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(54) **SIGHT**

VISIER

SYSTEME DE VISEE

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(73) Proprietor: **SAAB AB**
581 88 Linköping (SE)

(72) Inventor: **SVENSSON, Nils-Ola**
S-113 59 Stockholm (SE)

(74) Representative: **Norberg, Charlotte et al**
Albihns.Zacco
Valhallavägen 117
Box 5581
114 85 Stockholm (SE)

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Description

[0001] The present invention relates to a sight according to the preamble of claim 1.

[0002] The sight according to the above is suitable as a panning sight and can be mounted on, for example, the turret roof of a combat vehicle in order to serve as the principal sight or as another observation system. The sight can also be used at sea, for example on a combat boat. It can also be supplemented with a missile locator and be used for missile control.

[0003] Sights of the type indicated in the first paragraph are available on the market. In this connection, the normal construction is for the rotation about the second axis of rotation to be brought about by mounting the first body on a fork originating from the second body, on a shaft which connects the two legs of the fork.

[0004] Knepper, R.: "SIRIUS, a Long Range Infra Red Search and track System" In: "SPIE Proceedings" 20 April 1997 (1997-04-20), Orlando, USA vol. 3061, pages 578-584, discloses an IR search and track system including a platform having a first body which continuously rotates with constant rate about a vertical axis in azimuth. The systems first body is a horizontal hollow cylinder-like body rotating about said axis, the body being divided into a central section and two peripheral sections accommodating electro-optical sensors capable of rotating in elevation.

[0005] In inter alia such areas of application as those indicated above, it is of great value to render detection of the sight as difficult as possible. This applies equally to simple visual detection, detection by optronic means and detection by means of radar.

[0006] One object of the present invention is to construct a sight which makes the sight more difficult to detect visually, optronically or by means of radar than is the case in known constructions with, for example, fork mounting. Another object is to produce a sight which is easy to mount and which is suitable for upgrading already existing equipment in the form of, for example, vehicles, such as combat vehicles. A further object is to produce a versatile sight which can be used for observation, target location and missile control.

[0007] The objects of the invention are achieved by a sight according to the first paragraph, which is characterized by the features of the characterizing part of claim 1.

[0008] By means of the invention, a sight is produced which, irrespective of vertical and lateral orientation, has a visual outer contour which is virtually identical in all directions. This results in low probability of visual detection even if the sight is panned. The construction also affords the possibility of keeping the radar echoing area essentially constant in different directions irrespective of vertical and lateral manoeuvring. One condition, however, is that optical apertures which are formed in the peripheral sections are made in such a manner that they reflect electromagnetic radiation of the radar frequency concerned. By virtue of its shape and on account of the sight not requiring an optical channel, there is great freedom as far as positioning the sight is concerned, as a result of which inter alia the mounting work can be simplified.

[0009] According to an advantageous embodiment of the sight, the optical apertures can be protected by virtue of being rotated down into the protection of the second body. The embodiment is characterized in that the peripheral sections are arranged rotatably about the second axis of rotation into a protection position in which optical apertures, arranged in the peripheral sections, for normal sensors are protected by the second body.

[0010] According to a development of this advantageous embodiment, the sight can be provided with an extra sensor behind a small aperture. This aperture is oriented in a different direction from other apertures. The sight according to this development is characterized in that it comprises an extra sensor for use when normal sensors are located in protection position, which extra sensor is provided with an aperture which is small in relation to the apertures of other sensors and is oriented in a different direction from other apertures. By introducing this extra sensor, certain information can be obtained from the surroundings in protected position as well. In this context, small aperture means that its aperture area is at most 5% of the area of an aperture of normal size. The different direction is advantageously located in a direction which, relative to the direction of other apertures, corresponds to a rotation of the order of 90° about the second axis of rotation. This means that if the normal apertures are oriented vertically downwards in the protection position, the extra sensor with its aperture will be oriented essentially horizontally.

