June 23, 1970 W. GUIER 3,516,723

MEANS FOR ESTABLISHING VISUAL COMMUNICATION IN FLUIDS RESISTANT TO LIGHT PENETRATION

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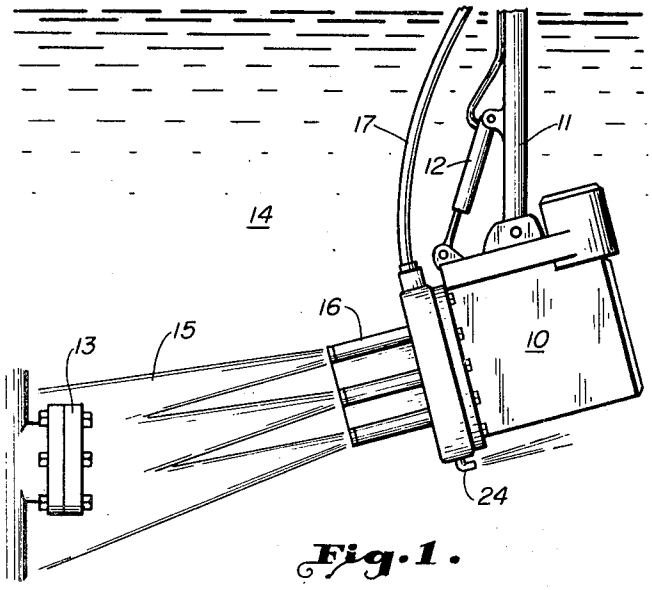


Fig. 1.

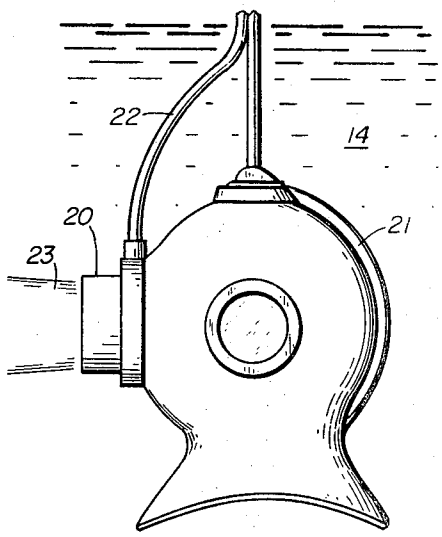


Fig. 2.

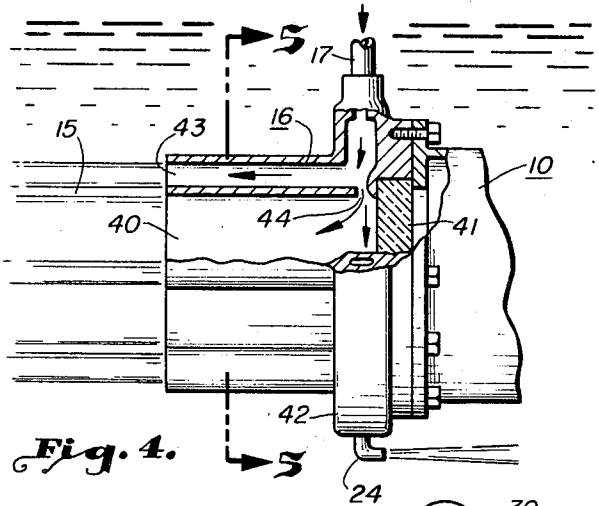


Fig. 4.

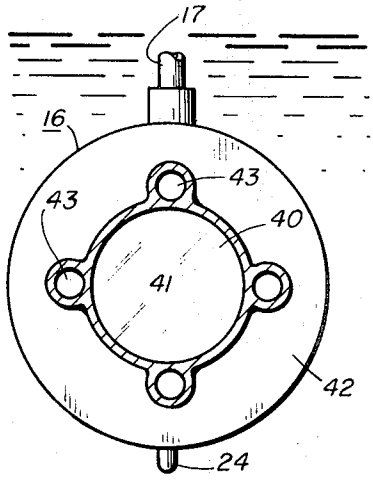


Fig. 5.

