

PATENT SPECIFICATION

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(72) Inventors NORMAN WAH MAN KO
KWOK YAN CHAN



(13)

(54) CAMERA FOR UNDERWATER AND ABOVE WATER USE

(71) We, W. HAKING INDUSTRIES (MECHANICS & OPTICS), LTD., a Hong Kong Body Corporate, of Haking Building, 981 King's Road, Hong Kong, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to cameras.
The invention provides a camera comprising a camera mechanism thereon including a film unit receiving portion for receiving a film unit in operative picture taking position, and a water impermeable housing having opening means to provide entry for the insertion of said support frame into the housing and to permit passage of a film unit into said operative position in the frame without removal of the frame from the housing body, the housing body having a front wall portion providing transparent objective and view finder window means for admitting picture forming and view finder light rays for exposing film carried by the camera mechanism support frame and for enabling a user to view a scene to be photographed by the camera and closure means for the opening means of the housing body to render the opening means water tight and dust proof, the housing also having further opening forming means through which operating controls extend in water tight relation of the camera mechanism on the support frame whereby the camera can be used both above and below water.

Preferably the first said opening means in the housing body comprises a single opening in the body for passage of said support frame and film unit.

It is also preferred that the housing is a formed in one-piece of a water-impermeable transparent material selected areas of the walls of the housing remaining light-trans-

mitting while other areas of the walls are rendered non-light transmitting, at least some of the selected light-transmitting areas forming said objective and viewfinder window means for admitting picture-forming and viewfinder light rays for exposing film carried by said support frame based in the housing and for enabling a user to find an objective to be photographed with the camera.

Said closure means may have a selected area thereof which is light-transmitting to form a viewfinder window for viewing the scene to be photographed through said viewfinder window means of said housing.

More specifically said closure means may be made of a single piece of transparent material, said closure means having a selected area thereof remaining light-transmitting while other areas thereof are rendered non-light transmitting to form a viewfinder window for viewing the scene to be photographed through said viewfinder window means of said housing.

In any of the preceding arrangements the housing may have openings formed therein supporting in watertight relation with the housing shutter release control means, electronic flash light control means operable externally of the housing, and said support frame may have mounted thereon camera mechanism including shutter release means, electronic flash element, electronic flash element energizing means, film-receiving means and film advancing means, said support frame further having clearances or openings formed therein to enable the film shutter release control means, the electronic flash light control means and the film advancing control means supported on the housing to be brought into operative relation with respect to the shutter release means, the electronic flash light energizing means and the film advancing means mounted on the support frame when the

support frame is positioned in the housing, while enabling a watertight and dustproof seal to be maintained between said control means and the housing.

5 In the latter construction the film advancing control means may include manually operable handle means which is movable with relation to the housing from a retracted, non-operable position to an extended, operable position.

10 Furthermore the handle means may comprise an elongate shaft portion which is slidably engaged in watertight and dustproof relation with guide means in the housing, and a handle portion adapted to be received in a recess in the housing when the handle means is in its retracted position.

15 The film advancing control means may include a movable film advancing arm carried on the support frame, said arm being in engagement with the handle means.

20 The movable film advancing arm may be provided with gear train actuating means for effecting a film winding operation when the handle means is moved between its retracted and extended positions.

25 In any of the preceding arrangements, the external dimensions of the housing may be such as to impart to it a vertically thin configuration enabling it to fit into an ordinary shirt pocket.

30 Again in any of the preceding arrangements the wall of the housing at the light-transmitting objective window means thereof may be formed to receive detachable close-up lens means.

35 The closure means may have at least one other selected area thereof which is light-transmitting to form a window for enabling a user of the camera to determine the number of the film frames as they are exposed.

40 The housing may be further provided with transparent window means for enabling a user to view electronic flash element indicator means carried on the support frame.

45 The support frame may be formed in one-piece.

The support frame may be formed with an opening adapted to receive a separable viewfinder lens.

