This invention relates to new and useful improvements in equipment for underwater photography and related uses. Particularly, the invention is directed to new and useful means for protecting and facilitating operation of equipment of the type of cameras and photographic instruments under conditions encountered by a swimmer or diver.

This application is a division of my application Serial No. 377,228, filed July 27, 1959, now Patent No. 3,026,784, which latter is a continuation of my application, Serial No. 420,338, filed April 1, 1954, now abandoned.

It is an object of the present invention to provide a cover for use in protecting equipment of the type of cameras and photographic instruments that will not only protect the photographic equipment from water but that will also incline a body of entrapped air, sufficient in volume to provide the buoyancy necessary to cause the entire assembly in event of accidental release from the hands of the operator, to rise in the water and float on the surface ready for recovery.

It is a further object of the present invention to provide a special exterior finder which will be clearly visible to the operator of the photographic equipment when under water.

It is a further object of the present invention to provide an arrangement whereby the special exterior finder and the covered camera are maintained in fixed relative position.

It is a further object of the present invention to provide means especially adapted to meet the needs of the free swimming or "scuba" diver, for protection of photographic equipment.

Further objects of the invention include overcoming certain disadvantages in presently available underwater photographic equipment. Other objects and advantages according to the present invention will become manifest in the course of the following disclosure.

It is a matter of note that the recent development of improved types of diving gear has greatly increased the capacity of a diver to move freely for prolonged periods of time in an underwater environment. This possibility has arisen very largely as a result of the development of underwater breathing apparatus, of the type exemplified by the "Aqualung." Apparatus of this type enables a human being to descend in the water to considerable depths, unencumbered with heavy diving gear and free from dependence upon a surface supply of air. The pioneer investigations in this field have stimulated widespread interest, and have given rise to an entire new field of activity including recreational occupations and specialized professional military, commercial, and scientific employments.

Essentially the "Aqualung" comprises a cylinder charged with compressed air, a tube and mouthpiece to deliver air to the diver and a valve, responsive to the pressure of the water, which regulates the pressure of the air received by the diver. Additional articles of equipment which may be used by the diver are buoyancy regulating weights, mask or goggles, swimming flippers and protective clothing. It may also be noted that the rise of interest in this form of activity is reflected by an expansion in swimming and diving as a sport, and as a method of scientific exploration. The details in regard to this background require no amplification inasmuch as they form part of the present invention, and are cited merely to indicate the utility and adaptability of the invention.

Proceeding in accordance with my invention, I have found that it is possible to provide an article which greatly facilitates the carrying out of underwater photography, and which to a notable degree obviates disadvantages hitherto encountered.

Whereas the several features and novel improvements which characterize the present invention are pointed out with particularity in the claims annexed to and forming a part of this specification, for better understanding of the invention, and the advantages and specific objects thereof, reference is made to the accompanying drawings and descriptive matter wherein there are illustrated and described certain preferred embodiments of the invention.

FIG. 1 is a perspective view of a cover composed of a yielding portion and a fixed portion wherein is mounted a camera of conventional design, and wherein also is mounted a finding device.

FIG. 2 is a sectional view taken at a vertical plane passing through the center of the camera lens and the center line of the finding device of FIG. 1.

FIG. 3 is a sectional view of a modified form of the invention wherein three windows are provided in fixed relationship to the camera.

FIG. 4 is a sectional view of a further form of the invention wherein a floating window is provided.

FIG. 5 is an exterior view on reduced scale showing the entire cover.

FIGS. 6, 7, 8 and 9 are views showing the manner of closing one end of the flexible or yielding portion of the cover.

Referring now to the drawings, there is shown a cover comprising a yielding portion 20 and a rigid portion 21. The yielding portion is permanently closed at one end in the manner shown in FIG. 5 at 23, and is open at the opposite end, as shown in FIG. 5 at 22. It may be noted that the relative positions of the closed and open ends may be reversed, or if preferred, both ends may be open. The flexible portion thus forms part of the cover, and is in the nature of a bag. The latter is provided with a cut-away portion 24 forming an opening in the front side of the bag, in the form illustrated. It may be noted that if the yielding or bag-like portion of the cover is formed from transparent material, it may not be necessary to provide same with a cutaway portion.

Attached to the flexible portion of the cover shown in FIG. 1, is the rigid portion 21. As shown this comprises a right angled bracket to which the camera is fixedly attached, the bottom part or platform part forming a support for the camera and for the attaching means 26 (shown in FIG. 2), and the vertical part 27 constituting the inner pane of a window.

