G. HORN.

DEVICE FOR TRAINING PILOTS AND OBSERVERS IN HANDLING AEROPLANES.

APPLICATION FILED JUNE 4, 1919.

1,402,498. Patented Jan. 3, 1922.

4 SHEETS—SHEET 1.

Fig. 1.

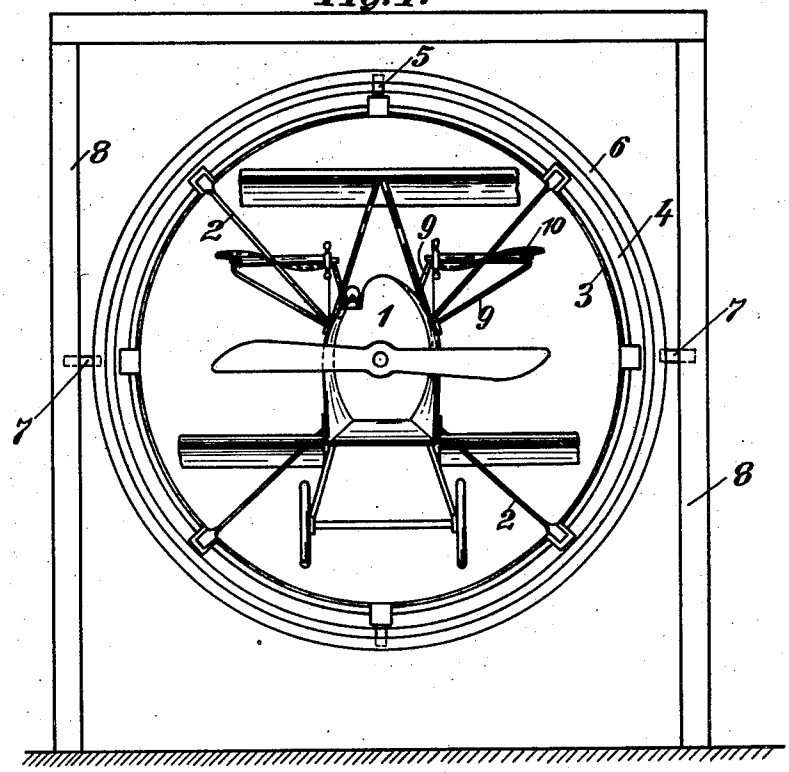
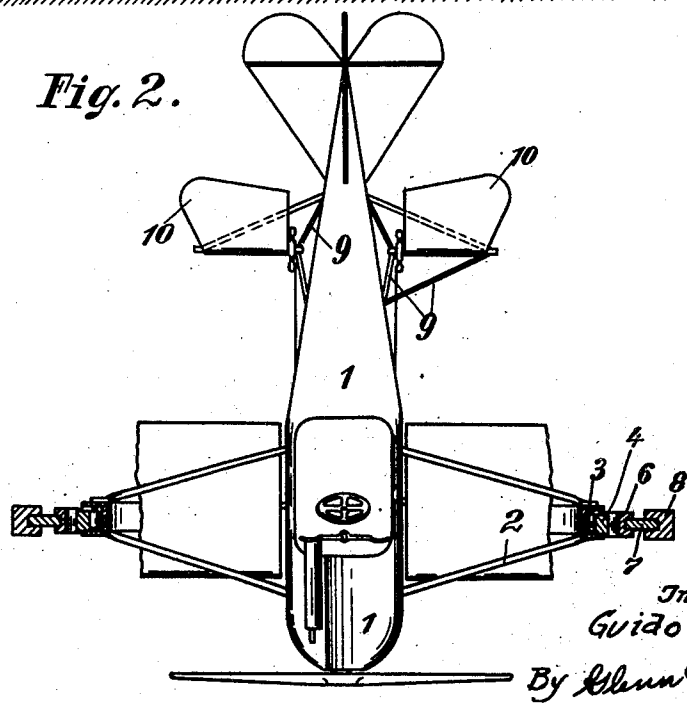


Fig. 2.