[0011] According to another advantageous embodiment of the sight according to the invention, the sight is designed to communicate with the equipment on which it is arranged via an electrical connection. By making the sight communicate with the equipment in the form of, for example, a combat vehicle via only an electrical channel, no separate direct optical channel is required. The solution makes mounting of the sight easy, and it is not necessary to make a hole to allow the passage of a direct optical channel. The solution also means that the observer has better protection. He has complete protection against the action of disruptive or destructive laser radiation. Only the detector itself is affected and risks being damaged.

[0012] According to a suitable embodiment, at least one electro-optical sensor is arranged in each peripheral section. By distributing the sensors between the peripheral sections, the spaces can be utilized optimally at the same time as the construction is balanced.

[0013] If, for example, a sensor requires a large space, the central section can be positioned slightly asymmetrically relative to the peripheral sections. The embodiment is characterized in that the central section is designed asymmetrically relative to the peripheral sections.

[0014] The second body of the sight is advantageously designed to have a circular cylindrical shape. This proposed shape has a favourably concealing effect.

[0015] The sight is suitable for accommodating many different types of electro-optical sensor. For example, at least one electro-optical sensor, which can be selected from the types TV, IRV, laser rangefinder and laser illuminator, can be arranged in at least one of the two peripheral sections.

[0016] For stabilizing the sight, a rate gyro is arranged, which stabilizes the sight by correcting rotational movements about the first and second axes of rotation. The rate gyro stabilization effectively isolates the sight line from the movements of the supporting surface.

[0017] In order to create a low thermal signature, the outer surfaces of the sight can be constructed so as to allow control of the surface temperature by means of, for example, liquid coolant.

[0018] The invention will be described in greater detail below in exemplified form with reference to the accompanying drawings, in which:

Figure 1 shows diagrammatically a sight according to the invention mounted on a combat vehicle;

Figure 2 shows a sight according to the invention in perspective, at an angle from the front;

Figure 3 shows a sight according to the invention in perspective, at an angle from the front, with the outer casing partly removed, and

Figure 4 shows an alternative embodiment of a sight according to the invention in perspective, at an angle from the front, with the outer casing partly removed.

[0019] According to Figure 1, a sight 1 is mounted on the turret 2 of a combat vehicle 3. Here, the sight can function as a panning principal sight or as another observation system. The sight is gyro-stabilized by a biaxial rate gyro (not shown) mounted on the same structure as the electro-optical sensors and with the measuring axes at right angles to the sight line. Although the sight 1 is shown mounted on a combat vehicle here, many other types of equipment are possible, and mention may be made in particular of use at sea on a combat boat.

[0020] The sight is now described in greater detail with reference to Figures 2-4.

[0021] According to Figure 2, the sight 1 comprises an essentially spherical body 4 adjacent to one end of a rotationally symmetrical body 5, preferably of circular cylindrical shape. The spherical body 4 comprises a central section 6 surrounded by a peripheral section 7 and, respectively, 8 on each side. In the embodiment shown, the peripheral section 7 is provided with one aperture 9, while the peripheral section 8 has two apertures 10, 11. The spherical body 4 is rotatable in relation to the body 5 about an axis of rotation 12. By rotation about the axis of rotation 12, it is possible to bring about complete rotation, that is to say 360°. The two peripheral sections 7, 8 are rigidly mechanically interconnected in a manner which will be discussed in greater detail below and are arranged rotatably so as to be capable of being rotated about an axis of rotation 13. The rotation can be limited to a range in which the apertures of the sight are, in one end position, oriented at an angle downwards relative to the horizontal plane and, in the other end position, oriented at an angle upwards relative to the horizontal plane.

[0022] Figure 3 shows how the electro-optical sensors are arranged in the two peripheral sections 7, 8. The peripheral section 7 is provided with one electro-optical sensor 14, while the peripheral section 8 has two electro-optical sensors 15, 16. The electro-optical sensors can be selected from possibilities including, for example, TV, IRV, laser rangefinder and laser illuminator. The electro-optical sensors 14-16 are mounted on circular plates 17, 18 which are bearing-mounted rotatably about the axis of rotation 13 and are rigidly mechanically interconnected. To drive the plates, a servomotor (not shown), which is controlled by information from the equipment on which the sight is mounted, is accommodated in the central section.