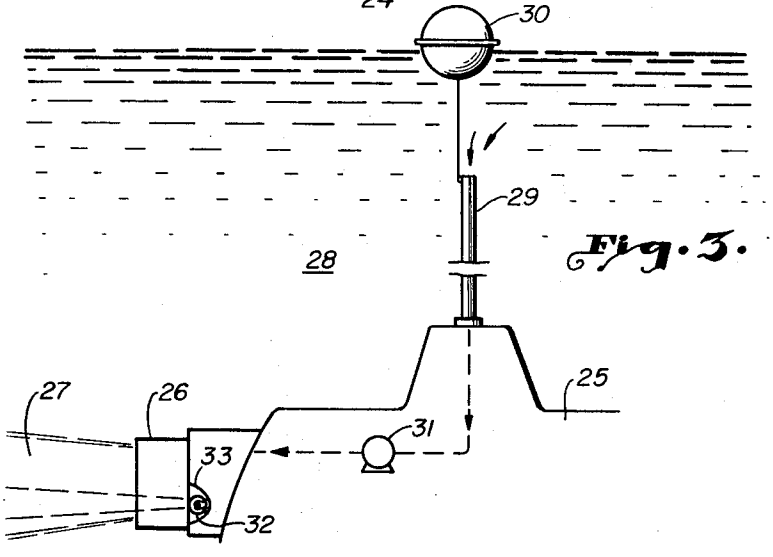


Fig. 3.

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MEANS FOR ESTABLISHING VISUAL COMMUNICATION IN FLUIDS RESISTANT TO LIGHT PENETRATION

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U.S. Cl. 350—63 1 Claim

ABSTRACT OF THE DISCLOSURE

An attachment for a subsea viewplate is connected to a source of clear fluid which is discharged by the passages of the attachment in a column having a core which readily transmits light for viewing, the core being provided an incapsulating curtain of the fluid to give definition to the core shape.

The present invention relates to visual communication through fluids which have a high resistance to light transmission. More specifically, the present invention provides a relatively clear column of liquid between two points in liquids through which visual contact cannot otherwise be established between the two points.

Off-shore drilling and production operations have increasing requirements for the services of personnel working in diving gear of some type. Skin diving is practiced in some areas. A helmet and complete suit must be used at greater depths and longer periods. Submersible vessels are developed for still greater depths.

Regardless of the type of diving gear employed, a common problem descends when the work is in waters filled with material in suspension. In many instances the water cannot be penetrated by light, rendering visual contact impossible. The diving personnel find themselves in a "sea of ink" and are restricted to working on submerged oil well equipment by feel. Obviously this limitation slows any work and raises the hazards to the submerged, working personnel.

The murky waters off the coast of Louisiana are well known for their obstruction to light. Perhaps the most recent and dramatic of these problems are found in Cook Inlet of Alaska. Here intense cold combines with heavy suspensions of vegetable matter to marke the working conditions for the diver some of the most demanding in the history of submarine oil production.

By and large, the Cook Inlet diver has given up all attempts to use sight. To avoid breakage, he wears a metal plate over his helmet window and limits himself to working by feel. Timing his working periods to the ebb and flow of the swift tides and his endurance to the cold of these waters, he fumbles blindly in the few minutes available for his tasks. Obviously some degree of sight would increase the amount of work he could accomplish in the work periods.

A principal object of the invention is to establish a column of fluid between a submarine viewpoint and an object to be viewed which will transmit light from the object.

Another object is to main the view plate at a submarine viewpoint transparent while the light-transmitting fluid column is established.

Another object is to provide access to a source of relatively clear fluid which is formed into a view-column through the first part of a fluid body obstructing the passage of light, the source being a second portion of the fluid body.

Another object is to provide a jetted stream of fluid as a view-column and at least a partially reactive, or force compensating, counter jet of fluid.

The present invention contemplates forming a column of relatively clear fluid and flowing it from a view point in a lighter-resistive body of fluid to an object to be viewed.

Further, the invention contemplates flowing relatively clear fluid, from a source, over the surface of a viewing window at a submarine view point so as to wash the surface of the window to keep it clear. The wash fluid is then combined with other clear fluid from the source to form a column of the fluid to transmit light for viewing.