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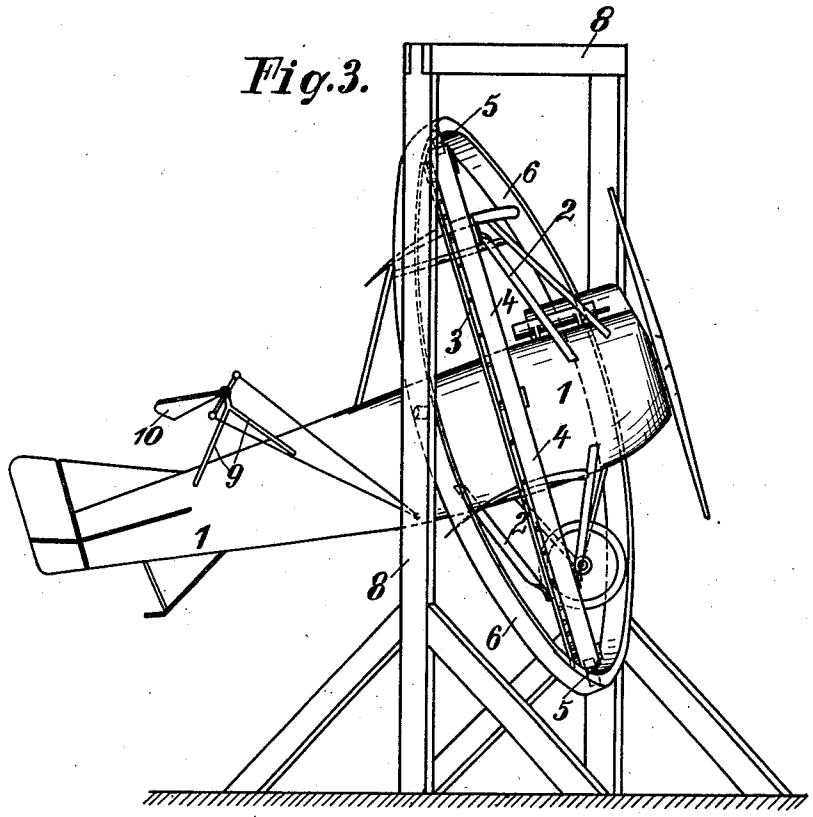
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4 SHEETS—SHEET 2.

Fig. 3.



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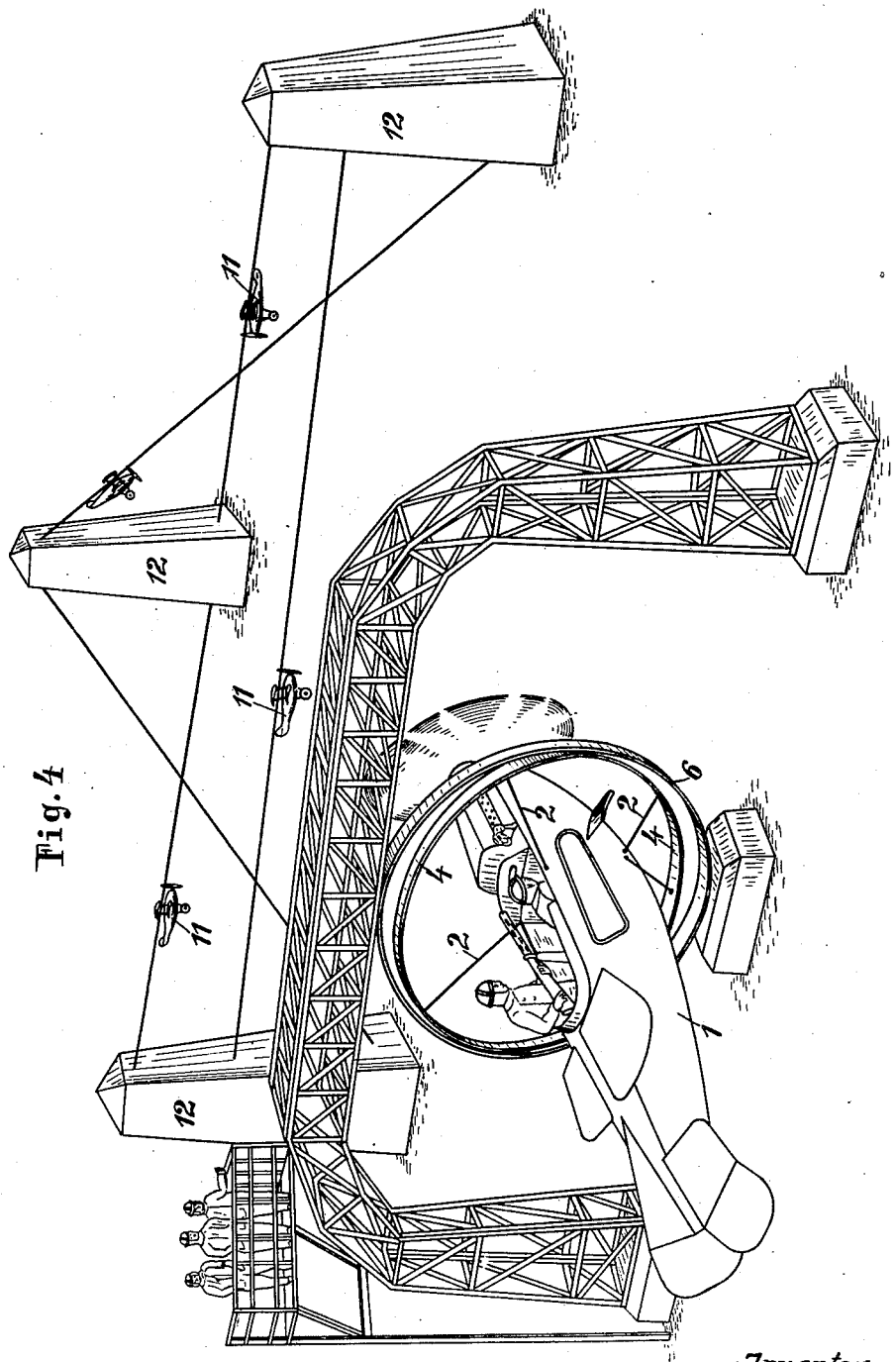


