

PATENT SPECIFICATION

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(54) OPTIC FOR INSTANTANEOUSLY PHOTOGRAPHING AN HORIZON OF 360°

(71) I, HUGH ANDERSON, of 24 Belgrave Road, Minster-In-Sheppey, Kent, England, a British citizen, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to an optical element enabling an horizon of 360° to be photographed instantaneously, which has an application in detail surveying. The invention further relates to the use of two such optical elements in construction of a panoramic camera enabling a 360° panoramic photograph to be produced.

According to the present invention the only moving part of the camera necessary at the time of exposure is the shutter, the lens system being static, and all areas of the film being exposed at one instant.

According to the present invention, light in the plane perpendicular to the axis of a reflective conical surface, is reflected by the cone through a conventional lens system.

In the field of detail ground survey, present common practice for "fixing detail is to: (a) draw a diagram of the detail to be surveyed,

(b) "fix" the detail relating to a known point by angles and distances from that known point, and

(c) relate further detail by dimensions to the points "fixed" by step (b).

The present invention provides the "diagram" photographically wherein all angles from the known point are "true", obviating the need for these angles to be measured by theodolite or similar device, as in step (b) of the above paragraph, and eliminating the need for certain dimensions required in stage (c) of the above paragraph.

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings in which:—

Fig. 1 is a longitudinal section through the panoramic receiving optic.

Fig. 2 is a schematic longitudinal section through a single panoramic receiving optic mounted on a conventional single lens reflex camera.

Fig. 3 represents a plan of objects to be photographed, with the camera position marked by a cross, such a point being a known point in the case of ground detail survey.

Fig. 4 represents the image produced by photographing the objects shown spatially by Fig. 3, with a single panoramic receiving optic mounted on a conventional camera as illustrated by Fig. 2.

Fig. 5 is a longitudinal section through a schematically represented panoramic camera employing two panoramic optics, one on each side of a conventional lens system.

Fig. 6 represents the image produced by photographing the objects shown spatially by Fig. 3, using the embodiment illustrated by Fig. 5.

The panoramic receiving optic depicted in Fig. 1 is comprised of a suitable optically transparent material in which the reflecting surface 1a, is a surface of rotation, thus forming an inverted cone. The surface 1b is also a surface of rotation. The angles α and β may be made equal to minimise chromatic aberrations.

The embodiment illustrated by Fig. 2 shows the optic 1 depicted in Fig. 1 mounted on a conventional single lens reflex camera by a mounting adaptor 2, the axis of rotation of surfaces 1a and 1b being coincident with the optical axis of the camera lens system 3. Light is prevented from entering the system through the "front" by a protective surface 4, and is prevented from striking the surface 1b obliquely by a protective surface 5. Light entering the system thus passes through the surface 1b, is reflected by the surface 1a, through the lens system 3, and is either reflected by the mirror 6 through the penta prism 7 and out through the eye-piece 8 for the purpose of viewing the image, or, with the mirror 6 out of the way, directed on to

the film 9 to make an exposure controlled by the focal plane shutter 10 and the aperture 11. If the embodiment is used with the axis of the camera lens system vertical, the maximum angle of acceptance of light above the horizon as represented by the ray 12 is governed by the focal length of the lens system 3, which governs its field of view, and by the angle α , whereas the maximum angle of acceptance of light below the horizon as represented by the ray 13 is governed only by the angle α , which must be less than 45° if a ray 13 is to be below the horizon. It is necessary for the apex of the inverted cone formed by rotation of the surface 1a to be displaced above the plane 1c so that the maximum angle of acceptance of light below the horizon is accommodated by the panoramic optic 1.

With the axis of the lens system 3 of the embodiment illustrated by Fig. 2 vertical, the objects represented spatially by Fig. 3 will appear on the film as shown by Fig. 4, the line 14 being an imaginary line representing the sensible horizon of the embodiment illustrated by Fig. 2.

In the further embodiment illustrated by Fig. 5, two panoramic optics 1 are situated either side of the lens system 15 with the axis of rotation of the surface 1a1, 12, 1b1 and 1b2 coincident with the optical axis of the lens system 15.

Extraneous light is prevented from entering the system by protective surface 4 and 5. Light from the objects to be photographed enters the system through surface 1b1, is reflected by surface 1a1, passes through the lens system 15, is reflected by surface 1a2, passes through surface 1b2 to make an exposure on the cylindrical film surface 16, controlled by between the lens shutter and aperture 17. The film surface 16 is a cylinder formed by

rotation about the identical axis as the axis of rotation of surface 1a2.

