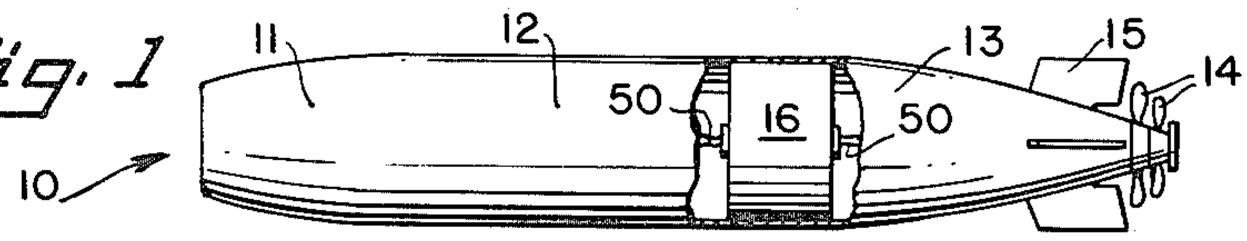
Sept. 20, 1960 J. L. JONES 2,953,111

BATTERY CASE AND FILLING MECHANISM

Filed Dec. 12, 1958

Fig. 1



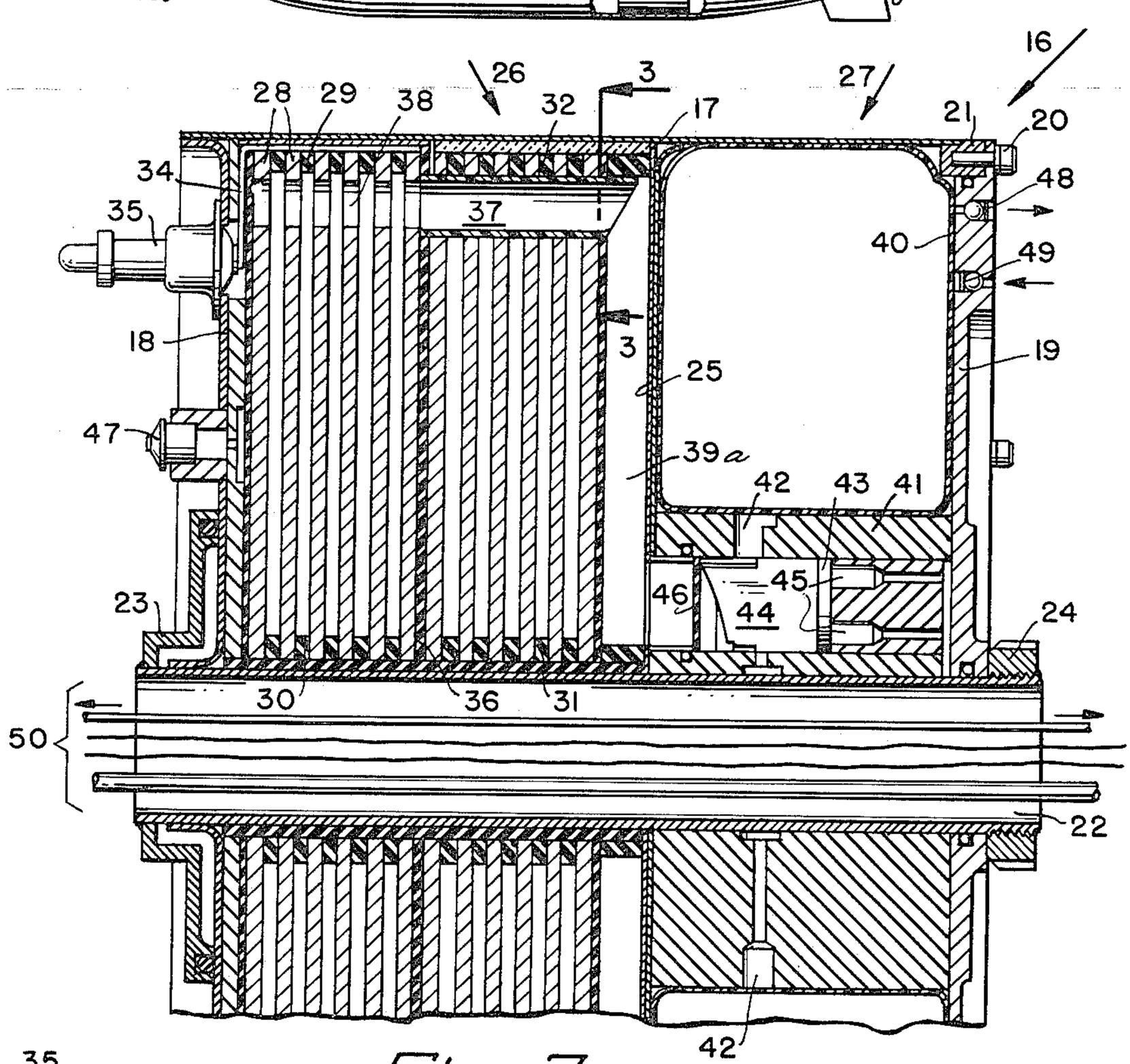


Fig. 2

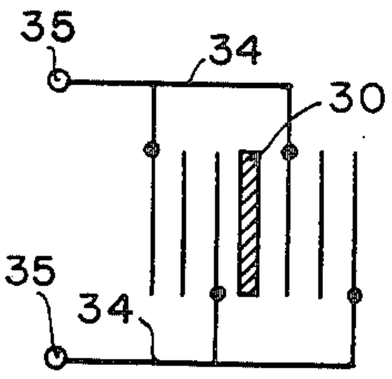


Fig. 4

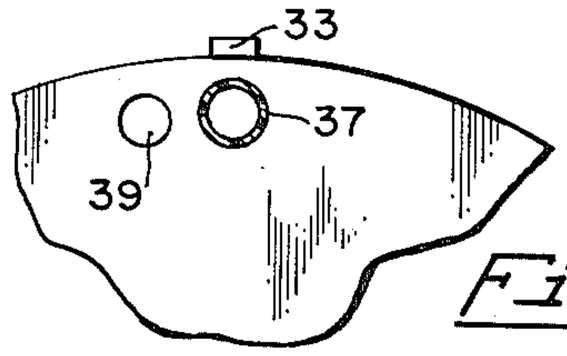


Fig. 3

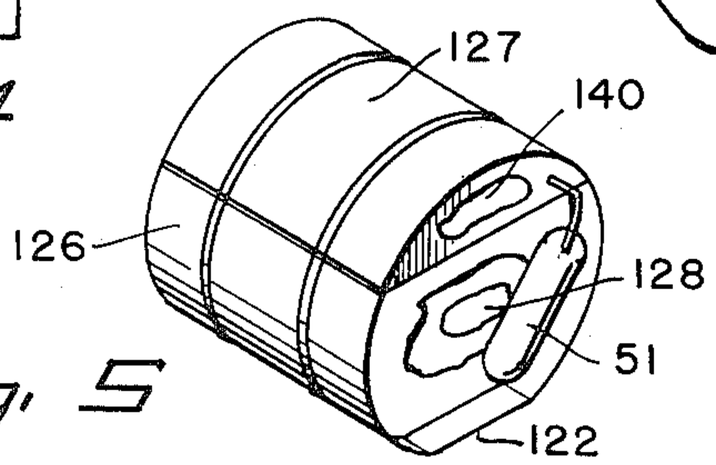


Fig. 5

INVENTOR.
JOHN LESLIE JONES
BY

Y. C. Muller

ATTORNEYS.

United States Patent Office

2,953,111

Patented Sept. 20, 1960

2,953,111

BATTERY CASE AND FILLING MECHANISM

John Leslie Jones, Pasadena, Calif., assignor to the United States of America as represented by the Secretary of the Navy

Filed Dec. 12, 1958, Ser. No. 780,172

6 Claims. (Cl. 114—20)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to torpedoes and more particularly to primary batteries for supplying electrical energy to torpedo electric propulsion motors.

The development of warfare tactics, wherein a torpedo is employed to destroy an intended target, has undergone many changes since the inception of the torpedo, probably the most important during the last decade or so involving the advent of sonar and faster moving targets. To be most effective a torpedo should among other characteristics carry a maximum explosive pay load and have high speed during the relatively short period of its run to a target. These factors call for a propulsion system of high energy output, minimum weight and minimum volume. Steam and gas turbines have reached a high state of development in the fulfillment of these requirements, but have disadvantages in that they are extremely complicated and expensive to produce. An electric motor, as is well known, can be designed to produce large amounts of power with relatively small weight and volume but its source of energy, the battery, has heretofore been bulky, heavy, and due to rectangular or other shapes formerly employed has not utilized available volume in the torpedo to best advantage.