Fig. 4

Inventor:
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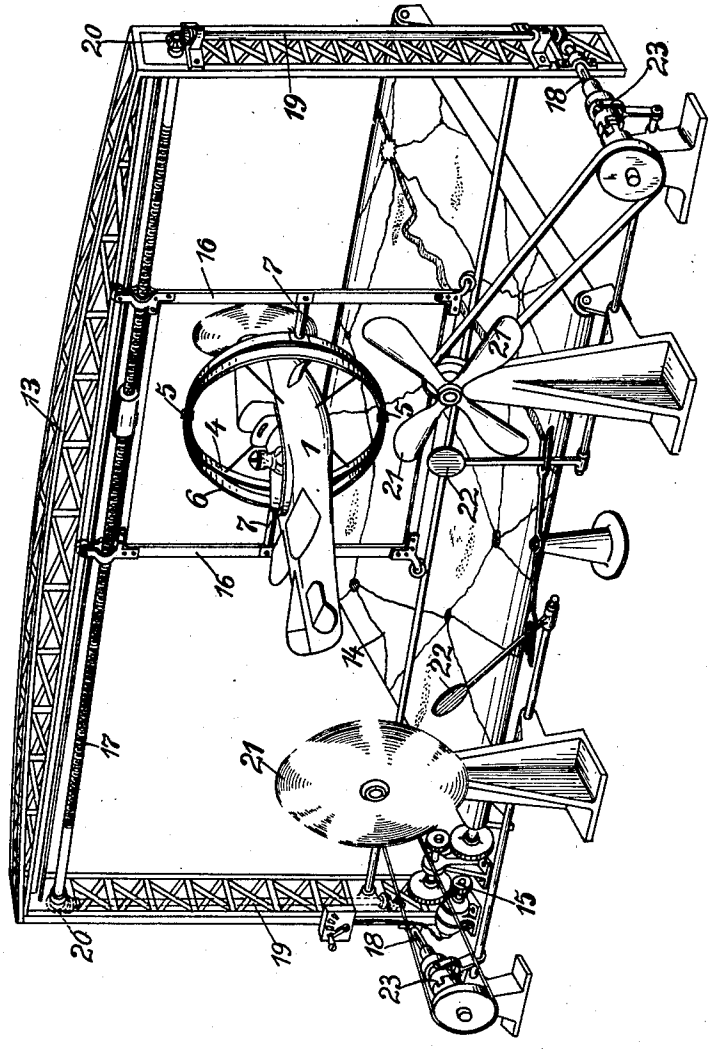
DEVICE FOR TRAINING PILOTS AND OBSERVERS IN HANDLING AEROPLANES.

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4 SHEETS—SHEET 4.

Fig. 5.



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UNITED STATES PATENT OFFICE.

GUIDO HORN, OF WEISSENSEE-BERLIN, GERMANY.

DEVICE FOR TRAINING PILOTS AND OBSERVERS IN HANDLING AEROPLANES.

1,402,498. Specification of Letters Patent. Patented Jan. 3, 1922.