[0023] The embodiment shown in Figure 4 has a different arrangement of electro-optical sensors in the peripheral section 8. In this case, the peripheral section 8 accommodates three electro-optical sensors 15, 16 and 19. The sensors 14-16 face in essentially the same direction, while the sensor 19 faces in a direction which is rotated by roughly 90° about the axis of rotation 13. It can also be observed that the sensor 19 has a small aperture. By virtue of the embodiment shown in Figure 4, a sight is produced in which the ordinary normal sensors can be protected by being rotated down into the protection of the body 5. At the same time, a certain monitoring of the situation is still permitted by the sensor 19 which has a small aperture and is thus not so vulnerable. Stabilization of the sensor 19 requires a third measuring axis at right angles to the measuring axes previously mentioned, and the sight is suitably supplemented with a uniaxial rate gyro (not shown). It may be pointed out here that the embodiment shown in Figure 3 also allows normal sensors to be protected in the body 5. In the protection position, however, there is then no back-up for the sight in order to find out what is happening in the surroundings.

[0024] The information from the sensors consists of only video signals or other digital signals. These are conducted to one or more monitors inside the turret via an electric cable. Signals from an aiming device inside the turret to the vertical and lateral servos can also be conducted via the same cable.

[0025] In order to obtain a low thermal signature, the outer casings of the sight, apart from the optical apertures, can be provided with a possibility for controlling the surface temperature by means of, for example, liquid coolant. The possibility for cooling also exists in the event

that the outer casing is designed to withstand fragments and firing.

Claims

1. Sight (1) which is rotatable vertically and laterally and comprises a first hollow body (4) which interacts with a second essentially rotatable symmetrical body (5), which bodies (4, 5) are rotatable in relation to one another about a first axis (12) of rotation, the first body (4) accommodating one or more electro-optical sensors (14, 15, 16) with associated apertures (9, 10, 11) which sensors are rotatable about a second axis (13) of rotation at right angles to the first axis (12) of rotation, the first body (4) being, along the second axis (13) of rotation, divided into a central section (6) and a first (7) and a second (8) peripheral section, which first and second peripheral sections are arranged one on each side of the central section (6) and are arranged rotatably about the second axis (13) of rotation, at least one peripheral section (17, 18) comprising at least one electro-optical sensor (14, 15, 16) with associated aperture (9, 10, 11, **characterized in that** the first body (4) is essentially spherical for producing a sight which irrespective of vertical and lateral orientation, has a visual outer contour which is virtually identical in all directions, the central section (6) being arranged rigidly relative to the second axis (13) of rotation, the first (7) and second (8) peripheral sections being interconnected so as to follow the rotational movements of one another wherein the peripheral sections (7, 8) are arranged rotatably about the second axis (13) of rotation into a protection position in which optical apertures (9, 10, 11), arranged in the peripheral sections, for normal sensors are protected by the second body (5), and the second body (5) is designed to have a circular cylindrical shape.

2. Sight according to Patent Claim 1, **characterized in that** the sight (1) comprises and extra sensor (19) for use when normal sensors are located in protection position, which extra sensor (19) is provided with an aperture which is small in relation to the apertures (9, 10, 11) of other sensors and is oriented in a different direction from other apertures (9, 10, 11).

3. Sight according to Patent Claim 2, **characterized in that** the different direction is located in a direction which, relative to the direction of other apertures (9, 10, 11), corresponds to a rotation of the order of 90° about the second axis (13) of rotation.

4. Sight according to any one of the preceding patent claims, **characterized in that** the sight (1) is designed to communicate with the equipment on which it is arranged via an electrical connection.

5. Sight according to any one of the preceding patent claims, **characterized in that** at least one electro-optical sensor (14, 15, 16) with associated aperture (9, 10, 11) is arranged in each peripheral section (7, 8).

