A waterproof housing is in the form of a generally rectangular collapsible bag (43) made from a flexible waterproof material and which is shaped and dimensioned to accommodate a camera. The bag (43) is provided with a pocket (44) having a lens port (47) and shaped to locate the lens port (47) with respect to the camera lens. Another pocket (50) has a viewing port (52), and is shaped to locate the viewing port (52) with respect to the camera viewfinder. The pockets are provided with respective reinforcements, in the form of annular collars (47, 53), to locate positively the lens port and viewing port with respect to the camera lens and viewfinder respectively. The pocket (50) having the viewing port may be a gaiter made from a flexible rubber material, which permits viewing substantially through the operative range of the viewfinder in the operative environment of the camera.
<table>
<thead>
<tr>
<th>AT</th>
<th>Austria</th>
<th>FR</th>
<th>France</th>
<th>ML</th>
<th>Mali</th>
</tr>
</thead>
<tbody>
<tr>
<td>AU</td>
<td>Australia</td>
<td>GA</td>
<td>Gabon</td>
<td>MR</td>
<td>Mauritania</td>
</tr>
<tr>
<td>BB</td>
<td>Barbados</td>
<td>GB</td>
<td>United Kingdom</td>
<td>MW</td>
<td>Malawi</td>
</tr>
<tr>
<td>BE</td>
<td>Belgium</td>
<td>HU</td>
<td>Hungary</td>
<td>NL</td>
<td>Netherlands</td>
</tr>
<tr>
<td>BG</td>
<td>Bulgaria</td>
<td>IT</td>
<td>Italy</td>
<td>NO</td>
<td>Norway</td>
</tr>
<tr>
<td>BJ</td>
<td>Benin</td>
<td>JP</td>
<td>Japan</td>
<td>RO</td>
<td>Romania</td>
</tr>
<tr>
<td>BR</td>
<td>Brazil</td>
<td>KP</td>
<td>Democratic People's Republic of Korea</td>
<td>SD</td>
<td>Sudan</td>
</tr>
<tr>
<td>CF</td>
<td>Central African Republic</td>
<td>KR</td>
<td>Republic of Korea</td>
<td>SE</td>
<td>Sweden</td>
</tr>
<tr>
<td>CG</td>
<td>Congo</td>
<td>LI</td>
<td>Liechtenstein</td>
<td>SN</td>
<td>Senegal</td>
</tr>
<tr>
<td>CH</td>
<td>Switzerland</td>
<td>LK</td>
<td>Sri Lanka</td>
<td>SU</td>
<td>Soviet Union</td>
</tr>
<tr>
<td>CM</td>
<td>Cameroon</td>
<td>LU</td>
<td>Luxembourg</td>
<td>TD</td>
<td>Chad</td>
</tr>
<tr>
<td>DE</td>
<td>Germany, Federal Republic of</td>
<td>MC</td>
<td>Monaco</td>
<td>TG</td>
<td>Togo</td>
</tr>
<tr>
<td>DK</td>
<td>Denmark</td>
<td>MG</td>
<td>Madagascar</td>
<td>US</td>
<td>United States of America</td>
</tr>
<tr>
<td>FI</td>
<td>Finland</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
WATERPROOF CAMERA HOUSING

This invention relates to waterproof housings or bags for cameras such as video cameras and more particularly to broadcasting cameras.

Broadcasting camera housings are known which can be used underwater down to depths of around 40 metres and remain waterproof. One known housing is made of cast aluminium and the camera controls, inside the housing, are operated by suitable external control mechanism passing in sealing-tight manner through the housing walls. Viewing ports are provided in the housing walls for the camera lens and the viewfinder. Once the camera and housing are assembled, it is not practicable, due to the length of disassembly time, to remove the camera from the housing for use above water. Such underwater housings are very expensive and thus, more often than not, are hired out for use rather than sold outright.

The applicant has identified the need for a waterproof camera housing which is capable of operating about the waterline, i.e. just above and below the waterline e.g. to depths of around 4 to 5 feet (1.25 to 1.75 metres). But for such use the known underwater camera housing referred to in the above paragraph is prohibitively expensive, awkward and heavy.