Application filed June 4, 1919. Serial No. 301,809.

To all whom it may concern:

Be it known that I, GUIDO HORN, a citizen of Germany, residing at Weissensee-Berlin, Germany, have invented a new and useful Improvement in a Device for Training Pilots and Observers in Handling Aeroplanes (for which I have filed applications in Germany on Sept. 26, 1917; Austria on Feb. 17, 1917; Holland on Nov. 14, 1918; Sweden on Jan. 4, 1919; Denmark on Jan. 10, 1919,) of which the following is a specification.

My invention relates to a device for training pilots and observers in handling aeroplanes and has for its object to provide an improved construction of such a device which allows of supporting the aeroplane in such a manner that the same may be moved about three different axes. With this object in view I provide a ring for carrying the flying machine which ring is revolubly mounted within the inner ring of a Cardan pair of rings. Another feature of my invention consists in disposing the lateral steering planes within the region of the action of the propeller, while the supporting planes may be dispensed with or otherwise considerably shortened, my novel apparatus keeping the flying machine stationarily suspended.

My invention allows of giving pilots and observers a preparatory all-round training in a war-like handling of aeroplanes, since all the movements may be exercised which will become necessary in ordinary flights as well as in actual air flights.

In order to render my invention quite clear I have illustrated an embodiment of the same, by way of example, in the accompanying drawings which form a part of this application.

In Fig. 1 I have shown my novel device in elevation and in

Fig. 2 in a plan view the parts being shown in section.

Fig. 3 is a lateral view of the novel device.

Fig. 4 shows a modification of the apparatus for use with target disks which are movable in various directions.

Fig. 5 shows how one may be trained in the use of the device for throwing bombs on determined objects with the aeroplane stationarily suspended.

For training purposes it is sufficient to use a main body 1 of an aeroplane provided with motor, propeller, a machine gun, and a complete steering equipment. The ring 3 is connected to the machine body 1 by means of stays 2 in such a manner that the centre of gravity of the fully loaded and horizontally placed main body 1 is situated within the plane of the ring 3. The ring 3 is provided with a radial flange 3^a and mounted within the ring 4 in such a manner that the same may readily revolve not only under the radially acting load of the main body but also when simultaneously the axial pull generated by the propeller acts upon the same. For that purpose I may, as shown in Fig. 2, provide rollers 4^a between the inner surface of the ring 4 and the outer surface of the ring 3, and balls 4^b between the rear surface of the ring 4 and the inner surface of the flange 3^a. By means of the guiding pieces 3^b the rings 3 and 4 are kept in operative connection. The ring 4 is provided with diametrically disposed pins 5 by means of which the ring 4 is oscillatingly mounted within the outer ring 6. This latter ring 6 is provided with pins 7 which are disposed at a right angle to the Cardan pins 5 of the ring 4 and engage in bearings of the frame 8. Towards the tail end of the main body 1 I provide a frame work 9 carrying the lateral steering planes 10 in such a position that the same are acted upon by the wind generated by the propeller. These lateral steering planes 10 are connected with the well known cables usually used in connection with lateral steering planes. Thus, the training of the pupil may be extended to the use of the lateral steering planes. If it is desired to dispose of the lateral steering planes the cables leading thereto may be directly connected to the ring 4. All the other steering devices are the usual. Any variation of sensibility of the steering planes and steadying surfaces may be obtained by a change of the size of the respective surfaces.

For shooting exercises it is desirable to place the targets at different levels and well distributed over the ground. I prefer to use hinged-to-fall and traveling targets since they are best suited for exercising purposes.

Fig. 4 shows such an apparatus for shooting exercises on movable targets 11, which are movable along wires at any desired speed and in any desired direction between target towers 12. The outer ring 6 is here suspended above and below, so that the aeroplane will be able to turn around its middle axis and the observer may also exercise shooting sideways and backwards.

The pupil or airman takes his seat on the

apparatus exactly in the same manner as on an ordinary flying machine ready to start. The motor is then turned on exactly as for an actual flight. Instead of the start at which the flying machine would commence to be lifted from the ground and would be suspended in the air subject to the action of the steering device, the apparatus remains suspended within the Cardan rings unable to advance but ready to take all the positions which the unarrested aeroplane would assume under the corresponding steering movements. If the main frame 8 on which the Cardan rings are mounted is of a sufficient size it is possible even to perform a harmless somersault.