50 The following is a description of a specific embodiment of the invention reference being made to the accompanying drawings wherein:

Fig. 1 is a view in perspective of an embodiment of the camera of this invention;

60 Fig. 2 is a fragmentary view in elevation illustrating the releasable locking means provided on the main housing of the camera for holding the cover in watertight and dustproof locked relationship on the main housing;

Fig. 3 is a fragmentary view corresponding to the view of Fig. 2 as viewed from the back of the camera;

Fig. 4 is an exploded view of the camera shown in Fig. 1 in its disassembled 70 state;

Fig. 5 is an exploded view with the components of the camera shown in reverse order to that illustrated in Fig. 4;

Fig. 6 is an enlarged fragmentary 75 sectional view showing the shutter actuating controls of the camera;

Fig. 7 is a fragmentary top plan view partly in section showing the operating switch for the electronic flash light 80 assembly;

Fig. 8 is a fragmentary view partly in section showing the film advancing arm in its operative position with respect to the camera mechanism mounted on the support 85 frame, in addition to the detachable close-up lens mounted in front of the objective lens window of the main housing; and

Fig. 9 is an end view partly in section showing in somewhat schematic form the 90 components of the electronic flash light assembly of the camera.

DESCRIPTION OF EXEMPLARY EMBODIMENT OF INVENTION

Referring, now, in particular, to Figs. 4 95 and 5 of the drawings, the embodiment of the invention illustrated comprises a main housing 12, a camera mechanism sub-housing or support frame 14, and a closure member or cover 16. As indicated, each of the principal components, that is, the housing 12, the support frame 14, and the cover 16 advantageously are of unitary, or one-piece construction formed in a plastics material. While each of the components 100 can be formed from the same material, the main housing 12 and the cover 16 most advantageously are formed from a transparent plastics material so that selected areas thereof may remain clear while other areas thereof are coated or plated to render them opaque, or non-light transmitting. As indicated hereinabove, in the preferred 105 embodiment of the camera, the dimensions and configuration of the main housing, the support frame and the cover are such as to impart a horizontally elongated, vertically thin, compact profile to the camera which will enable it to be easily carried in the user's shirt pocket or handbag. 120

The main housing comprises a front wall 12a, a top wall 12b, a bottom wall 12c, and end walls 12d and 12e. The rear of the main housing is open to provide an entry into a chamber 18 defined by the 125 walls of the main housing. The front wall 12a of the main housing 12 as illustrated has selected areas thereof which are clear to provide an objective lens window 20, a viewfinder window 22, and a flash diffuser 130

window 24. The objective lens window 20 is recessed, and has inwardly converging side walls adapted to receive in snug engagement a detachable close-up lens 30.

- 5 The close-up lens 30 has a central, convex, photographic light admitting portion 30a to each end of which is joined an outwardly and laterally extending L-shaped gripping portion 30b to facilitate attachment and
10 detachment of the lens 30 on the main housing. The flash diffuser window 24 is formed with a plurality of longitudinal, inwardly extending, parallel ridges 24a which serve to more effectively diffuse the light
15 emitted by a flash light means of the camera

- The top wall 12b of the main housing 12 is formed with a cylindrical, inwardly extending portion 32 having a bore 32a
20 therethrough, and a cylindrical upwardly extending portion 34 having a bore 34a therethrough. As shown, the bore 32a is ringed by an upwardly extending, annular portion 36 which serves as a well for a shutter release control button 40. The button 40 has a head portion 40a joined to shaft 40b having an annular groove or recess
25 formed therein for receiving an "O" ring 42. The lower end 40c of the shaft 40b is reduced, and is provided with an annular groove or recess 40d for receiving a spring clip 44. The bore 34a in the top wall 12b of the main housing 12 is adapted to receive an electronic flash light control
30 knob 50. The knob 50 has a circumferentially ridged head portion 50a which is joined at its base to a shaft 50b. The shaft 50b has an annular groove or recess formed therein for receiving an "O" ring 52. The lower end 50c of the shaft 50b is reduced, and is provided with an annular groove or recess 50d for engaging a spring clip 54. As best shown in Fig. 1 of the drawings, the upper surface of the head
35 portion 50a of the control knob 50 has an arrowheaded shaped marking 56 thereon for indicating the "on" and "off" position of the knob 50. A window 58, which comprises a clear area in the top wall 12b of the main housing 12, enables a user to view an electronic indicator mounted on the sub-housing or support frame 14.