It has already been proposed to provide a camera housing for use about the waterline, such housing being in the form of a bag made of a flexible waterproof material and metal pieces and having a planar lens port and a planar viewing port.
However such a construction is cumbersome, not easy to make, operationally impractical, not commercially viable and location of the lens and viewing ports with respect to the camera lens and viewfinder respectively is difficult. And the viewing port is not suitable for permitting viewing throughout the entire range of the viewfinder (i.e. that range which is suitable for use in the operative environment of the camera), so that it has to be moved around to obtain the operative viewing range.

Accordingly, the main object of the present invention is to provide a waterproof camera housing for use about the waterline in which the aforesaid disadvantages are eliminated or at least substantially reduced.

To this end the present invention consists in a waterproof camera housing which is made from a flexible waterproof material and which is shaped to accommodate the camera, with the flexibility of the material being such that the camera controls are operable through the material when the camera is accommodated in the housing, characterised in that said housing has two shaped portions provided respectively with a lens port and a viewing port, the said two portions being shaped to locate the lens port and viewing port with respect to the camera lens and viewfinder respectively when the camera is accommodated in the housing, and the viewing port being so arranged as to permit viewing substantially throughout that range of the camera viewfinder, which is suitable for use in the operative environment of the camera.

By means of the invention, it is a simple
matter to place the camera in the housing, locate the two shaped portions respectively over the camera lens and viewfinder and close the housing with a suitable waterproof closure, e.g. a waterproof zip, and connect up any audio connections through a suitable water tight fitting in the material of the housing.

If desired the housing may be provided with a valve for introducing air to provide buoyancy and/or the housing may be provided with a suspension point, e.g. a shackle, for attachment to a rope or cable from e.g. a waterborne vessel.

Preferably the shaped portions are pockets which fit loosely over the projecting lens and viewfinder parts of the camera.

The planar lens port and viewing port are attached in any suitable watertight manner to the flexible material and are made of an appropriate transparent material such as "Perspex" (Trade Mark).

The viewing port may be arcuate to provide a radius of curvature sufficient to permit said viewing substantially throughout the said operative range of the camera viewfinder.

In another embodiment, the shaped portions are provided with respective reinforcements to locate positively the lens port and viewing port with respect to the camera lens and viewfinder respectively. Preferably, one of the shaped portions is provided with an annular reinforcing collar, in which the lens port is retained, the collar extending inwardly
into the shaped portion to fit loosely around the end of the projecting part of the lens of the camera. The other one of the shaped portions is preferably a gaiter formed from a flexible rubber material, which is attached at one end, in a watertight manner, to the material of the housing and which extends from the housing and has the viewing port retained in a reinforcement in the other end thereof, the flexibility of said rubber material enabling the camera viewfinder to be manoeuvred in arcuate manner so as to permit said viewing substantially throughout the said range of the viewfinder. This reinforcement may also be in the form of an annular reinforcing collar.

The invention also consists in the combination of a camera and any of the waterproof housings defined hereinabove.

In order that the invention may be more readily understood, reference will now be made, by way of example, to the accompanying drawings in which:

Figs. 1 and 2 are a side elevation and a front end view respectively of one form of television broadcasting camera,

Fig. 3 is a side elevation of a waterproof housing, in accordance with one embodiment of the present invention, for a camera, and suitable for the broadcasting camera of Figs. 1 and 2.

Figs. 4 and 5 are front and rear end views respectively of the housing of Fig. 3,

Figs. 6 and 7 are top plan and underneath plan views of the housing of Fig. 3,

Fig. 8 is a detail cross-sectional view to an enlarged scale of one way of sealingly securing the lens port to the housing material,

Fig. 9 is a detail cross-sectional view to an
enlarged scale of one way of sealingly securing the viewing port to the housing material.

Fig. 10 is a side elevation of the camera housing with the camera of Fig. 1 accommodated within,

Fig. 11 is a side elevation of a waterproof camera housing, in accordance with another embodiment of the present invention, with the camera therewithin,

Fig. 12 is a front end view of the housing of Fig. 11.

Fig. 13 is a top plan view of the housing of Fig. 11, with the camera accommodated within,

Fig. 14 is an elevation of the other side of the housing of Fig. 11, and

Fig. 15 is a schematic illustration of the useful range of the camera viewfinder.

