOWS AND HATCHES ON BOATS

Max Hummel, 164—30 95th St., Howard Beach, N.Y. 10031

Filed July 9, 1965, Ser. No. 470,833
6 Claims. (Cl. 49—340)

The present invention relates to an apparatus for opening and closing, respectively, windows on boats.

It is of importance to provide means for opening and closing, respectively, the windows, in particular the windshield on boats, since dependent upon the prevailing weather, it is desirable to have access to fresh air or to close the windshield in case of rain or wind. Manually operated means have been provided for opening and closing the window, which means require a strenuous force for their operation, creating difficulties particularly for female users of the boats.

It is, therefore, one object of the present invention to provide an apparatus for opening and closing, respectively, windows on boats, which includes lever means pivotally connected to the window and electrically or hydraulically operated means for moving the lever means into the window opening and closing positions, respectively.

With this and other objects in view, which will become apparent in the following detailed description, the present invention will be clearly understood in connection with the accompanying drawings, in which:

FIG. 1 is a side elevation of a portion of a boat including an apparatus for opening and closing, respectively, the windshield, designed in accordance with the present invention;

FIG. 2 is a schematic top plan view of the apparatus disclosed in FIG. 1;

FIG. 3 is a fragmentary side elevation of the apparatus, parts being broken away for better demonstration of the invention;

FIG. 4 is a top plan view of the apparatus disclosed in FIG. 3;

FIG. 5 is a section along the lines 5—5 of FIG. 4, shown at an enlarged scale;

FIG. 6 is a section along the lines 6—6 of FIG. 4;

FIG. 7 is a top plan view of another embodiment of the present invention, designed for operation of a double windshield;

FIG. 8 is a side elevation of another embodiment of the apparatus for opening and closing, respectively, the windshield of a boat;

FIG. 9 is a side elevation of a variation of the embodiment disclosed in FIG. 8;

FIG. 10 is a top plan view of electrically operated drive means applied to the apparatus of FIGS. 8 and 9;

FIG. 11 is a side elevation of the drive means disclosed in FIG. 10; and

FIG. 12 is a top plan view of hydraulically operated drive means applied to the apparatus of FIGS. 8 and 9.

Referring now to the drawings, and in particular to FIGS. 1 to 6, a boat 1 has a deck 2. A housing 3 is immovably secured to the deck 2 by screw bolts 4. The housing 3 comprises a longitudinal portion 3' and a crosswise disposed portion 3^2.

The longitudinal portion 3' has mounted therein by any suitable means a threaded shaft 5, which is rotatable, but axially immovable.

The threaded shaft 5 is mounted at one end in a bearing 6 and at its other end in a bearing 7 and carries at the latter end a gear 8 which meshes a worm gear 9 keyed to a motor shaft 10 of an electric motor 11. Feeding cables 12 are shown in FIG. 4 of the drawings for feeding electric current from any suitable electric source

(not shown). A double switch 13 is disclosed in FIG. 3, which permits the motor 11 to turn in one or the other direction, depending upon the intention to open or close the windshield.

The housing portion 3' has on its top face a longitudinal slot 14 for a purpose to be described below.

A nut member 15 is threadedly mounted on the shaft 5 and has an upwardly extending projection 16 which extends through a longitudinal slot 14 of the housing 3 and moves longitudinally therein upon rotation of the shaft 5, which causes an axial movement of the nut 15.

A lever 17 is provided on top of the housing 3, which lever 17 has a threaded end portion 18 which receives a nut 19 to operate as abutment means for a sleeve 20 surrounding the lever 17. The sleeve 20 has a forked downwardly projecting portion 21, which receives the projection 16 of the nut member 15. A pivot pin extends through corresponding bores of the projection 16 and of the projecting portion 21, thereby providing a pivot connection between the nut 15 and the sleeve 20.

Referring now to FIGS. 1 and 2, a single windshield 23 is pivotally mounted to the boat 1 by means of a pivot 24. The other end of the lever 17 is secured to a bracket 25, which is mounted on the frame of the windshield 23. The bracket 25 has a pivot 26 extending through a projection 21' of a sleeve 20' surrounding the other end of the lever 17 at its opposite end and retained on the lever 17 by means of nuts 19' disposed at both sides of the sleeve 17.

The apparatus of the present invention operates in the following manner:

In order to open the windshield 23, the motor 11 is switched on by the switch 13, whereupon the threaded shaft 5 turns in a predetermined direction advancing the nut 15 and, thereby, the lever 17. By this movement the windshield 23 is turned from the closing position shown in full lines in FIG. 1 into the open position, shown in dotted lines. A reversal of rotation of the shaft 5 brings about the closing position of the windshield 23.