- The end walls 12d and 12e of the main housing 12 each has a releasable locking
55 unit 60 positioned thereon adjacent to the rear of the main housing 12. Each unit 60 comprises a lever 62 which is pivotally mounted by means of a pin 64 between a pair of spaced, outwardly extending ears
60 66-66 formed on the main housing 12. The lever 62 comprises a handle portion 62a and a cover release portion 62b. A U-shaped locking member 68 is pivotally mounted by means of a pin 70 on the handle portion
65 62a of the lever 62 adjacent to the ears 66-

66. The operation of the lever 62 and the locking member 68 will become clear as description proceeds.

As best illustrated in Figs. 5 and 8 of the drawings, the end wall 12d and the
70 bottom wall 12c of the main housing 12 are formed to provide a recess 72 for a film advancing control arm 74. The bottom wall 12c extends inwardly a short distance along each side of the opening 72 to provide a
75 pair of guide rails 76-76 for the handle portion 74a of the film advancing control arm 74. At the inner end of the opening 72, the main housing 12 forms an elongated channel 78 through which the shaft 74b of the film advancing control arm 74 extends.
80 The shaft 74b has an annular groove or recess which retains an "O" ring 80. The "O" ring 80 provides a watertight seal between the shaft 74b and the walls of the channel 78. A recess or notch 74c is provided at the distal end of the shaft 74b for engaging an extension on the film advancing means mounted on the support frame 14 of the camera.
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The support frame 14, as indicated, is adapted to have mounted thereon substantially the entire camera mechanism, including an electronic flash light assembly. As viewed in Figs. 4 and 5 of the drawings,
90 the support frame 14 is formed to receive an objective lens 82, and a shutter release control member which, as shown in more detail in Fig. 6, is in the form of a depressible plunger 86 positioned in a
95 cylinder 88 which is integrally joined to support frame 14. The head 86a of the plunger 86 is maintained in engagement with the lower end 40c of the shaft 40b of the shutter release control button 40 by a compression spring 90 which receives the shaft 86b of the plunger 86. A downward force exerted on the button 40 is transmitted to the plunger 86 which is operatively connected to the shutter release
100 mechanism (not shown) of the camera.

The support frame 14 also has compartments 92-92 formed therein for receiving a film cartridge (not shown). The end wall of each compartment 92-92 is provided with
115 a hole 94 which is aligned with a hole 96 in the front wall 14a of the support frame 14. The holes 94-94 are of a size to enable fastening means such as screws 98-98, as well as the shaft of a screwdriver, to pass
120 therethrough. The screws 98-98, as shown in Fig. 8, are then secured in position, through the holes 96-96 in the front wall 14a, in tapped posts 102-102 joined to the inner surface of the front wall 12a of the
125 main housing 12

As best shown in Fig. 5 of the drawings, the camera mechanism mounted on the support frame 14 comprises a film advancing member 110 having an extension 110a
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thereon adapted to be engaged in the recess or notch 74c formed in the lower end of the shaft 74b of the film advancing control arm 74. Joined to the member 110 is a rack 5 112 having a plurality of teeth 112a formed thereon for engaging the teeth of a transmission gear 114. The gear 114 is mounted for rotation about a common vertical axis with a film winding gear 116. A ratchet 10 wheel 118 is positioned adjacent to the transmission gear 114. A locking pawl 120, connected to a stroke lever 122, is urged against the teeth of the ratchet wheel 118. A film sprocket opening engaging finger 15 124 is operatively connected to the stroke lever 122 for advancing each frame of a film cartridge.

The support frame 14 further is formed with viewfinder lens receiving portion 130 20 having an opening 132 at the forward end thereof and an opening 134 at the rear end thereof. The inner surfaces of the sidewalls of the portion 130 are channelled inwardly of, and adjacent to, the opening 132 to 25 enable a viewfinder lens 140 to be detachably supported on the support frame 14.