6. Sight according to any one of the preceding patent claims, **characterized in that** at least one electro-optical sensor (14 ,15, 16), which can be selected from the types TV, IRV, laser rangefinder, laser illuminator and missile locator, is arranged in at least one of the two peripheral sections (7, 8).

7. Sight according to any one of the preceding patent claims, **characterized in that** a rate gyro is arranged for stabilizing the sight (1) by correcting rotational movements about the first (12) and second (13) axes of rotation.

8. Sight according to any one of the preceding patent claims, **characterized in that** the outer casings of the first (4) and second (5 body are designed to allow control of the surface temperature.

9. Sight according to any one of the preceding patent claims, **characterized in that** the central section (6) is designed asymmetrically relative to the peripheral section (7, 8).

Patentansprüche

1. Visier (1), welches vertikal und seitlich rotierbar ist und einen ersten hohlen Körper (4) umfasst, welcher mit einem zweiten, im Wesentlichen rotierbaren, symmetrischen Körper (5) zusammenwirkt, wobei die Körper (4, 5) in Bezug aufeinander um eine erste Drehachse (12) rotierbar sind, wobei der erste Körper (4) einen oder mehrere elektrooptische Sensoren (14, 15, 16) mit zugeordneten Öffnungen (9, 10, 11) aufnimmt, wobei die Sensoren um eine zweite Drehachse (13) in rechten Winkeln zu der ersten Drehachse (12) rotierbar sind,
wobei der erste Körper (4) entlang der zweiten Drehachse (13) in einen zentralen Abschnitt (6) und einen ersten (7) und einen zweiten (8) Umfangsabschnitt unterteilt ist, wobei der erste und zweite Umfangsabschnitt an jeder Seite des zentralen Abschnitts (6) angeordnet sind und rotierbar um die zweite Drehachse (13) angeordnet sind, wobei zumindest ein Umfangsabschnitt (17, 18) zumindest einen elektrooptischen Sensor (14, 15, 16) mit zugeordneter Öffnung (9, 10, 11) umfasst,
dadurch gekennzeichnet, dass der ersten Körper (4) im Wesentlichen kugelförmig ist, um ein Visier zu erzeugen, welches unabhängig von der senkrechten und seitlichen Orientierung eine sichtbare äußere Kontur aufweist, die in allen Richtungen na-

hezu identisch ist, wobei der zentrale Abschnitt (6) relativ zu der zweiten Drehachse (13) starr angeordnet ist, wobei der erste (7) und zweite (8) Umfangsabschnitt miteinander verbunden sind, um den Drehbewegungen gegenseitig zu folgen,
wobei die Umfangsabschnitte (7, 8) rotierbar um die zweite Drehachse (13) in einer Hervorstehposition angeordnet sind, in der die optischen Öffnungen (9, 10, 11) für normale Sensoren, die in den Umfangsabschnitten anordnet sind, von dem zweiten Körper (5) geschützt werden und wobei der zweite Körper (5) ausgebildet ist, um eine runde Zylinderform aufzuweisen.

2. Visier nach Anspruch 1, **dadurch gekennzeichnet, dass** das Visier (1) einen extra Sensor (19) zur Verwendung, wenn die normalen Sensoren in einer Schutzposition angeordnet sind, umfasst, wobei der extra Sensor (19) mit einer Öffnung versehen ist, die klein in Bezug auf die Öffnungen (9, 10, 11) der anderen Sensoren ist und in einer sich von anderen Öffnungen (9, 10, 11) unterscheidenden Richtung ausgerichtet ist.

3. Visier nach Anspruch 3, **dadurch gekennzeichnet, dass** die unterschiedlichen Richtungen in einer Richtung angeordnet sind, welche relativ zu der Richtung der anderen Öffnungen (9, 10, 11) einer Drehung in der Größenordnung von 90° um die zweite Drehachse (13) entspricht.

4. Visier nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** das Visier ausgebildet ist, um mit der Ausrüstung, auf welcher es angeordnet ist, über eine elektrische Verbindung zu kommunizieren.