The film 16 is encased in a cylindrical cassette 18, and protected by a cylindrical dark slide 19, which is moved downwards, out of the way, before an exposure is made, and replaced before removal of the cassette and film for processing.

With the axis of the lens system 15 of the embodiment illustrated by Fig. 5 vertical, the objects represented by Fig. 3 will appear on the opened out cylindrical film as shown by Fig. 6, the line 14 being an imaginary line showing the sensible horizon of the embodiment illustrated by Fig. 5.

The panoramic optic 1 depicted in Fig. 1 may be mounted in front of the lens system of any conventional still or cine camera to produce an image as shown by Fig. 4, and subsequently mounted in front of the lens system of any conventional enlarger, or still or cine projector to produce a 360° panoramic image on a cylindrical screen.

WHAT I CLAIM IS:—

1. A panoramic optic formed by a rotation of an obtuse angled triangle about a chord across one of the acute angles and perpendicular to the short side including the acute angle.

2. A camera having the optic of claim 1 mounted in front of the camera lens with the axis common with the axis of the lens so that the panoramic image is produced as a circular image on the film plane.

3. A camera having the optic of claim 1 mounted in front of the camera lens and behind the camera lens a similar optic in an inverted position, the axes of both optics being common with the axis of the lens, so that the panoramic image is produced on a cylindrical film surface.

