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PNEUMATIC HARPOON GUN AND HARPOON THEREFOR

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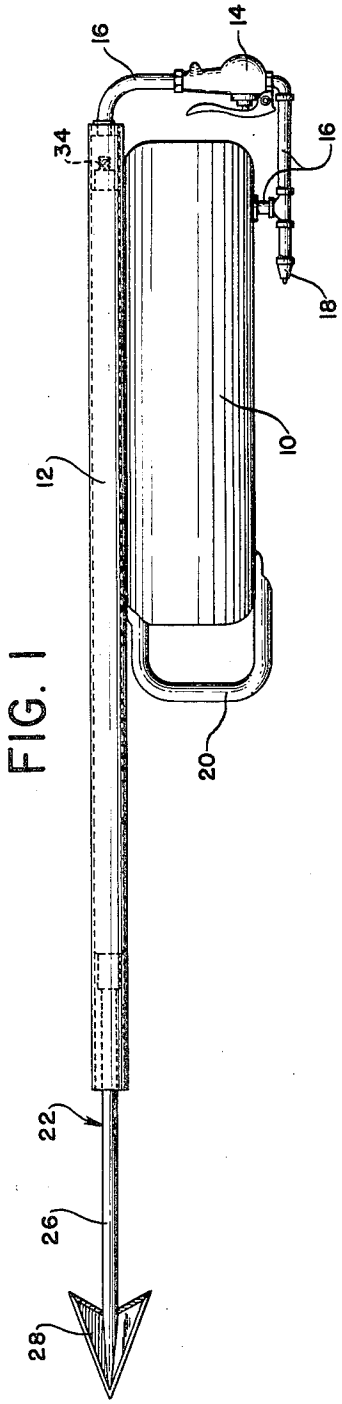


FIG. 1

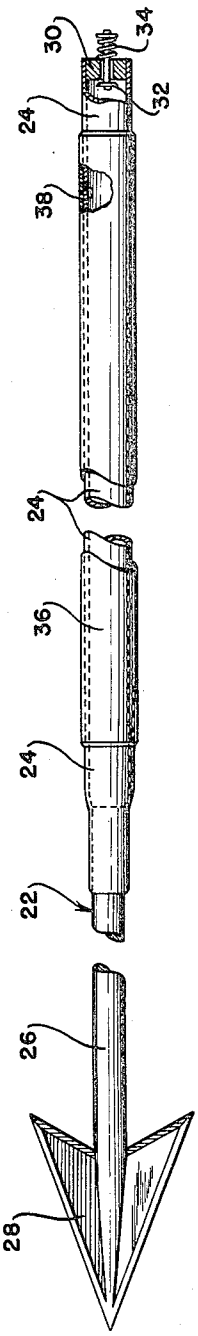


FIG. 2

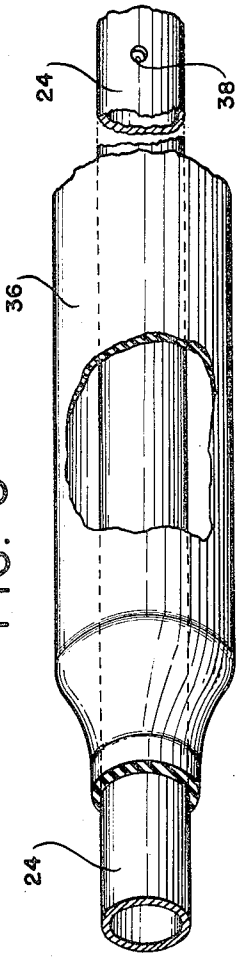


FIG. 3

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PNEUMATIC HARPOON GUN AND HARPOON THEREFOR

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6 Claims. (Cl. 43—6)

This invention relates to improvements in pneumatic harpoon guns and in harpoons for use therein for spearing fish and similar purposes.

Harpoon guns are now used to a considerable extent for spearing fish. In some of these guns, the harpoons are ejected from the gun barrel by means of springs or rubber bands, while in other guns, the harpoons are ejected by air or other gaseous medium under pressure. In some instances the harpoons discharged by the gun carries an attached line so that the harpoon may be recovered if the fish is missed or the fish and harpoon both recovered. However, a line attached to a harpoon is a considerable disadvantage because it often interferes with the aim of the harpoon gun and the line is likely to become snarled and caught on rocks or other under water objects. Where a line is not attached to the harpoon and the fish is missed the harpoon is lost.

The primary object, therefore, of the present invention is to provide an improved pneumatic harpoon gun and harpoon in which the harpoon is provided with means for automatically retrieving the harpoon in case of a miss.

A further object of the invention is to provide a pneumatic harpoon gun and harpoon which are operable in such a manner that the means for automatically retrieving the harpoon cooperates with the gun proper to facilitate the discharge of the harpoon in an effective manner.