Referring now to FIG. 7 of the drawings, another embodiment of the present invention is disclosed, wherein two windshields 23*a* and 23*b* are provided on the boat, and a separate drive is arranged for each of the windshields. For this purpose two drives, each including a lever 17*a* and 17*b*, respectively, is connected with corresponding drive shafts (not shown). Since the elements of the drives are identical with those of the previously described embodiment, reference is made to the structure disclosed in FIGS. 3 and 4.

Referring now again to the drawings, and in particular to FIGS. 8 to 12, another embodiment of the drive means of the apparatus is disclosed.

A shaft 26^a has an outer thread 27^a and is formed as a worm $27^{a'}$ at one end. The latter is rotatably, but axially immovably mounted in a two-sided housing 40. A nut 30^a is non-rotatably, but axially movably in threaded engagement with the threaded shaft 26^a in order to move the nut 30^a axially upon rotation of the shaft 26^a. Linkage 31^a is pivotally connected to the nut 30^a and includes two arms 41 pivotally connected to the nut at diametrically opposite sides of the nut. The other ends 42 of the arms 41 of the linkage are secured to a common axle 43 which axle 43 is pivotally mounted in the housing 40. The linkage 31^a transmits the movement of the nut 30° to two lever means 32^a, one end of each lever means being secured to the frame of a pivotally hinged windshield 33^a, to turn the latter into open or closed position, respectively, and the other end of each being operatively connected to the other ends 42 of the arms 41 by being secured to the axle 43 at op-

posite ends thereof. Each lever means **32a** comprises two links **44** which are pivotally connected together, one of which being pivotally connected to the windshield **33a** and the other secured to the ends of the axle **43**.

As indicated in FIG. **10**, an electric motor **11a** has a shaft **10a** which carries a worm **37a** being in mesh with the worm gear **27a'**, so that upon operation of the electric motor **11a** axial movement of the nut 30° is brought about, whereby the windshield **33a** is opened and closed, respectively. The axes of pivoting of the threaded shaft **26a**, the axle **43** and the hinged windshield, respectively, are parallel to one another.

While in the embodiment disclosed in FIG. 8 the motor **11a** is disposed on top of the windshield **33a**, FIG. **9** shows an embodiment, in which the motor **11a** is disposed at the bottom and secured to the deck of the boat.

Spring means **34a** may be provided to be attached to the axle **3** to retain the windshield in any intermediate position.

As indicated in FIG. 12 of the drawings, the threaded shaft with its nut can be replaced by a hydraulic cylinder **35a** in which a piston **36a** reciprocates and the free end of the piston is secured to the linkage operating the closing and opening, respectively, of the windshield.

While I have disclosed several embodiments of the present invention, it is to be understood that these embodiments are given by example only and not in a limiting sense, the scope of the present invention being determined by the objects and the claims.

I claim:

1. An apparatus for opening and closing, respectively, windows on boats, comprising:

a housing,

an electric motor disposed in said housing and having a drive shaft,

a threaded shaft rotatably and pivotally, but axially immovably mounted at one end of said drive shaft in said housing,

means for operatively connecting said drive shaft with said threaded shaft,

an operating nut axially movable along, but non-rotatably engaging said threaded shaft,

a linkage pivotally connected with said nut at one end and pivotally mounted to said housing at the other end,

at least one lever means pivotally connected at one end thereof to a window and operatively connected at the other end thereof to said other end of said linkage, and;

a double switch in the circuit of said electric motor and turning said motor in any of two directions, depending upon the operative position of said switch.

2. The apparatus, as set forth in claim **1**, wherein:

said at least one lever means comprises two links pivotally connected together,

one of said links being pivotally connected to said window, and

the other of said links being operatively connected to said other end of said linkage.

3. The apparatus, as set forth in claim **2**, further comprising:

an axle pivotally mounted in said housing and secured to said other end of said linkage, and

said other end of said at least one lever means secured to said axle.

4. The apparatus, as set forth in claim **3**, further comprising:

spring means operatively connected about said axle for retaining said window in any intermediate position.

5. The apparatus, as set forth in claim **3**, wherein:

said at least one lever means includes two of said at least one lever means,

each of said two lever means being secured at said other end of said lever means to opposite ends of said axle,

said linkage including two arms diametrically connected pivotally to said nut at one end of each of said arms, and

the other ends of said each of said arms secured to said axle between said two lever means.

6. The apparatus, as set forth in claim **5**, wherein:

said window is pivotally hinged for opening and closing, and

the axes of pivoting of said threaded shaft, said axle and said window, respectively, are oriented parallel relative to one another.

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DAVID J. WILLIAMOWSKY, *Primary Examiner.*

HARRISON R. MOSELEY, *Examiner.*

J. K. BELL, *Assistant Examiner.*