Jan. 8, 1963 R. MERZ 3,071,883

UNDERWATER PROJECTILE

Filed June 30, 1959

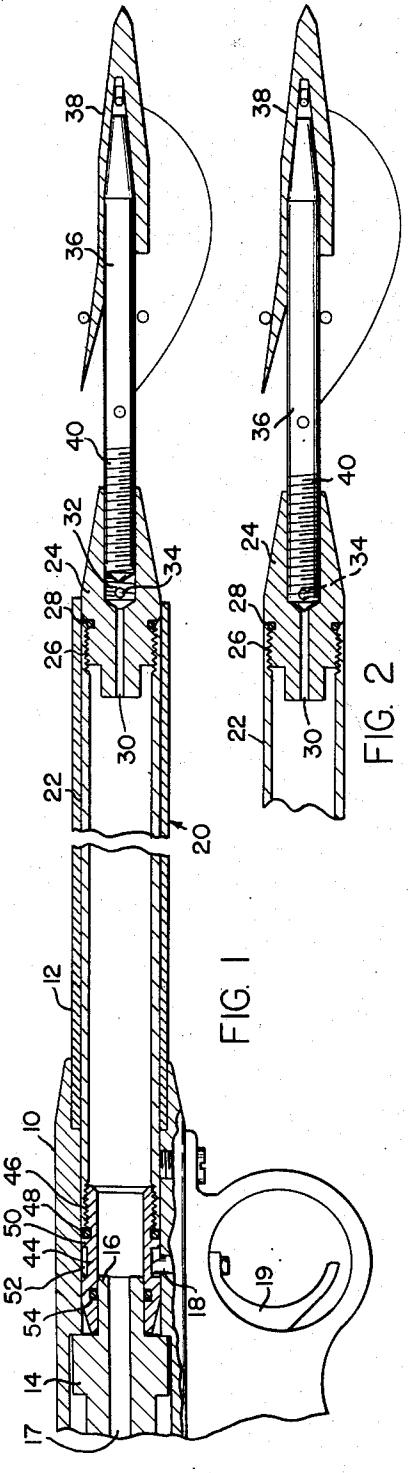


FIG. 1

FIG. 2

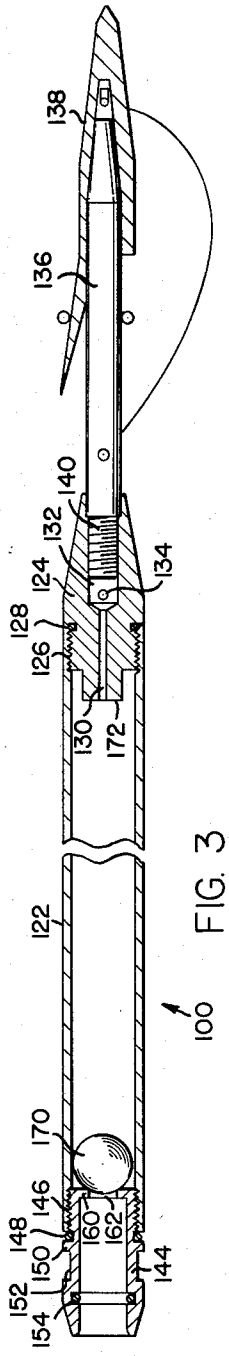


FIG. 3

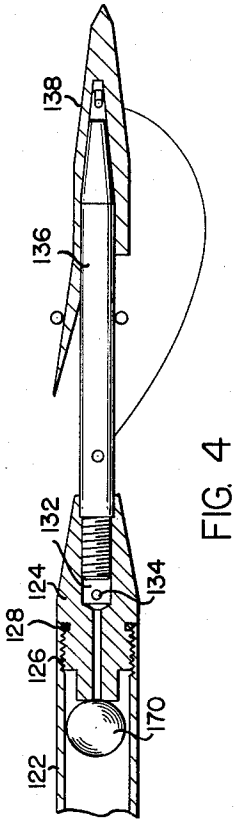


FIG. 4

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UNDERWATER PROJECTILE

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5 Claims. (Cl. 43—6)

The present invention relates to underwater projectiles, and more particularly to projectiles adapted to be fired from a gas-operated underwater gun while submerged. In a more specific aspect, the invention relates to an elongated hollow spear-like projectile which is adapted to be filled with the propelling gas while it is loaded in the gun so that when the projectile is released it is propelled through the water with great power and extreme accuracy. This is partly due to the fact that the spear is subjected to the maximum propelling pressure before the spear leaves the barrel of the gun, and partly due to the fact that the propelling gas fills the hollow spear prior to firing and expands in the spear after it leaves the barrel of the gun thus producing an additional reactionary propelling pressure.

One object of the present invention is to provide an improved elongated hollow spearlike projectile for gas-powered underwater guns.

Another object of this invention is to provide an improved underwater projectile of the character described which can be loaded into the gun while submerged.