It is one of the objects of this invention to provide a primary torpedo battery of high energy drain rate for a short discharge time which utilizes available space in a torpedo to optimum advantage, thus rendering available for use space for other torpedo components.

Another object is to utilize the cylindrical shape of an intermediate portion of a torpedo to best advantage by providing a battery which substantially fills a portion of its length.

Another object is to provide communication requirements for electrical or other components disposed ahead of the battery and those disposed to the rear thereof.

Still further objects, advantages and salient features will become apparent from the description to follow, the appended claims, and the accompanying drawing in which:

Fig. 1 is a side elevation of a torpedo, a portion being broken away to show the battery forming the subject of the invention;

Fig. 2 is an enlarged central longitudinal section through the battery;

Fig. 3 is a section taken on line 3—3, Fig. 2,

Fig. 4 is a wiring diagram; and

Fig. 5 is a perspective of a modified form of battery configuration, portions being broken away.

Referring to the drawing, Fig. 1 illustrates a torpedo hull **10** of conventional form having a converging nose section **11**, a cylindrical central section **12**, and a generally conical tail section **13**. The nose section contains the warhead or explosive, target homing apparatus, such as a transducer and associated equipment, while the tail

section contains an electric motor and other necessary apparatus for rotating the torpedo propellers **14**. Fins **15** are provided with any conventional control surfaces, such as horizontal and vertical rudders, which guide the torpedo to its target in response to signals received from the target homing apparatus disposed in the nose section.

Referring now to Fig. 2, the battery **16** comprises a cylindrical outer casing **17** closed at the ends thereof by end plates **18**, **19**. The periphery of plate **18** may be welded or otherwise secured to one end of the casing and plate **19** is removably secured to the other end by screws **20** which engage a flange **21**, welded to the other end. A tube **22**, having an integral flange **23** on one end thereof sealingly engaging plate **18**, extends through and between the end plates and is maintained in position by a nut **24** engaging plate **19**. Suitable gaskets and O-rings may be employed as desired to render the casing gas and liquid tight. A transverse plate or bulkhead **25** suitably sealed at its periphery to the casing **17** and to tube **22** divides casing **17** into two compartments **26**, **27** to now be described:

Compartment **26** is substantially filled with annular cells **28** which are spaced apart and spaced from any metal parts of the casing by dielectric spacers **29**, **30**, **31**, **32**. As illustrated in Fig. 4 the cells comprise two sets, each in electrical series, the two sets being electrically connected in parallel to thus provide the output voltage of one set but a current drain equal to the sum of the two sets. Suitable tabs **33** project from the periphery of the cells and are joined by bus bars **34** to the terminals **35** of the battery. The unshown bus bar in Fig. 2 and its terminal **35** may be angularly spaced from the one shown, as desired. The two sets are also electrically insulated by a dielectric plate **36**. A dielectric tube **37** extends through the right set of cells, and is aligned with apertures **38** in the left set. The right set is provided with similar aligned apertures **39**, as shown in Fig. 3, which are angularly displaced relative to the apertures in the left set. Tube **37** and aperture **39** thus directly and independently communicate the spaces between the cells of each set with a common communication passage **39***a* which delivers electrolyte to both cells at equal rate of flow and concentration of the electrolyte.

Compartment **27** contains an annular collapsible bag **40** containing electrolyte which surrounds a hub-like member **41**. Member **41** is provided with one or more suitable spaces **42** containing conventional squibs which may be electrically ignited to rupture the inner wall of the bag. Member **41** is also provided with a piston **43** carrying a knife blade **44** which is actuated by one or more squibs disposed in spaces **45** which move the piston and knife blade to the left rupturing rupture disc **46**.

Prior to use of the battery, compartment **26** is evacuated through a suitable connection or check valve **47** which communicates with this compartment. A check valve **48**, disposed in plate **19**, prevents ambient pressure within the torpedo hull from communicating with compartment **27** prior to activating the battery. When the squibs are fired the bag and disc **46** are ruptured whereupon the difference in pressure between the two compartments now permits check valve **49** to open allowing ambient pressure within the torpedo hull to collapse the bag and deliver its contents to the cell chamber. The bag is so proportioned to the spaces between the cells, the porosity of the cells, and the communicating passages between the bag and cells, that the entire surfaces of the cells will be in contact with electrolyte.