In accordance with the invention, the improved harpoon gun comprises a pneumatic harpoon ejection mechanism including a barrel in which the harpoon is inserted, the harpoon being surrounded with an elongated expansible tube or bag which is inflated partially in the gun barrel, thereby sealing off the barrel with respect to the harpoon. In this construction the harpoon includes a hollow shaft provided at its end opposite the spear point with a valve for admitting pressure fluid from the breech section of the gun barrel, the hollow shaft in turn being provided with an orifice through which pressure fluid flows into the inflatable tube or bag around the tubular shaft so that the peripheral surface of the bag is pressed against the interior surface of the gun barrel.

The pneumatic harpoon includes a storage chamber for a gaseous fluid under pressure, a conduit for supplying fluid into the breech of the gun barrel and a trigger-operated valve for releasing the fluid from the pressure chamber into the breech of the gun barrel.

The inflatable tube surrounding the hollow shaft of the harpoon grips the interior of the gun barrel to prevent leakage of air around the harpoon and at the same time controls the acceleration of the harpoon from a static condition to the full velocity of the air as it is ejected so that the harpoon is ejected without shock. In addition to these important functions and results the inflatable bag also serves as a means for floating the discharged harpoon to the surface of the water, in case of a miss, or floating both the harpoon and a fish to the surface of the water.

The improved pneumatic harpoon gun of the present invention includes other features, objects and advantages described more in detail hereinafter in connection with the accompanying drawings forming a part of this invention and in which one embodiment of the invention is illustrated.

In the drawings:

Fig. 1 is a side elevational view of a pneumatic harpoon gun according to the invention, showing the improved harpoon thereof in the barrel of the gun in the process of being ejected;

Fig. 2 is an enlarged broken side elevational view of the improved harpoon shown in Fig. 1, with parts broken away and shown in section; and

Fig. 3 is a broken view similar to that of Fig. 2, showing the tube inflated.

Referring to Fig. 1 of the drawings, the improved pneumatic gun includes an air cylinder **10**, in which air or other gaseous pressure medium is stored under pressure, a tubular gun barrel **12** fixed to the surface of the cylinder, a hand-operated air valve **14** located in tubing **16** for charging the gun barrel with air from the cylinder, an air charging valve **18** connected into the tubing **16** for pressurizing the cylinder **10** with air or other gaseous pressure medium. The hand-operated air valve **14** serves as a breech handle for the gun, while the forward end of the cylinder **10** is provided with a forward hand grip **20** located under the barrel **12**, the foregoing parts of the gun being advantageously arranged in the manner shown in Fig. 1.

The air charging valve **18** may be of the tire valve type and the cylinder **10** may be charged with air from the usual air supply from automobile service stations. The cylinder may be charged at pressures of from 40 to 120 lbs. per square inch, 40 lbs. being satisfactory provided the barrel **12** is of sufficiently large diameter for that pressure, as will be readily understood. The pneumatic harpoon gun shown in Fig. 1 includes a harpoon **22** in the barrel **12** ready to be fired or ejected upon the actuation of the valve **14**.

The structure of the improved harpoon **22** is shown more in detail in Fig. 2, in which it will be seen that the harpoon comprises a hollow cylindrical metal tube **24** swedged at one end to a solid metal shaft section **26** provided with a barbed spear point **28**. At its opposite end the hollow cylindrical tube **24** is blocked off by means of a fixed plug **30** carrying an air inlet valve **32** normally biased to closed position by means of a light spring **34** on the outside of the plug **30**. An inflatable rubber tube **36** surrounds the major portion of the length of the hollow tube **24** with a short section of its end portions sealed or cemented to the tube **24** by a cement, adhesive, or other suitable means. The rubber tube **36** is not secured to the hollow tube **24** except for its end portions, and within the secured end portion at the valve end of the harpoon, the hollow tube **24** is provided with a small orifice **38** for admitting air under pressure from the hollow tube **24** into the inflatable rubber tube **36** for inflating the latter.

When the harpoon **22** is inserted in the barrel **12** of the pneumatic gun, as in Fig. 1, and the valve **14** operated, air at high pressure and velocity is released from the cylinder **10** through the tubing **16** into the breech of the gun barrel **12**. However, the harpoon **22** will not be immediately ejected, that is, until there is a build up of air pressure inside the hollow tube **24** of the harpoon through the inlet valve **32**, which is opened by the air admitted to the breech of the gun barrel **12**. When the air pressure has been built up and substantially equalized in the breech of the gun and the tube **24**, the valve **32** will close and the harpoon will be ejected from the barrel of the gun.

During the time the air pressure is building up in the hollow tube **24**, a small stream of air will pass through the orifice **38** to inflate and expand the rubber tube **36** against the inside of the gun barrel, thereby preventing air leakage past the harpoon so that the latter is ejected in the most efficient manner. As the rubber tube **36** is inflated it is charged with air at a pressure about equal to the air pressure in the breech of the gun barrel before the harpoon is ejected, resulting in the acceleration of the harpoon from a static condition to the full velocity of the air admitted to the breech of the gun barrel, and in its discharge without any shock. The lack of shock in discharging the harpoon is due to the inflation of the rubber tube **36**, which grips the interior of the gun barrel until the harpoon is ejected.