Referring to Figs. 1 and 2 of the drawings, the television broadcasting camera is indicated generally at 1 and comprises a camera proper 2 and a recorder 3 for recording sound and vision on tape. The camera proper 2 has a zoom lens 4 operated by a zoom servo-unit 5, and a viewfinder 6. The camera controls include a zoom control switch 7, a focus ring 8, a side panel 9 having a standby switch 10, a gain switch 11 and a colour bars switch 12, and a front panel 13 having a video tape start/stop button 14 and a white/black balance switch 15. The power for operating the camera 1 comes from a battery pack 16 in the recorder 3 with there being a power on/off switch 17. In the rear wall of the recorder 3, there is provided an MIC input socket which is designated by the reference
Referring now to Figs. 3 to 7 of the drawings, there is shown one embodiment of a waterproof housing which is in the form of a generally rectangular collapsible bag 20 and which is shaped and dimensioned to accommodate the television broadcasting camera 1 shown in Figs. 1 and 2. The housing 20 is made from a flexible waterproof material which, in the embodiment illustrated, is constituted by a polyurethane coated "Nylon" (Trade Mark) fabric. Applicant has found that a 9oz weight of such a fabric is suitable for the camera 1.

The bag 20 has a waterproof closure in the form of a zip 21 which extends for substantially the entire lengths of the upper wall 22 and rear end wall 23 of the bag 20 to facilitate insertion of the camera 1 into the bag. The front end wall 24 of the bag 20 is provided with a shaped portion in the form of a pocket 25 having a lens port 26 of "Perspex" (Trade Mark) or other suitable transparent material. The pocket 25 is shaped to locate the camera lens 4 with respect to the lens port 26 and to accommodate the lens 4 and servomotor 5 with a loose fit. One of the side walls, the left hand wall 27, of the bag 20 is provided with a shaped portion in the form of a generally cylindrical pocket 28 having an arcuate viewing port 29 of "Perspex" (Trade Mark), or other suitable transparent material, secured to the curved surface of the pocket 28 as will be more readily
apparent from Figs. 5 and 6. The pocket 28 is shaped to locate the viewing port 29 with respect to the camera viewfinder 6 and to accommodate, with a loose fit, the viewfinder 6. The viewing port 29 has a radius of curvature of 7.5 cm which is sufficient to permit viewing, without movement of the port 29, over the entire range of the camera viewfinder 6.

The rear wall 23 of the bag 20 is provided with a tubular connector 30, e.g. of rubber, which is integral with a seal 31 secured to the rear wall 23. The tubular connector has a bore which is undersized with respect to the microphone cable (not shown) which when the camera is accommodated within the bag 20 extends through the tubular connector 30 with a watertight fit and has a jack for connection to the MIC socket 18 in the rear wall of the recorder 3.

Since, when the camera is accommodated in the bag 20 the assembly has negative buoyancy, the rear wall 23 is provided with a suspension shackle 32, e.g. of rubber, to which a rope or cable may be connected to prevent the camera sinking if the operator should lose hold. However, the embodiment illustrated may have provision for positive buoyancy in the form of a valve 33, illustrated in chain lines, by means of which the bag 20 can be inflated with air.

As shown in Fig. 9, the lens port 26 is fixed to the material of the bag 20 by means of outer and
1 inner rings 34 and 35 respectively which clamp the material of the bag 20 between them in watertight manner by means of screws 36. (Fig. 5). The screws 36 pass through countersunk holes such as 37 in the outer ring 34 and into screw threaded holes 38 in the inner ring 35. The lens port 26 is secured in position by a suitable waterproof cement or adhesive 39 in a channel 40 formed by the rings 34 and 35. The rings 34 and 35 may be made of any suitable material but plastics is preferred.

The arcuate viewing port 29 is conveniently secured to the material of the bag 20 by means of a seal 41, e.g. of rubber, fixed by a suitable waterproof adhesive to the bag material and the port 29 with the port also being adhesively secured to material as indicated at 42.

Fig. 10 shows the bag 20 in chain lines with the camera 1 accommodated therein with the lens port 26 and viewing port (not visible) being located with respect to the camera lens 4 and camera viewfinder 6 by the pockets 25 and 28 respectively. As will be appreciated the entire camera 1, the lens 4 and the viewfinder 6 are accommodated in the bag 20, the pocket 25 and the pocket 28 respectively with a loose fit. Moreover, the distance of the rear wall 23 of the bag from the rear wall 19 of the tape recorder is such as to provide sufficient space for ease of plugging in of the microphone cable jack into the socket 18.