HUGH ANDERSON

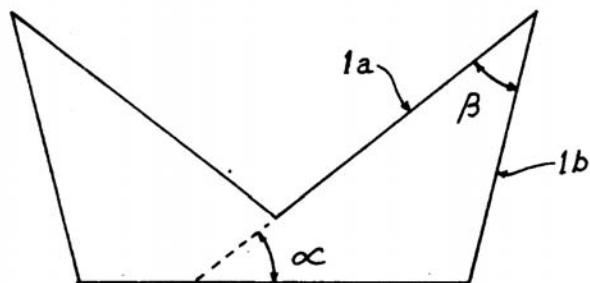


FIG 1

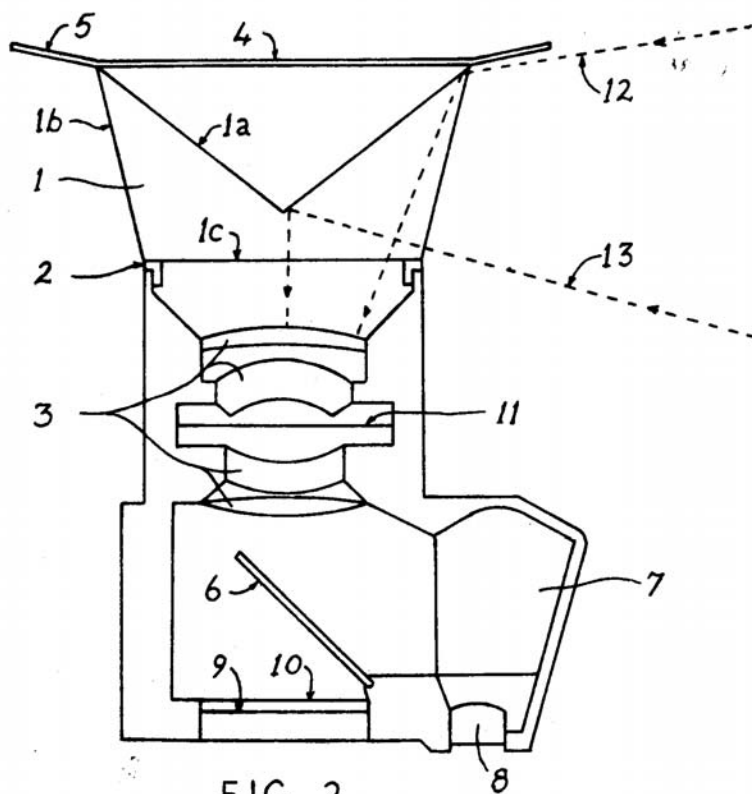


FIG 2

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COMPLETE SPECIFICATION

3 SHEETS

*This drawing is a reproduction of
the Original on a reduced scale
Sheet 2*

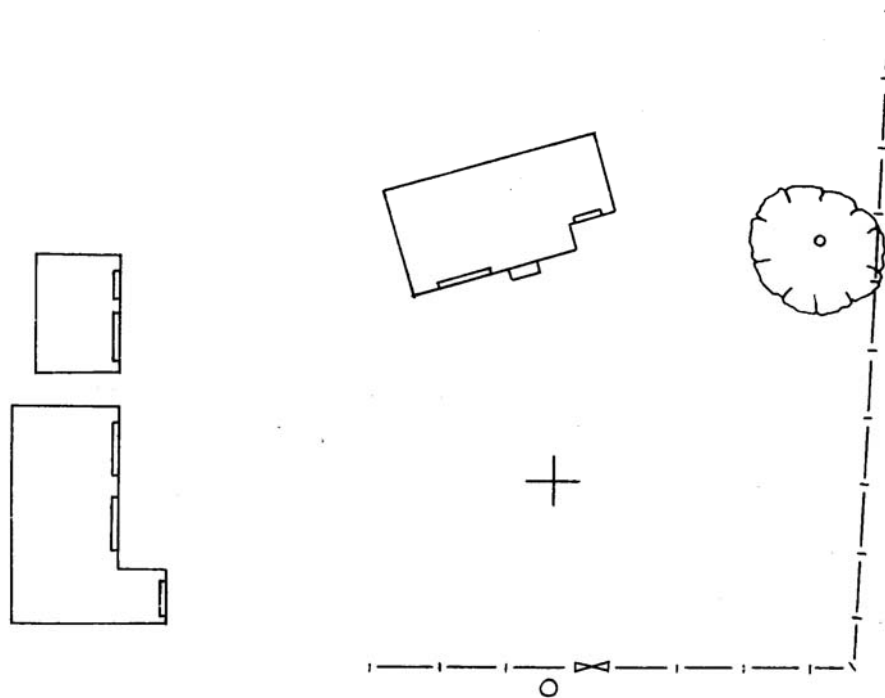


FIG 3

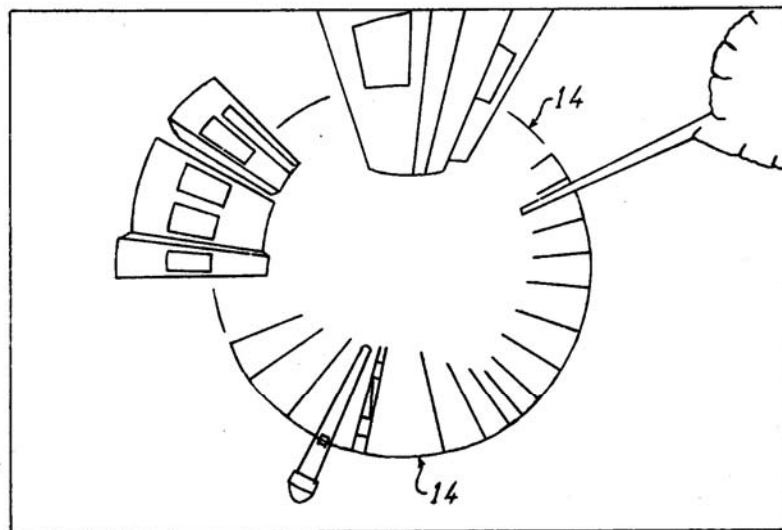


FIG 4

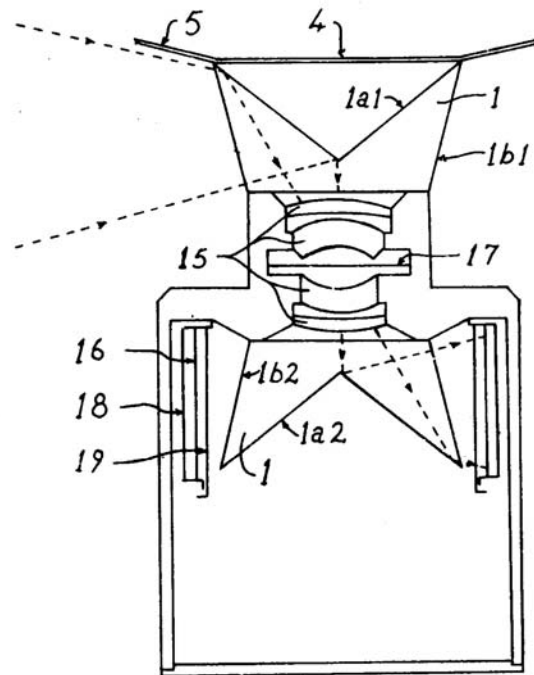


FIG 5

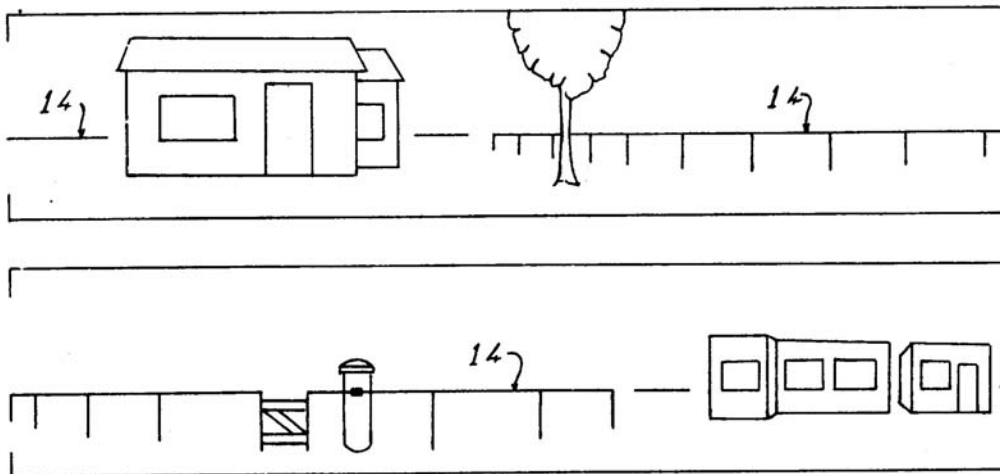


FIG 6

Patent No. 1493188

Date of Patent. 22 April 1975
Date of Sealing 22 March 1978



Elizabeth the Second by the Grace of God of the United Kingdom of Great Britain and Northern Ireland and of Her other Realms and Territories, Queen, Head of the Commonwealth, Defender of the Faith: To all to whom these presents shall come greeting:

WHEREAS a request for the grant of a patent has been made by

HUGH ANDERSON of 24 Belgrave Road, Minster-In-Sheppey, Kent, England,
a British Citizen,

for the sole use and advantage of an invention for

Optic for instantaneously photographing an horizon of 360° :

AND WHEREAS We, being willing to encourage all inventions which may be for the public good, are graciously pleased to condescend to the request:

KNOW YE, THEREFORE, that We, of our especial grace, certain knowledge, and mere motion do by these presents, for Us, our heirs and successors, give and grant unto the person(s) above named and any successor(s), executor(s), administrator(s) and assign(s) (each and any of whom are hereinafter referred to as the patentee) our especial licence, full power, sole privilege, and authority, that the patentee or any agent or licensee of the patentees and no others, may subject to the conditions and provisions prescribed by any statute or order for the time being in force at all times hereafter during the term of years herein mentioned, make, use, exercise and vend the said invention