5. Visier nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** zumindest ein elektro-optischer Sensor (14, 15, 16) mit einer zugeordneten Öffnung (9, 10, 11) in jedem Umfangsabschnitt (7, 8) angeordnet ist.

6. Visier nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** zumindest ein elektro-optischer Sensor (14, 15, 16), der von den Typen TV, IRV, Laserentfernungsmesser, Laserbeleuchtungsquelle und Raketenortungsgerät ausgewählt werden kann, an zumindest einem der beiden Umfangsabschnitte (7, 8) angeordnet ist.

7. Visier nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** ein Gyrometer zum Stabilisieren des Visiers (1) durch Korrigieren von Rotationsbewegungenum die erste (12) und zweite (13) Drehachse angeordnet ist.

8. Visier nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** das äußere Gehäuse des ersten (4) und zweiten (5) Körpers angeordnet ist, um die Steuerung der Oberflächentemperatur zu gestatten.

9. Visier nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** der zentrale Abschnitt (6) relativ zu dem Umfangsabschnitt (7, 8) asymmetrisch angeordnet ist.

Revendications

1. Système de visée (1) qui est verticalement et latéralement rotatif et comprend un premier corps creux (4) qui interagit avec un deuxième corps symétrique essentiellement rotatif (5), lesquels corps (4, 5) peuvent tourner l'un par rapport à l'autre autour d'un premier axe (12) de rotation, le premier corps (4) logeant un ou plusieurs capteurs électrooptiques (14, 15, 16) avec des ouvertures (9, 10, 11) associées, lesquels capteurs peuvent tourner autour d'un deuxième axe (13) de rotation en angle droit par rapport au premier axe (12) de rotation, le premier corps (4) étant, le long du deuxième axe (13) de rotation, divisé en une section centrale (6) et en une première (7) et une deuxième (8) section périphérique, lesquelles première et deuxième sections périphériques sont agencées de chaque côté de la section centrale (6) et sont agencées de manière rotative autour du deuxième axe (13) de rotation, au moins une section périphérique (17, 18) comprenant au moins un capteur électro-optique (14, 15, 16) avec une ouverture (9, 10, 11) associée, **caractérisé en ce que** le premier corps (4) est essentiellement sphérique pour produire un système de visée qui indépendamment de l'orientation verticale et latérale, a un contour externe visuel qui est virtuellement identique dans toutes les directions, la section centrale (6) étant agencée de manière rigide par rapport au deuxième axe (13) de rotation, les première (7) et deuxième (8) sections périphériques étant interconnectées afin de suivre les mouvements de rotation l'une de l'autre, dans lequel les sections périphériques (7, 8) sont agencées de manière rotative autour du deuxième axe (13) de rotation dans une position de protection dans laquelle les ouvertures optiques (9, 10, 11), agencées dans les sections périphériques, pour les capteurs normaux, sont protégées par le deuxième corps (5) et le deuxième corps (5) est conçu pour avoir une forme cylindrique circulaire.

2. Système de visée selon la revendication 1, **caractérisé en ce que** le système de visée (1) comprend un capteur supplémentaire (19) destiné à être utilisé lorsque les capteurs normaux sont positionnés dans la position de protection, lequel capteur supplémen-

taire (19) est prévu avec une ouverture qui est petite par rapport aux ouvertures (9, 10, 11) des autres capteurs et est orientée dans une direction différente des autres ouvertures (9, 10, 11).

3. Système de visée selon la revendication 2, **caractérisé en ce que** la direction différente est située dans une direction qui, par rapport à la direction des autres ouvertures (9, 10, 11), correspond à une rotation de l'ordre de 90° autour du deuxième axe (13) de rotation.

4. Système de visée selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le système de visée (1) est conçu pour communiquer avec l'équipement sur lequel il est agencé via une connexion électrique.

5. Système de visée selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**au moins un capteur électro-optique (14, 15, 16) avec une ouverture (9, 10, 11) associée, est agencé dans chaque section périphérique (7, 8).