As stated, the support frame 14 is formed in a manner to enable a complete electronic flash light assembly to be 30 mounted on it. Thus, as shown in Figs. 4, 5, 7 and 9, the frame 14 is provided with a space 150 for accommodating batteries 152-152, and a compartment 154 for receiving a capacitor 156. A reflector 158, in 35 which an electronic flash tube 160 is positioned, is also provided. An electronic indicator 162, which is visible through the window 58 in the top wall 12b of the main housing 12 when the support frame 14 is 40 secured therein, is positioned above and to the rear of the reflector 158. The indicator 162 enables a user to determine the number of charges remaining in the capacitor 156. A switch 166, actuated by the control knob 45 50, is located between the compartment 154 for the capacitor 156 and a circuit board 168 for the electronic flash light assembly. The switch 166, as best shown in Fig. 7 of the drawings, comprises two pairs of metal 50 contact strips 166a-166a, which are anchored in a non-conducting block member 170. The pairs of metal contact strips carry contacts 166b-166b which are positioned in opposed relation to one 55 another. The lower end 50d of the control knob 50 is provided with flattened surfaces 50e-50e which are in parallel relation to the metal contact strips 166a-166a when the control knob 50 is in its "off" position. 60 Turning of the knob 50 through an approximate 90° angle to its "on" position acts to close the pairs of contacts 166b-166b.

The closure or cover 16 for the rear of the main housing 12 is formed with clear 65 areas to provide a viewfinder window 180

and film indicator window 182. The cover 16 has an annular skirt portion 16a having a peripheral groove or recess 184 formed therein for receiving an "O" ring 186 which provides a watertight and dustproof seal 70 between the cover 16 and the main housing 12. Joined to each end of the cover 16 is a locking projection or ear 16b. Each ear 16b is adapted to be engaged by the U-shaped locking member 68 of the locking 75 devices 60-60 positioned on the end walls 12d and 12e of the main housing 12. Two pairs of film engaging springs 192-192 are secured in spaced apart relation on the inner surface of the cover 16 on opposite 80 ends of the film indicating window 182.

The dimensions and configuration of the support frame 14, and the various components mounted on it, are such that the frame 14 can be easily and readily inserted 85 into the compartment 18 defined by the main housing 12. In assembling the camera, it is preferable that the shaft of the shutter release control button 40 and the electronic flash light knob 50 are first positioned in their respective receiving bores 32a and 34a, 90 and spring clips 44 and 54 are secured in place thereon. The shaft of the film advancing control arm 74, similarly, is positioned in the channel 78 formed in the housing 12. 95 To enable the support frame 14 to be positioned in the compartment whereby the lower end 40c of the control button 40 will abut the plunger 86, and the lower end 50d of the control knob 50 will be positioned 100 between the metal contact strips 166a-166a, openings 200 and 202, respectively, are provided in the front wall 14a of the support frame 14. Also, to enable the support frame 14 to clear the shaft 74b of the film advancing control arm 74, a clearance space 204 105 (see Fig. 5) is formed on the underside of the support frame 14. When the support frame 14 is in position in the main housing 12, it is secured to the main housing 12 by 110 means of the screws 98-98. The assembly of the camera is completed by placing the cover 16 on the back of the main housing 12, engaging each locking spring 68 on the outside surface of the locking tabs 16b- 115 16b, and moving the lever 62 forwardly and against the end walls 12d and 12e of the main housing. To remove the cover 16, it is merely necessary to raise leg 62a of the lever 62. This will urge the leg 62b against 120 its associated tab 16b thereby disengaging the cover 16 from the main housing 12.

While for purposes of illustration, a preferred embodiment of the invention has been shown and described, it should be 125 understood that various modifications can be made therein within the scope of the claims. Thus, for example, the objective lens of the camera may be formed integrally with the main housing thereby eliminating 130

the objective lens on the support frame. Also, the viewfinder lens may be formed integrally with the cover thereby eliminating the need for a detachable viewfinder lens on the support frame. The camera, furthermore, can be modified to convert it to a reflex-type camera, with the objective lens serving as a viewfinder lens as well as for admitting picture-forming light rays.