Further, the invention contemplates a conduit and piping system to draw relatively clear fluid from a first part of a body of fluid and from it into a view-column through a relatively murky second portion of the fluid body.

Further, the invention contemplates the view-column being formed by jetting it forceably from a fixture mounted on the view plate of apparatus which receives light for visual communication. The jetting force is then counter-balanced, at least in part, by a jet of fluid from structure which is also mounted on the receiving apparatus and directed in a direction to oppose to the force of the jetted view-column.

Other objects, advantages and features of this invention will become apparent to one skilled in the art upon consideration of the written specification, appended claims, and attached drawings, wherein:

FIG. 1 is an elevation of a camera suspended in a body of light-resistive fluid with a fixture mounted thereon with which a view-column of clear water is established in accordance with the invention to a portion of submerged structure of which a picture is required;

FIG. 2 is an elevation of a hard hat, or helmet, of a diving suit to which a fixture is attached to employ the invention in obtaining a view through a window of the helmet;

FIG. 3 is an elevation of a portion of a submarine vessel at the view point with a conduit suspended from the surface to draw clear water from a layer close to the surface for use in a view-column at a lower layer;

FIG. 4 is a partially sectioned elevation of the housing of FIG. 1 in which the invention is embodied; and

FIG. 5 is a section of FIG. 4 taken along lines 4—4.

GENERAL PLAN

Referring to FIGS. 1 and 2, there is disclosed two pieces of diving equipment which employ the present invention. In FIG. 1 a closed circuit television camera **10** is depicted, lowered on a support member **11** and further positioned by a hydraulic piston **12**. A view of an object **13** is desired by camera **10**. Inspection of equipment, represented by **13**, is possible with receiving equipment at the surface of fluid body **14**. Preparation for service, or modification, is thereby possible. However, if fluid body **14** has solid matter dispersed and suspended in it, very little reflected light may reach camera **10** at the view point. The present invention provides a column **15** of relatively clear fluid between the camera and object. Reflected light from the object will then reach the camera to provide the desired view.

Column **15** is formed by relatively clear fluid discharged, in the desired pattern, from housing **16**. The

fluid is brought from a source, not shown in this FIG. 1, through conduit **17** and formed into column **15** which extends from the viewing window of camera **10** to object **13**. Visual communication is thereby established.

FIG. 2 discloses a modified version of housing **16**. Housing **20** is adapted and arranged to be mounted over the view part of "hardhat," or helmet, **21** of a diver submerged in a fluid body **14**. Fluid which will transmit light is conducted to housing **20** through conduit **22**. A column **23** is formed, extending from the view plate of helmet **21** to the length the column of fluid will be maintained in body **14**. The aid of visual contact is thereby available to the diver to support his work on equipment represented by object **13** of FIG. 1.

There are several generalizations appropriate to the general plan of view-column establishment. Obviously a source of relatively clear fluid must be provided. The source may require some form of chemical treatment to give it the proper clarity for use in this application.

The force required to discharge this clear fluid may develop a reactive force on the camera, or helmet, which will tend to move these pieces of equipment from the desired view point. Nozzle **24** may be used to discharge a portion of the clear fluid in a direction to oppose the force of the view-column discharge and stabilize the equipment at the view point.

The object **13** is seen because it reflects light from an original source. If natural light will not reach object **13** through body **14**, an artificial source must be provided. This source can be located within the camera, or helmet, at the view point. The source can also be mounted independently and near enough to object **13** to provide the required amount of reflected light. The source could even be provided with a separate column of clear fluid to place enough light on object **13** for the required reflection along the length of columns **15** and **23** to their view points.

At least two features of the invention are disclosed in FIG. 3. First, it is demonstrated how a source of clear fluid for column **27** can be drawn from a suitable portion of body **28**. The suitable portion could be an upper layer of the fluid of body **28**. Conduit **29** is shown elevated by float **30** to withdraw the the clear fluid down to housing **26**. A pump **31** is indicated as included in a conduit system to force the clear fluid downward and through housing **26** to form view-column **27**.