Another object of this invention is to provide an improved underwater projectile of the character described which permits the propelling gas to eject water from the interior of the projectile prior to firing while it is loaded in the gun.

A further object of this invention is to provide an improved underwater projectile of the character described which permits the propelling gas to effectively force the water out of the hollow portion of the projectile prior to firing and also to seal the hollow chamber in the projectile to prevent the escape of gas, prior to firing, after the water is forced out of the projectile.

A still further object of this invention is to provide an improved underwater projectile of the character described, which is simple in its construction, and inexpensive to manufacture.

Other objects of this invention will become apparent from the drawings, the specification, and the appended claims.

In the drawing:

FIG. 1 is a fragmentary sectional view of an underwater spear constructed according to one embodiment of this invention, and showing the spear inserted in firing position in an underwater gun with the water outlet of the spear open;

FIG. 2 is a fragmentary sectional view of the spear shown in FIG. 1 showing the water outlet closed;

FIG. 3 is a fragmentary sectional view of a modified hollow underwater projectile with the water outlet of the spear open; and

FIG. 4 is a fragmentary sectional view of the spear shown in FIG. 3 with the water outlet closed.

An underwater spear constructed according to this invention is adapted to be used with a gas powered gun such as disclosed in application of William R. Malcolm, Serial No. 800,503, filed March 19, 1959, and reference may be made to that application for a more detailed description of this gun. The gun shown comprises a tube **10** to which is attached a barrel **12**. A valve body **14** is secured in the tube **10** and has a forward portion **16** of reduced diameter around which the spear is adapted to seat when in firing position. A manually-operated valve (not shown) controls the admission of gas from a pressurized cartridge (not shown) through a central bore **17** formed in the valve body **14** into the hollow projectile. A trigger sear **18** is slidably mounted in the tube **10** and is attached to a trigger **19** which withdraws the sear from the interior of the tube **10** to release a projectile held therein.

The projectile is generally referred to as **20**. It comprises a tube **22** which is closed at its forward end by a plug **24** which is threaded at **26** into the tube. The threaded joint between the plug **24** and the tube **22** is pressure sealed by an O-ring **28**. The plug **24** has an axial bore **30** that communicates at its rear end with the interior of the tube **22** and communicates at its forward end with the rear end of an axially-extending internally-threaded chamber **32** formed in the plug **24**. The plug **24** has a radially-extending duct **34** which communicates at one end with the interior of the threaded chamber **32** and opens at its other end with the exterior. A rod **36**, which has external threads **40** adjacent its rear end threads into the chamber **32**. It has attached at its forward end a piercing head **38**. The rod **36** is rotatably threaded into the chamber **32** so that by turning in opposite directions the rod **36**, the duct **34** may be sealed off or opened, respectively.

The tube **22** has a centering member **44** threaded into it at its rear end which is adapted to be positioned around the forward portion **16** of the valve body **14**, and to center the projectile in the gun barrel. An O-ring **48** is interposed between the end of the tube **22** and a shoulder **50** formed on the member **44** to seal the threaded joint **46**. Rearwardly of the shoulder **50** is an annular groove **52** in which the sear **18** is adapted to engage. An O-ring **54** is positioned in an internal groove in the member **44** to seal the member on the forward portion **16** of the valve body **14**.

Assuming that the diver is under water and wishes to reload the gun shown in FIG. 1, the projectile **20** is inserted into the barrel **12** and shoved rearwardly so that the member **44** sealingly fits about the reduced diametrical portion **16** of the valve body and the trigger sear **18** engages in the annular groove **52**. The rod **36** is then threaded forwardly so that the rear end of the threaded portion **40** of the rod clears the inner end of the duct **34**. The gun is tilted so that the front end of the spear or projectile points downwardly and gas is then admitted through the bore **17** of the valve body **14** and into the interior of the projectile **20** by opening the previously mentioned valve of the gun. The gas forces the water contained in the hollow portion of the projectile through the bore **30** into the chamber **32** and out through the radial duct **34**. When the diver sees bubbles coming from the duct **34** he merely rotates the rod **36** to thread it inwardly in the chamber **32** thus sealing off the duct **34** and preventing any further escape of gas. The aforementioned valve is then shut off, after the pressure in the interior of the projectile reaches the desired amount. To fire the projectile the trigger **19** is pressed which disengages the trigger sear **18** from the annular groove **52** thereby permitting the gas to force the projectile out of the gun.

Referring to FIGS. 3 and 4 a modified spear **100** is shown. This comprises a tube **122** which is closed at its forward end by a plug **124** which is threadably secured to the tube at **126**. An O-ring **128** pressure seals the threaded joint **126**. The plug **124** is provided with an axial bore **130** which communicates at its rear end with the interior of the tube **122** and at its forward end with the rear end of a chamber **132** which is internally threaded for a portion of its length. A radial duct **134** which is formed in the plug **124** communicates at its inner end with the chamber **132** and at its other end with the exterior. A rod **136** is permanently threaded into

the chamber **132** by threads **140**. This rod has a piercing head portion **138** attached at its front end. The rear end of the rod **136** terminates forward of the radial duct **134**. Thus duct **134** is open at all times.