6. Système de visée selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**au moins un capteur électro-optique (14, 15, 16), qui est sélectionné parmi les types TV, IRV, télémètre à laser, éclaireur laser et balise missile, est agencé dans au moins l'une des deux sections périphériques (7, 8).

7. Système de visée selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**un gyromètre est agencé pour stabiliser le système de visée (1) en corrigeant les mouvements de rotation autour des premier (12) et deuxième (13) axes de rotation.

8. Système de visée selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les boîtiers externes des premier (4) et deuxième (5) corps sont conçus pour permettre le contrôle de la température de surface.

9. Système de visée selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la section centrale (6) est conçue de manière asymétrique par rapport à la section périphérique (7, 8).

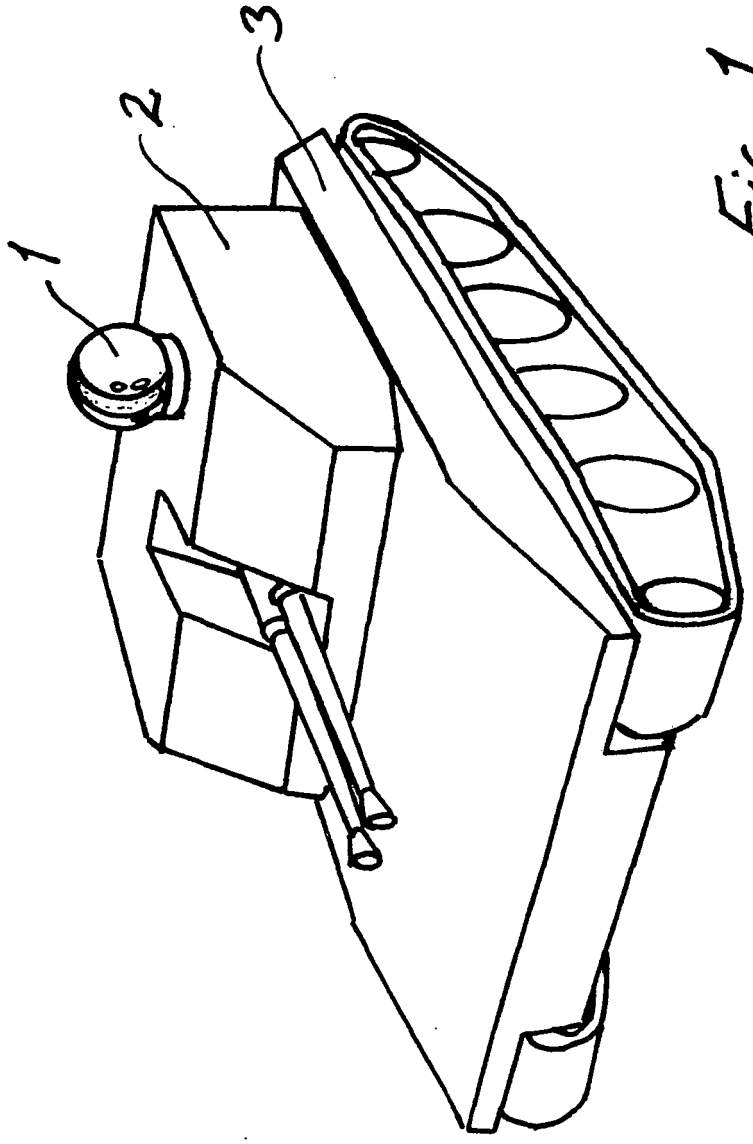

Fig. 1

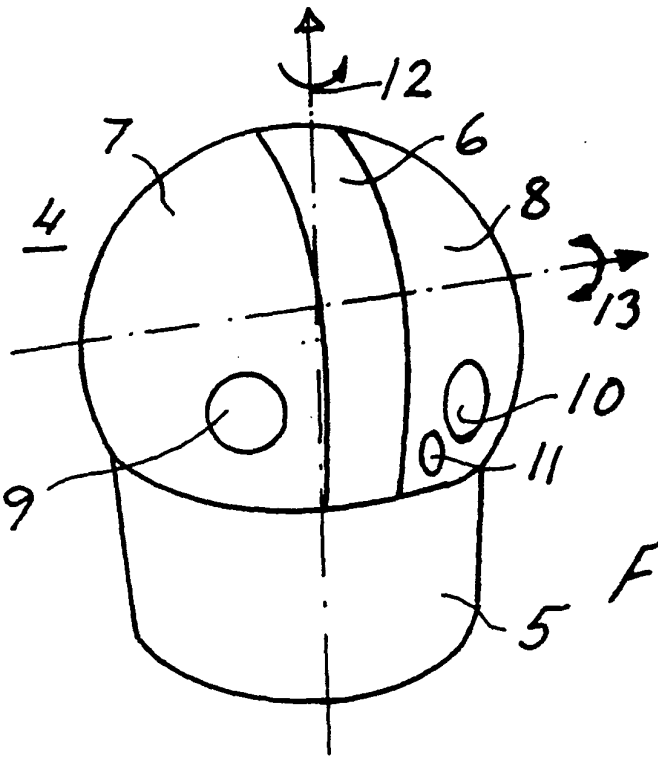

Fig. 2

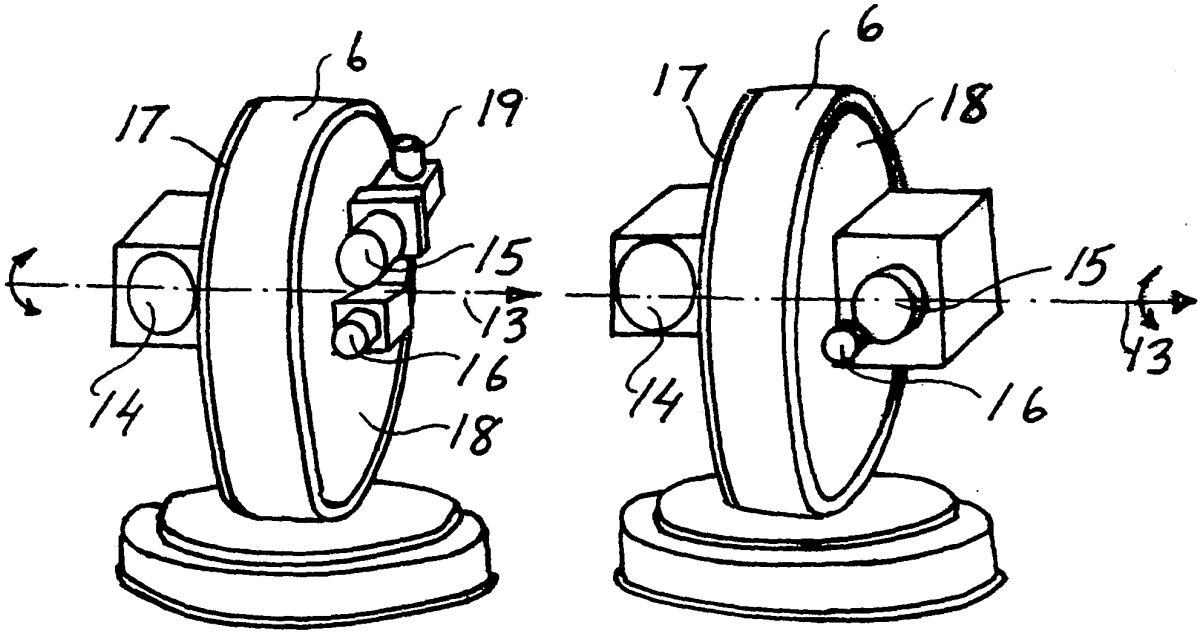

Fig. 4

Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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Non-patent literature cited in the description

- **Knepper, R.** SIRIUS, a Long Range Infra Red Search and track System. *SPIE Proceedings,* 20 April 1997, vol. 3061, 578-584 **[0004]**