Any control wires **50**, hydraulic communications, or mechanical interconnections between components in the front and rear ends of the torpedo pass through tube **22**.

Fig. 5 illustrates another embodiment of the invention

wherein cell compartment 126 and electrolyte compartment 127 when assembled adjacent each other are substantially cylindrical but do not contain the axial communication tube, in lieu thereof, a chordal portion 122 being cut away from compartment 127 to provide a space adjacent the hull and between opposite ends of the battery through which the control wires or the like may extend. As in the first embodiment described the volume of the electrolyte compartment is sufficient to completely fill the cell compartment. Cells 128 are spaced in the same as in the previous embodiment but their shape is that of the cross sectional shape of compartment 126. Similarly, the collapsible bag 140, disposed within compartment 127, is of a shape to conform to its outer arcuate, inner chordal and parallel end walls. As in the previous embodiment, compartment 126 is evacuated but in lieu of creating a differential pressure by ambient or inside torpedo hull pressure and evacuated cell compartment pressure, a pressure source, such as a high pressure gas flask 51 is employed to pressurize compartment 127 and collapse the bag contained therein. As will be apparent, this high pressure gas source may also be employed with the previous embodiment in lieu of the ambient or inside torpedo hull pressure.

The material, construction of the cells and electrolyte may be of any desired high energy type but preferably of the type disclosed in my copending application, Serial No. 342,761 for Primary Electrical Battery, filed March 16, 1953 (now abandoned).

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. In a torpedo having a cylindrical hull portion intermediate its ends and a unitary primary battery contained within a casing of substantially right circular cylindrical shape and of a diameter substantially equal to the internal diameter of said portion, closed at opposite ends therefore, and forming a bulkhead between the ends of the torpedo, the improvements comprising; a space extending between opposite ends of said casing through which means for interconnecting components disposed forwardly and rearwardly of said battery are adapted to extend, said casing comprising a first compartment containing a plurality of parallel spaced cells in normally dry state and forming a predetermined void volume, and a second compartment containing an electrolyte for activating said cells, the volume of said second compartment being proportioned to said void volume to substantially fill same without substantial reserve of unusable electrolyte whereby the volume of the battery

approaches an optimum proportion of cells, voids and electrolyte, and means for delivering said electrolyte from said second compartment into said first compartment when desired to thereby activate said cells.

2. A battery in accordance with claim 1 wherein said space comprises a central aperture extending axially through the battery.

3. A battery in accordance with claim 1 wherein said space is disposed between a portion of the periphery of the battery and the inside surface of the hull and extends in an axial direction of the torpedo.

4. A battery in accordance with claim 1 including a central tube extending between opposite ends of said battery, the interior of said tube forming said space, said first compartment being annular in shape and containing annular cells, said second compartment being axially adjacent said first compartment and containing an annular collapsible bag containing the electrolyte, and means for applying a differential pressure between the outside of the bag and said first compartment for collapsing the bag and delivering its contents to said first compartment.

5. A battery in accordance with claim 1 wherein said first and second compartments each comprise a circular outer wall, parallel end walls and a chordal wall, the chordal walls being juxtaposed whereby the assembled compartments are substantially right cylindrical in shape, said first compartment having a chordal cut-out to provide said space, said first compartment containing cells of the shape of its cross section and said second compartment containing a collapsible bag of a shape to conform to its inside walls, and means for applying pressure to said second compartment for collapsing the bag therein and delivering its contents to said first compartment.

6. A battery in accordance with claim 1 wherein said cells comprise a plurality of like sets of cells of equal number in electrical series, the sets being in electrical parallel to thereby produce voltage equal to that of one cell and a current flow directly proportional to the number of sets, and means for independently delivering electrolyte to each set at the same concentration, whereby each set produces its proportionate amount of the total current.

References Cited in the file of this patent

UNITED STATES PATENTS

1,348,152	Conlin	Aug. 3, 1920
1,378,291	Sperry	May 17, 1921
2,491,640	Blake	Dec. 20, 1949
2,710,458	Reed	June 14, 1955
2,847,494	Jeannin	Aug. 12, 1958