within our United Kingdom of Great Britain and Northern Ireland, and the Isle of Man, and that the patentee shall have and enjoy the whole profit and advantage from time to time accruing by reason of the said invention during the term of sixteen years from the date hereunder written of these presents: AND to the end that the patentee may have and enjoy the sole use and exercise and the full benefit of the said invention, We do by these presents for Us, our heirs and successors, strictly command all our subjects whatsoever within our United Kingdom of Great Britain and Northern Ireland, and the Isle of Man, that they do not at any time during the continuance of the said term either directly or indirectly make use of or put in practice the said invention, nor in anywise imitate the same, without the written consent, licence or agreement of the patentee, on pain of incurring such penalties as may be justly inflicted on such offenders for their contempt of this our Royal Command, and of being answerable to this patentee according to law for damages thereby occasioned:

PROVIDED ALWAYS that these letters patent shall be revocable on any of the grounds from time to time by law prescribed as grounds for revoking letters patent granted by Us, and the same may be revoked and made void accordingly:

PROVIDED ALSO that nothing herein contained shall prevent the granting of licences in such manner and for such considerations as they may by law be granted: AND lastly, We do by these presents for Us, our heirs and successors, grant unto the patentee that these our letters patent shall be construed in the most beneficial sense for the advantage of the patentee.

IN WITNESS whereof We have caused these our letters to be made patent
as of the twenty-second day of April
one thousand nine hundred and seventy-five and to be sealed.

Comptroller-General of Patents
Designs, and Trade Marks.