Attached to the vertical part of the bracket-window is an exterior pane 28, affixed by means of bolts or rivets 29. The inner and outer panes of the window are thus firmly compressed upon the edges of the cut-away portion 24 of the flexible portion of the bag, thereby providing a water tight seal. Thus also, the flexible portion and the rigid portion are consolidated into a single protective cover or envelope for the camera.

In the form of the invention shown in FIG. 1, there is affixed to the fixed portion of the cover, by means of the bolts or rivets 29, a finder 30, which extends outside of the cover, and which consists of an eye 31 and cross-wires 32 mounted in a frame. This finder enables the operator to orient the camera toward the object to be photographed.

In FIG. 3, there is shown a form of the invention
wherein the flexible portion 20 is substantially the same as that shown in FIGS. 1 and 2, with the exception that three windows are provided instead of one. In this form a bracket 42 is provided which extends as shown on four sides of the camera, in a form approaching a square. The upper window 33 and the rear window 34 are constructed in the same manner as the front window 32, which reproduces the construction of the window shown in FIGS. 1 and 2. An exterior finder may be provided having an eye mounted at 35 and a forward cross-wire mounted at 36, although the exterior finder may be dispensed with in this modification for reasons that will be described. Except for the change in means of attachment, the exterior finder is identical with that shown in FIGS. 1 and 2, and is not further illustrated in FIG. 3.

In FIG. 4, there is shown a modification provided with a rearwardly positioned floating window 37, which is not rigidly attached to the bracket.

Referring generally to the invention as shown in FIGS. 1, 2, 3, and 4, the flexible portion 20 is composed of a suitable plastic, water-resistant material such as rubber or flexible plastic material. The bracket and window elements are composed of transparent material and for this purpose I have found transparent rigid plastic sheet material to be suitable. While glass may be employed, especially for the outer panes 28, I prefer a clear transparent stiff plastic sheet material for this purpose.

While any suitable means may be employed for closing the open end of the yielding portion of the cover, I have found the method illustrated in FIGS. 5 through 9 to be satisfactory. As shown, the lips 38 and 39 are brought together in a manner shown in FIG. 6. Thereafter a fold 40 is made at the end. Following this a double bend in the fold is made as shown in FIG. 8, and brought smoothly together as shown in FIG. 9. A clamp (not shown) of conventional design may be then attached to hold the folds in permanent sealed contact.

The platform part of the bracket can be provided with any suitable means for attaching the camera. While it is described to attach the cover only to one camera, I have found that a single perforation drilled in the platform will serve satisfactorily, the camera being attached by a conventional set screw having a knurled knob, for purposes of accommodation of other types or shapes of camera, slots cut in the platform, or other adjustable means may be employed.

The operation of my invention is as follows:

Referring to the drawings, the yielding portion 20, together with the fixed portion 21 forms an envelope that is waterproof and that completely surrounds the camera. The latter is inserted through the open end 22 of the envelope and affixed to the platform 25 by knob 26. To receive the affixing means, holes or slots are provided in the platform, whereby the camera may be suitably aligned. When the camera has been fixed in place, the open end of the envelope is closed tightly, as shown in FIGS. 5 through 9. The envelope surrounds the camera loosely and defines a space larger than the space occupied by said camera and contains after closing a certain amount of entrapped air.

The device may be constructed to accommodate a camera of single design, or it may be constructed to accommodate cameras of different types. In any event, the construction of the rigid portion should be such as to facilitate use of the optical elements of the camera. The camera lens normally will be substantially centered behind the window, and the finder may be aligned with the line of sight from the eye of the operator to the object to be photographed. The placement of the window with respect to the portions of the camera to be brought under observation is within the skill of the art. In the drawings, the apparent slight departure from the operating line of sight is an accommodation of the drawings, and obviously is not designed as a limitation on the construction.

As previously described, the yielding portion is composed of relatively thin sheet material, preferably not necessarily transparent, water and moisture-resistant, tough and pliant. For this purpose rubber is suitable, or one of the numerous plastic materials available on the market. This portion interposes a barrier against ingress of moisture and water, but does not prevent the operator of the camera from reaching the controls, grasping, and moving same at will. There is full ease of movement, and accessibility. The thin material is brought into direct contact with the part of the camera grasped by the operator, and interposes no more impediment to handling than would be experienced if the hand of the operator were encased in a thin glove.

If desired, in order to provide control of the entrapped atmosphere, a humidity controlling means such as a moisture absorbent material may be suitably contained in the envelope or a leading element may be furnished. The air-entrancing space in the envelope serves the purpose of inflating the envelope and thus maintaining a freely movable relationship of the envelope to the camera insofar as the flexible portion of the envelope is concerned. The operator consequently can quickly and without difficulty or prejudgment, reach any part of the camera at will.