Secondly, the light reflected from the object to be viewed may be supplied from a source within housing **26**. This source of light may have its light directed down view-column **28** and on the object to be viewed. This light, reflected back up the view-column, will then be visible from the view point behind housing **26**.

Light source **32** is indicated, mounted to one side of the view point. A shield represents means for directing and focusing the light down column **27**. Also, the light source is shown against the window of housing **26** to illustrate that the heat generated with light may be exchanged with the fluid passing through the housing and flowing over the viewing window. Thus, the invention provides for directing the fluid into useful heat exchange with light source **32** and subsequently formed into view-column **27**.

HOUSING 16

FIGS. 4 and 5 disclose the details of housing **16** which generate view-column **15**. It is recognized that evolvement of the actual reduction to practice may change the shape and arrangement of many features of housing **16**. However, the concept of the invention should be a common denominator of all such structure.

Basically, housing **16** is a cylindrical tube with a first passage **40** extending axially therethrough. The viewing window **41** of camera **10** is at one end of this first passage and column **15** extends from this window, through the passage and on to the viewed object, not shown in this FIG. 4.

The housing **16** includes a manifold **42** which is connected and communicated to conduit **17** to receive the clear fluid from its source. This clear fluid must be distributed about first passage **40** to be flowed out in forming column **15**. Second passages **43** are arranged to illustrate a structure to make the required distribution.

FIG. 5 shows passages **43** as cylindrical in configuration. Of course they may be other shapes that will provide the distribution which will form the outer surface of the column **15** to give continuity to the view-column as a transmitting media of light.

More specifically, the clear fluid discharge from passages **43** are to form a curtain of the fluid about the interior of the view-column. The interior of the column is made up of clear fluid discharged down first passage **40**.

Clear fluid flows from manifold **42** through openings **44** which communicate manifold **42** with passage **40** near window **41**. One or more openings **44** may also be arranged as desired about the edge of window **41** to flow the clear fluid in a cleansing action over the surface of the window. The openings **44** may be sized, as will provide the desired view-column extending down passage **40** and out to the viewed object.

Obviously there is going to be a systematic proportioning of the volumes of fluid passing from manifold **42** out passages **43** and passage **40**. Possibly the passages **43** will generate a stream of fluid which moves a finite rate faster than the stream from passage **40**. This incapsulating curtain of fluid on the outside of the column **15** will tend to give sharper definition to the shape of column **15**. The view-column, formed of the composite streams of fluids will extend farther in body **14** before being dissipated.

Additionally, if required, counter-jet conduit **24** is connected into manifold **42** to provide any needed stabilization by providing a counter-force to the reaction force of the view-column.

CONCLUSION

Although I have utilized the broader term "fluid" in disclosing the invention, there is an immediate use for the invention in off-shore oil production. Note that my broad claim does not limit the invention to either the specific nature of the submerging fluid or the specific nature of the view-column fluid.

In the immediate application of the invention in the salt water of most offshore installations there is usually an adequate source of clear water and any powering equipment required to force it down and to my novel structure. There is no question but what the increased view provided submarine work will save valuable time in oil production problems.

From the foregoing it will be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth, together with other advantages which are obvious and which are inherent to the method and apparatus.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and sub-combinations. This is contemplated by and is within the scope of the claim.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. A structure with which to establish a view path through a water layer having solid material suspended in the layer in such quantities as to obstruct the passage of light, including,

a housing of generally cylindrical form with an axial first passage aligned with the view path and adapted to be attached to a viewing window,

a source of relatively clear water with which a column is established from the axial housing first passage to

any object which is to be viewed in the murky water layer,

at least one second passage in the housing arranged to discharge water in the form of an incapsulating curtain of water on the outside of the column established from the axial housing first passage,

conduits formed in the housing to connect the source to the first and second passages to direct clear water in the form of an incapsulated column along the line

of sight from the viewing window to the object to be viewed.

References Cited

UNITED STATES PATENTS

1,222,156	4/1917	Steinmetz	350—63
2,481,808	9/1949	Barna	61—70

PAUL R. GILLIAM, Primary Examiner