Centering member **144** is threadably secured to the rear end of the tube **122** at **146**. An O-ring **148** which is interposed between the end of the tube **122** and an annular shoulder **150** formed on the member **144** pressure seals the threaded joint **146**. An annular groove **152** on the member **144** is adapted to be engaged by the trigger sear **18**. An O-ring **154** is positioned in an internal groove in the member **144** to seal against the forwardly projecting portion **16** of the valve body **14**. The forward end of the member **144** is partially closed by an annular flange **160** which has a central opening **162** therethrough. A float ball **170** is disposed in the tube **122** to move between the flange **160** and the rear face **172** of projection of the plug **124**.

The projectile **100** is loaded into the barrel **12** of the gun in a manner similar to that described for loading the projectile **20**. The gun is tilted so that the front end of the spear or projectile points downwardly and when gas is admitted into the interior of the cylindrical member **144**, in a manner similar to that described for the embodiment shown in FIG. 1, the pressure of the gas forces water out of the tube **122** through the bore **130** into the chamber **132** and out through the duct **134**. The ball **170** floats forwardly in the projectile **100** as the water is forced out of the tube **122**. When the water is completely forced out of the tube **122** the ball **170** engages against the surface **172** of the plug **124** closing off the bore **130** thereby preventing any further escape of gas. The manual valve of the gun is shut off after the pressure within the hollow projectile reaches the desired amount. The projectile is now ready for firing from the gun.

Thus, I have provided an improved hollow underwater projectile which is adapted to be fired beneath the surface of the water from a gas powered gun, and which can be loaded into the gun while the gun is submerged.

While the invention has been described in connection with two specific embodiments thereof it will be understood that it is capable of further modification, and this application is intended to cover any variations, uses, or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice in the art to which the invention pertains and as may be applied to the essential features hereinbefore set forth, and as fall within the scope of the invention or the limits of the appended claims.

Having thus described my invention, what I claim is:

1. A projectile for use in a gas-operated underwater gun having a barrel, comprising an elongate tube which is adapted to have its rear end inserted in the barrel of the gun, said tube being open at its rear end whereby water may enter, and gas be admitted into said tube to propel the tube from the gun barrel, a plug closing the forward end of said tube, said plug having a duct formed therein communicating with the interior of said tube and opening to the exterior of said plug to discharge water from said tube when gas under pressure is admitted to the rear end of said tube to force the water out of said tube, and a floating member disposed in said tube and movable forwardly and rearwardly therein, said member being adapted to move forwardly with the discharged water by pressure of the gas admitted to the rear of said tube, and said member when in its foremost position closing off said duct.

2. A projectile for use in a gas-operated underwater gun, comprising an elongate tube, said tube being open at its rear end whereby water may enter, and gas be received under pressure and being adapted to be mounted at its rear end in the gun, a plug closing the forward end of said tube, said plug having an axial duct formed therein and opening into the interior of said tube, said plug having a radial duct therein communicating at one end with said axial duct and communicating at its other end with the exterior of said plug for conducting water from said tube and plug upon introduction of gas under pressure into the rear end of said tube, a member threaded into said plug and extending forwardly beyond said plug, a floating member disposed in said tube and freely movable therein, an end member attached to said tube adjacent its rear open end for keeping said floating member in said tube, said floating member being adapted to be forced forwardly through said tube by gas pressure to close off said duct when the water has been expelled from said tube.

3. A projectile adapted to be fired by gas pressure from an underwater gun that has a barrel and that is adapted to hold a source of gas pressure, said projectile comprising an elongate tube adapted to have its rear end inserted in the barrel of the gun, and having means at its rear end for mounting and centering it in the barrel of the gun, said tube being hollow and forming a chamber for reception of gas from the source in said gun to propel the projectile from the gun, said tube being open at its rear end whereby water may enter, and gas be admitted from the source into said chamber, a plug secured in said tube at the forward end thereof and closing said tube at its forward end, said plug having a duct extending therethrough and communicating at its rear end with said chamber and at its other end with the exterior of said plug, for conducting water from said chamber upon introduction of gas under pressure into said chamber, and closure means movably mounted relative to said plug and movable on said projectile in opposite directions for opening and closing, respectively, said duct.

4. A projectile as claimed in claim 3, wherein said closure means comprises a rod that carries a piercing head at its forward end and that threads at its rear end into said plug, and that is manually adjustable in said plug selectively to open and close said duct.

5. A projectile as claimed in claim 3, wherein said closure means is mounted in said tube and is movable in said chamber under pressure of gas entering the rear end of said tube to close off said duct.

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