The air entrapped in the envelope serves the further purpose of constituting a pneumatic body which, in event of loss of the camera underwater, will float the camera to the surface where it can be readily recovered. It will be readily understood that the volume of entrapped air may be apportioned to the weight of the equipment. Since, according to the invention, the envelope fits loosely, it may be not only individually proportioned to suit the particular camera size, but any particular size envelope will accommodate a certain variation in camera size, and further, the envelope may be adjusted to contain various volumes of air. For example, in the embodiment shown in FIG. 5, the photographer has merely to insert the camera through the opening 22, and after affixing the camera in position, close the opening (FIG. 6), and fold the lips of the envelope (FIGS. 7, 8 and 9). During this process suitable hand pressure on the body of the envelope prior to clamping shut the lips, will force out any desired amount of air, to an extent that the remaining air entrapped in the envelope will suffice for purposes of flotation.

The volume of air required for flotation of the assembly may be most easily determined by the user by simply tightening the clamp and immersing the apparatus in water. For construction purposes those skilled in the art can readily calculate the necessary size of the cover from the weight of the equipment the cover is intended to contain. The size of the cover should be such as to provide a body of inclosed air the volume of which when converted to weight based on the known density of water, should somewhat exceed the weight of the contained equipment—in brief, should be sufficient to provide buoyancy.

While I have found ordinary, atmospheric, unconditioned air to serve satisfactorily as the gaseous content of the envelope, it is entirely feasible to maintain dehumidified or conditioned air, or any other inert or relatively inert gas or atmosphere within the envelope, that may be desired. For long submersion or other purposes.

As many windows may be provided as desired. In FIGS. 1 and 2, I have illustrated a form wherein but one window is provided. In FIG. 3, three windows are provided, a front window through which the picture may be taken, a rear window for observation through the finder, and a top window for observation of the setting of the controls. The latter embodiment contemplates a ringlike plastic transparent mounting open left and right to
provide accessibility. In Fig. 4 a floating rear window is shown, which has the advantage of adjustability to various designs of cameras, the window being movable in any direction, within the scope of operating orientation.

As hereinbefore described, the fixed mounting portion provides such limitation upon the free relationship between the camera and the flexible portion as may be desired. Also, the rigid portion provides means for mounting exterior controls if desired, as for example, the finder means illustrated in Figs. 1 and 2. The latter thus may be mounted in fixed relationship to the camera. The advantage of this provision of special externally disposed finder means will be understood when it is considered that the normally provided finder of the enclosed camera is rendered non-visible by the interposition of the cover. The externally mounted sighting device according to the present invention, on the other hand, will be visible to the photographer and since it is fixed in relationship to the camera will enable the operator to accurately sight and properly orient the camera. The dimensions of the finder means preferably should be proportioned so that the frame portion 30 will approximately outline that portion of the field of view that coincides with the picture frame of the photographic film.

From the herein description it follows that the flexible portion may be provided with transparent areas which preferably may be established by forming the interior part of the rigid portion of a single integral unit of transparent material. The external planes which clamp the edges of the openings in the flexible portion to the interior mount, may be of the same material, although my invention contemplates the use of a different material if desired. There are available a number of suitable stiff light-transmitting plastic materials which are well adapted to the construction of the fixed portion or portions of the envelope. As will be understood by those skilled in the art, preference is for material of sufficient mechanical strength, and transparency. Glass may be used. However, it is contemplated to employ any type of light transmitting material for the windows that may be preferred for particular operations, as for example, light filtering glass or plastic to modify the quality of the light entering the envelope.

From the foregoing description and illustrations of embodiments of my invention, further details within the scope thereof will be apparent to those skilled in the art, or may be further developed. I have set forth the aforesaid examples by way of illustration and not of limitation, and what I claim and desire to protect by Letters Patent is as follows:

A cover for use in protecting equipment of the type of camera and photographic instruments, and the controls thereof, from the deleterious effects of water, comprising a yielding portion and rigid portion, said yielding portion being formed of thin, pliant, water-imperious material, said rigid portion being formed of relatively stiff material, and comprising a window and an internally disposed platform rigidly attached to said window, said yielding portion being attached to said window by a water-tight seal about the periphery of said window, said platform being provided with means for mounting said equipment thereon, said yielding portion constituting a cover loosely surrounding said equipment and said controls, said cover being normally out of contact with said equipment, except at said platform mounting, said cover being water-tight and air-tight, said yielding portion normally extending out of contact with and away from said camera, said cover being of a size in proportion to said equipment to contain a body of entrapped air, said yielding portion being movable with respect to said camera whereby and wherethrough the controls of the camera may be reached and manually operated, said cover being provided with at least one window in addition to said first-named window, said additional window being movable with reference to said first-named window.

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