The flexibility and thickness of the material
1 of the bag is such that the controls 7, 8, 10, 11, 12, 14, 15 and 17 can be felt and operated through the bag material.

Referring now to Figs. 11 to 14, there is shown another embodiment of the waterproof housing. This housing is also in the form of a generally rectangular collapsible bag 43, which is shaped and dimensioned to accommodate the television broadcasting camera 1 (shown in dashed lines) and is made from the same material as the bag 20. A shaped portion in the form of a pocket 44 is formed in the front end wall 45 of the bag 43. This pocket 44 is reinforced by an annular reinforcing collar 46, preferably formed from a suitable rigid plastics material, in which a lens port 47 is retained. The collar 46 extends inwardly into the pocket 44 and is intended to fit loosely over the end of the projecting camera lens 4, so as to locate positively the lens port 47 with respect to the camera lens. The pocket 44 is also shaped to accommodate the servo-unit 5 and zoom control switch 7 of the camera 1. The annular collar 46 consists of two parts, which clamp the material of the bag 43 in watertight manner by means of screws 48, as shown in Fig. 12.

Side wall 49 of the bag 43 is provided with another shaped portion in the form of a gaiter or cylindrical pocket 50 made from a flexible rubber material for accommodating the camera viewfinder 6. The gaiter 50 is joined at one end 51, in a watertight manner, to the material of the bag 43 and extends in an arcuate configuration from the bag. A viewing port 52 is
retained in an annular reinforcing collar 53 attached, in watertight manner, to the outer end of the gaiter 50. Consequently, the reinforcement provided by the annular collar 53 enables the viewing port 52 to be positively located with respect to the camera viewfinder. Also in this second embodiment instead of the viewing port 52 itself being arcuate, it is planar, but is attached to the flexible gaiter 50 which permits the camera viewfinder to be manoeuvred in an arcuate manner, thereby permitting viewing substantially throughout the operative range of the viewfinder. In this particular embodiment, the camera viewfinder can be manoeuvred in an arcuate manner through a range subtending an angle of approximately 180° from a vertical downward direction to a vertical upward viewing direction. However, the range of the viewfinder, which is actually suitable for use in the underwater operative environment of the camera, normally subtends an angle of approximately 90°, for example from a horizontal viewing direction to a vertical viewing direction, as illustrated schematically by the viewfinder 6 in Figure 15. It is therefore only, in fact, necessary for the viewing port to be arranged to permit viewing substantially throughout the whole of this useful operative range.

As in the first embodiment, the bag 43 is also provided with a waterproof zip 59 and all joins between the materials of the bag are covered by a compatible plastics material to ensure that they are watertight. Straps 54 to 57 and a shackle 58 are also attached to the outside of the bag to enable the camera, when accommodated in the bag, to be carried or otherwise supported.

Although preferred embodiments have been described, it should be appreciated that the invention includes all modifications and variations falling within its scope. Thus, the invention is applicable to waterproof housings for video cameras of the home video type and to cameras with or without an audio facility.
Also it will of course be envisaged that the useful operative range of the camera may be less than, or greater than 90° for example between approximately 80° to 100°.
1. A waterproof camera housing (20; 43) which is made from a flexible waterproof material and which is shaped to accommodate the camera (1), with the flexibility of the material being such that the camera controls are operable through the material when the camera (1) is accommodated in the housing (20; 43), characterised in that said housing has two shaped portions (25, 28; 44, 50) provided respectively with a lens port (26; 47) and a viewing port (29; 52), the said two portions (25, 28; 44, 50) being shaped to locate the lens port (26; 47) and viewing port (29; 52) with respect to the camera lens (4) and viewfinder (6) respectively when the camera (1) is accommodated in the housing (20, 43), and the viewing port (29; 52) being so arranged as to permit viewing substantially throughout that range of the camera viewfinder (6) which is suitable for use in the operative environment of the camera.

2. A housing as claimed in claim 1, characterised in that the shaped portions (25, 28; 44, 50) are pockets, which are arranged to fit loosely over the projecting parts of the lens (4) and viewfinder (6) of the camera (1).

3. A housing as claimed in claim 1 or 2, characterised in that the lens port (26; 52) and the viewing port (29; 52) are attached in a watertight manner to the flexible material and are made of a transparent material.