- Attention is directed to our U.K. Patent Application No. 15127/77 (Serial No. 1494867) which is a divisional of the present application and which describes and claims a camera for under-water use having a one piece housing formed from an originally transparent, water impermeable synthetic plastics material having openings for controls and a film rendered water tight, selected areas of the housing being rendered non-light transmitting to hide most of the mechanism and its support frame from view whilst other areas remain transparent to provide objective and view finder windows.

WHAT WE CLAIM IS:—

1. A camera comprising a camera mechanism support frame having mechanism thereon including a film unit receiving portion for receiving a film unit in operative picture taking position, and a water-impermeable housing having opening means to provide entry for the insertion of said support frame into the housing and to permit passage of a film unit into said operative position in the frame without removal of the frame from the housing body, the housing body having a front wall portion providing transparent objective and view finder window means for admitting picture forming and view finder light rays for exposing film carried by the camera mechanism support frame and for enabling a user to view a scene to be photographed by the camera and closure means for the opening means of the housing body to render the opening means water tight and dust proof, the housing also having further opening forming means through which operating controls extend in water tight relation to the exterior of the camera housing for operation of the camera mechanism on the support frame whereby the camera can be used both above and below water.

2. The camera of claim 1 wherein the first said opening means in the housing body comprise a single opening in the body for passage of said support frame and film unit.

3. A camera as claimed in claim 1 or claim 2 wherein the housing is formed in one piece of a water-impermeable transparent material, selected areas of the walls of the housing remaining light-transmitting while other areas of the walls are rendered non-light transmitting, at least

some of the selected light-transmitting areas forming said objective and viewfinder window means for admitting picture-forming and viewfinder light rays for exposing film carried by said support frame based in the housing and for enabling a user to find an objective to be photographed with the camera.

4. A camera as claimed in any of claims 1 to 3 wherein said closure means has a selected area thereof which is light-transmitting to form a viewfinder window for viewing the scene to be photographed through said viewfinder window means of said housing.

5. A camera as claimed in claim 4 wherein said closure means is made of a single piece of transparent material said closure means having a selected area thereof remaining light-transmitting while other areas thereof are rendered non-light transmitting to form a viewfinder window for viewing the scene to be photographed through said viewfinder window means of said housing.

6. A camera as claimed in any of the preceding claims wherein the housing has openings formed therein supporting in watertight relation with the housing shutter release control means, electronic flash light control means and film advancing control means operable externally of the housing, and said support frame has mounted thereon camera mechanism including shutter release means, electronic flash element, electronic flash element energizing means, film-receiving means and film advancing means, said support frame further having clearances or openings formed therein to enable the film shutter release control means, the electronic flash light control means and the film advancing control means supported on the housing to be brought into operative relation with respect to the shutter release means, the electronic flash light energizing means and the film advancing means mounted on the support frame when the support frame is positioned in the housing, while enabling a watertight and dustproof seal to be maintained between said control means and the housing.

7. A camera according to claim 6 wherein the film advancing control means includes manually operable handle means which is movable with relation to the housing from retracted, non-operable position to an extended, operable position.

8. A camera according to claim 7 wherein the handle means comprises an elongate shaft portion which is slidably engaged in watertight and dustproof relation with guide means in the housing, and a handle portion adapted to be received in a recess in the housing when the handle means is



the objective lens on the support frame. Also, the viewfinder lens may be formed integrally with the cover thereby eliminating the need for a detachable viewfinder lens on the support frame. The camera, furthermore, can be modified to convert it to a reflex-type camera, with the objective lens serving as a viewfinder lens as well as for admitting picture-forming light rays.

Attention is directed to our U.K. Patent Application No. 15127/77 (Serial No. 1494867) which is a divisional of the present application and which describes and claims a camera for under-water use having a one piece housing formed from an originally transparent, water impermeable synthetic plastics material having openings for controls and a film rendered water tight, selected areas of the housing being rendered non-light transmitting to hide most of the mechanism and its support frame from view whilst other areas remain transparent to provide objective and view finder windows.