After the trigger of the valve **14** is pulled, the hollow shaft of the harpoon is filled with air under pressure and the tube **36** around the shaft begins to inflate until it fits the barrel of the gun. Because of these conditions, the

shaft gradually approaches its discharge velocity, which for the first second is 48 feet per second, as determined by actual tests. Tests also show that the shaft or harpoon has a striking force of 180 foot lbs. In view of these conditions it is apparent that the harpoon will reach its objective, under normal circumstances, in a fraction of a second, since fish are speared, particularly in sport fishing operations, at comparative close range, that is, at a fraction of 48 feet.

After the harpoon has reached its objective, or missed, the rubber tube **36** will be gradually inflated, as in Fig. 3, by the stream of air under pressure flowing through the orifice **38** from the interior of the harpoon, this inflation being sufficient to provide the necessary buoyancy to float the harpoon to the surface of the water in case of a miss, or to bring up both the harpoon and the fish.

The various parts of the harpoon gun proper, as shown in Fig. 1 are preferably made of suitable metals and the air cylinder **10** will be sufficiently large to accommodate a great many harpoon-ejection operations. The solid metal shaft portion or shank **26** of the harpoon **22** as well as the barbed point or head **28** will be made of suitable metal and suitably fixed in the reduced end portion of the hollow shaft section **24**, which is also preferably made of metal. The hollow portion of the harpoon shaft is preferably of considerable length so that it extends the major portion of the length of the gun barrel. Likewise the rubber bag or tube **36** extends for the major part of the length of the hollow section of the harpoon shaft so that it presents a long cylindrical gripping surface for the inside of the gun barrel **12** during the pressure build-up and ejection of the harpoon, and at the same time will hold a sufficient volume of air for bringing the harpoon to the surface of the water.

When an ejected harpoon is retrieved from the surface of the water the air is released from the rubber tube **36** by pressing in on the stem of the valve **34** so that the rubber tube deflates and assumes its normal close fit around the hollow shaft **24**. The air pressure in the hollow shaft and rubber tube excludes entry of water so that the interior of the shaft and rubber tube are kept dry.

What I claim is:

1. In a pneumatic harpoon gun including a tubular barrel, a harpoon having a shaft fitting in the barrel, means for storing a gaseous propellant under pressure, means including a valve for conducting gaseous propellant from the storage means into the breech of the barrel behind the shaft of the harpoon, a considerable part of the shaft of the harpoon normally fitting in the barrel of the gun being hollow, valve means for admitting propellant from the breech of the barrel into the hollow shaft, and an inflatable tubular member surrounding a considerable part of the shaft in the barrel with its ends sealed to the shaft, said shaft being provided with an orifice for the flow of propellant from the hollow part of the shaft into the inflatable member, whereby said member is expanded against the interior of the gun barrel when propellant is supplied thereto and holds the shaft in the barrel until a discharge pressure is built up in the barrel and said hollow shaft pressurized, said inflatable member after discharge of the harpoon being inflated from the pressurized hollow shaft to float the harpoon in water.

2. A pneumatic harpoon gun as claimed in claim 1, in which the valve means for admitting propellant to the hollow shaft comprises a valve at the base end of the shaft biased to closed position and openable by the build up of pressure of the propellant in the breech of the gun barrel.

3. In a pneumatic harpoon gun as claimed in claim 1, in which the inflatable tubular member normally fits the peripheral surface of the hollow portion of the shaft.

4. In a pneumatic harpoon gun including a tubular barrel, a harpoon including a hollow shaft section, a shank carrying a barbed head attached to one end of said hollow section, a valve at the other end of the hollow section biased to closed position for preventing the escape of a gaseous pressure medium therefrom, said valve being responsive to an external pressure for admitting gaseous pressure medium to the interior of the hollow section of the shaft, an elastic inflatable tubular member surrounding a considerable portion of the hollow shaft section, the ends of said tubular member being sealed to the shaft, and an orifice in the hollow portion of the shaft for conducting gaseous pressure medium therefrom into the inflatable tubular member, whereby said inflatable tubular member is inflated by the gas pressure in the hollow shaft section after discharge of the harpoon from the gun so that the discharged harpoon is readily recoverable.

5. A harpoon for a pneumatic harpoon gun comprising a straight hollow shaft section, a shank carrying a barbed spear point attached to one end of said hollow section, an air inlet valve at the other end of the hollow section, means for biasing said valve to closed position, an inflatable bag carried by the harpoon, and means providing a conduit for conducting a restricted flow of air from the hollow section into the inflatable bag, whereby air under pressure in the hollow section of the harpoon is adapted to flow into, inflate the bag and float the harpoon when it is discharged into water.

6. A harpoon as claimed in claim 5, in which said inflatable bag comprises a sleeve-like tubular member surrounding the hollow section of the shaft, and means for sealing and securing the ends of the tubular member to the shaft.

No references cited.