4. A housing as claimed in any preceding claim, characterised in that the viewing port (29) is arcuate to provide a radius of curvature sufficient to permit said viewing substantially throughout the said operative range of the camera viewfinder.
5. A housing as claimed in any preceding claim, characterised in that the shaped portions (44, 50) are provided with respective reinforcements to locate positively the lens port (47) and the viewing port (52) with respect to the lens (4) and the viewfinder (6) of the camera (1).

6. A housing as claimed in claim 5, characterised in that one (44) of the shaped portions is provided with an annular reinforcing collar (46), in which the lens port (47) is retained, the collar (46) extending inwardly into the shaped portion (44) to fit loosely around the end of the projecting part of the camera lens (4), when the camera (1) is accommodated within the housing.

7. A housing as claimed in claim 5 or 6, characterised in that the other one (5) of the shaped portions is a gaiter formed from a flexible material, which is attached at one end, in a watertight manner, to the flexible material and which extends from the housing and has the viewing port (47) retained in a reinforcement (53) in the other end thereof, the flexibility of said material enabling the camera viewfinder to be manoeuvred in arcuate manner, so as to permit said viewing substantially throughout the said operative range of the viewfinder.

8. A housing as claimed in claim 7, characterised in that said reinforcement (53) consists of an annular reinforcing collar attached, in watertight manner, to the said other end of the other shaped portion (50).

9. A housing as claimed in claim 7 or 8, characterised in that said other one (50) of said shaped portions extends from the housing in a
1 substantially arcuate configuration.
10. A housing as claimed in any preceding claim, characterised in that it is provided with a valve (33) for introducing air into the housing to provide buoyancy.
11. A housing as claimed in any preceding claim, characterised in that it is provided with straps (54 to 57) and/or a suspension point (32; 58) to enable the camera (1), when accommodated within the housing to be carried or otherwise supported.
12. A housing as claimed in any preceding claim, characterised in that it is provided with a waterproof closure in the form of a waterproof zip.
13. In combination, a camera (1) and a waterproof camera housing, as claimed in any preceding claim.
# INTERNATIONAL SEARCH REPORT

**International Application No:** PCT/GB 88/00467

## I. CLASSIFICATION OF SUBJECT MATTER

According to International Patent Classification (IPC) or to both National Classification and IPC

**IPC**: G 03 B 17/08

## II. FIELDS SEARCHED

<table>
<thead>
<tr>
<th>Classification System</th>
<th>Classification Symbols</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPC</td>
<td>G 03 B 17/08; A 45 C 11/22</td>
</tr>
</tbody>
</table>

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched

## III. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of Document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to Claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>DE, U, 8609815 (R. GOEDECKE) 4 September 1986, see pages 2,3; figures 1,2</td>
<td>1,3,5,6,11</td>
</tr>
<tr>
<td>A</td>
<td>DE, A, 2233881 (R. GOEDECKE) 31 January 1974, see pages 5-7; figures 1,2</td>
<td>--</td>
</tr>
<tr>
<td>A</td>
<td>US, A, 3026784 (D.J. BYERS) 27 March 1962, see columns 2-5; figures 1-6</td>
<td>1,3</td>
</tr>
<tr>
<td>A</td>
<td>US, A, 4071066 (M.J. SCHAFFER) 31 January 1978, see columns 2,3; figures 1-4</td>
<td>1,3,11,12</td>
</tr>
</tbody>
</table>

### Notes
- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed
- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- Document member of the same patent family

## IV. CERTIFICATION

**Date of the Actual Completion of the International Search**
28th September 1988

**Date of Mailing of this International Search Report**
26.10.83

**International Searching Authority**
EUROPEAN PATENT OFFICE

**Signature of Authorized Officer**

P.C.G. VAN DER PUTTEN

Form PCT/ISA/210 (second sheet) (January 1985)
ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO. GB 8800467
SA 22745

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 12/10/85. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

<table>
<thead>
<tr>
<th>Patent document cited in search report</th>
<th>Publication date</th>
<th>Patent family member(s)</th>
<th>Publication date</th>
</tr>
</thead>
<tbody>
<tr>
<td>DE-U- 8609815</td>
<td>24-07-86</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>DE-A- 2233881</td>
<td>31-01-74</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>US-A- 3026784</td>
<td></td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>US-A- 4071066</td>
<td>31-01-78</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

For more details about this annex: see Official Journal of the European Patent Office, No. 12/82