WHAT WE CLAIM IS:—

1. A camera comprising a camera mechanism support frame having mechanism thereon including a film unit receiving portion for receiving a film unit in operative picture taking position, and a water-impermeable housing having opening means to provide entry for the insertion of said support frame into the housing and to permit passage of a film unit into said operative position in the frame without removal of the frame from the housing body, the housing body having a front wall portion providing transparent objective and view finder window means for admitting picture forming and view finder light rays for exposing film carried by the camera mechanism support frame and for enabling a user to view a scene to be photographed by the camera and closure means for the opening means of the housing body to render the opening means water tight and dust proof, the housing also having further opening forming means through which operating controls extend in water tight relation to the exterior of the camera housing for operation of the camera mechanism on the support frame whereby the camera can be used both above and below water.

2. The camera of claim 1 wherein the first said opening means in the housing body comprise a single opening in the body for passage of said support frame and film unit.

3. A camera as claimed in claim 1 or claim 2 wherein the housing is formed in one piece of a water-impermeable transparent material, selected areas of the walls of the housing remaining light-transmitting while other areas of the walls are rendered non-light transmitting, at least

some of the selected light-transmitting areas forming said objective and viewfinder window means for admitting picture-forming and viewfinder light rays for exposing film carried by said support frame based in the housing and for enabling a user to find an objective to be photographed with the camera.

4. A camera as claimed in any of claims 1 to 3 wherein said closure means has a selected area thereof which is light-transmitting to form a viewfinder window for viewing the scene to be photographed through said viewfinder window means of said housing.

5. A camera as claimed in claim 4 wherein said closure means is made of a single piece of transparent material said closure means having a selected area thereof remaining light-transmitting while other areas thereof are rendered non-light transmitting to form a viewfinder window for viewing the scene to be photographed through said viewfinder window means of said housing.

6. A camera as claimed in any of the preceding claims wherein the housing has openings formed therein supporting in watertight relation with the housing shutter release control means, electronic flash light control means and film advancing control means operable externally of the housing, and said support frame has mounted thereon camera mechanism including shutter release means, electronic flash element, electronic flash element energizing means, film-receiving means and film advancing means, said support frame further having clearances or openings formed therein to enable the film shutter release control means, the electronic flash light control means and the film advancing control means supported on the housing to be brought into operative relation with respect to the shutter release means, the electronic flash light energizing means and the film advancing means mounted on the support frame when the support frame is positioned in the housing, while enabling a watertight and dustproof seal to be maintained between said control means and the housing.

7. A camera according to claim 6 wherein the film advancing control means includes manually operable handle means which is movable with relation to the housing from retracted, non-operable position to an extended, operable position.

8. A camera according to claim 7 wherein the handle means comprises an elongate shaft portion which is slidably engaged in watertight and dustproof relation with guide means in the housing, and a handle portion adapted to be received in a recess in the housing when the handle means is

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in its retracted position.

9. A camera according to claim 8 wherein the film advancing control means includes a movable film advancing arm 5 carried on the support frame, said arm being in engagement with the handle means.

10. A camera according to claim 9 wherein the movable film advancing arm is provided with gear train actuating means for effecting a film winding operation when the handle means is moved between its retracted and extended positions.

11. A camera as claimed in any of the preceding claims, wherein the external dimensions of the housing are such as to impart to it a vertically thin configuration enabling it to fit into an ordinary shirt pocket.

12. A camera according to any of the preceding claims wherein the wall of the housing at the light-transmitting objective window means thereof is formed to receive detachable close-up lens means.

13. A camera according to any of the preceding claims wherein the closure means has at least one other selected area thereof

which is light-transmitting to form a window for enabling a user of the camera to determine the number of the film frames as they are exposed.

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14. A camera according to any of the preceding claims wherein the housing is further provided with transparent window means for enabling a user to view electronic flash element indicator means carried on 30 the support frame.

15. A camera according to any of the preceding claims wherein the support frame is formed in one-piece.

16. A camera according to any of the preceding claims wherein the support frame is formed with an opening adapted to receive a separable viewfinder lens.

17. A camera substantially as hereinbefore described with reference to and as 40 illustrated in the accompanying drawings.

W. HAKING INDUSTRIES
(MECHANICS & OPTICS) LTD.,
Per: BOULT, WADE & TENNANT,
34 Cursitor Street,
London EC4A 1PQ
Chartered Patent Agents.