The operator of the machine may be induced by the observer, or from the outside, by means of signals to perform certain movements with the training apparatus. The exercises may be varied in many-fold manner, and thus actual flying conditions be imitated, by changes in the position of the steadying surfaces, by influencing the propeller wind by means of baffle plates and screens, or through generating alternating winds.

For shooting exercises targets of different kinds, stationary and traveling targets, are set up at different levels and in various directions (Fig. 4) until the gun operator has acquired sufficient practice in this respect. Such exercises are not only of importance with a fixedly mounted machine gun with which the aim is taken through the steering devices of the complete apparatus but also on an aeroplane which carries an observer beside the pilot, in order to train both men in properly co-acting together.

For exercises in throwing bombs some auxiliary devices are required, but the mode of operation requires but little modification. Fig. 5 shows the device as used for the exercise in bomb-throwing, comprising the frame-work 13. Proper timing of the fall of the projectile can of course not be attained, since the fall cannot be imitated, but training may be given in the use of the telescope. For this purpose I prefer to suspend the Cardan rings of the apparatus as high as possible, transversely in a frame-work 13, below which a wide cloth is spread horizontally. The landscape above which the plane is supposed to fly, is represented on this cloth, on a scale corresponding to the height at which the bomb-throwing is supposed to take place. The cloth provided with this map of the landscape, is moved below the flying machine, by means of the motor gear 15, at a speed which is determined by the trainer for the assumed flight over such landscape. The observer does not know this speed, it being his task to find out and make a note of same for comparison later on.

The suspension of the Cardan rings in a stationary frame does not enable one to find a given place lying laterally of the vertical center plane of the flying machine. In order to make this possible, the device is hung in the frame 16, which is easily slidable over the whole width of the map along a slide rod 17. If now one of the side steering planes is operated sufficiently strong, the whole device together with the frame 16 will move towards that side. In this manner any point of the map may be flown over. The sideward movement is brought about by means of the gears 18, 19, 20, which receive their movement from the fans 21, which latter are driven by the wind from the propeller when the lateral steering planes are operated. The gearing for the slide rod 17 is engaged automatically, for the purpose of a lateral movement of the aeroplane, by means of the reciprocating wind shields 22, which operate the couplings 23.

It is the task of the observer to induce the pilot, by means of the direction indicator, to overflow the aim as accurately as possible while adhering to the direction once chosen. I prefer a modification of this mode of operation according to which the pilot operates a second lateral steering plane until the bomb is to be detached, and this mode of manipulation enables the pilot to quickly acquire practice in the use of the lateral steering planes.

In order to determine the spot upon the map on which, under the conditions attempted to establish, the bomb might be expected to fall down I propose to place beside the field glass, or telescope, an air-gun or Flobert-gun directed to the same aim to which the field glass is adjusted. When the observer thinks that the proper moment for dropping the bomb has arrived he may discharge the air gun instead of detaching the bomb. As a control whether the observer adjusted the libella of the telescope at the proper moment a pendulum may be arranged which independently indicates the position of the telescope at the moment the trigger of the gun is operated. Moreover, I may directly connect the gun with the pendulum, the discharged shot will then hit the aim only if the telescope has been properly positioned.

What I claim as my invention and desire to secure by Letters Patent of the United States, is:—

1. An apparatus for training pilots and observers in handling flying machines, comprising, in combination, a ring adapted to be fixedly connected to the body of a flying machine, a pair of rings interconnected on the Cardan principle, means between said first named ring and the inner ring of said pair of rings, whereby said first named ring is enabled to co-axially revolve within the

inner ring of said pair of rings, and a frame adapted to oscillatingly carry the outer ring of said pair of rings.

2. An apparatus for training pilots and observers in handling flying machines, comprising, in combination, a main body of a flying machine, a motive power source mounted on said body, a propeller mounted on said body and operatively connected to said motive power source, a pair of lateral steering devices disposed within the region of action of said propeller, a ring fixedly connected to said body of a flying machine, a pair of rings interconnected on the Cardan principle, means between said first named ring and the inner ring of said pair of rings, whereby said first named ring is enabled to co-axially revolve within the inner ring of said pair of rings, and a frame adapted to oscillatingly carry the outer ring of said pair of rings.

3. An apparatus for training pilots and observers in handling flying machines, comprising, in combination, a ring adapted to be fixedly connected to the body of a flying machine, a pair of rings interconnected on the Cardan principle, means between said first named ring and the inner ring of said pair of rings, whereby said first named ring is enabled to co-axially revolve within the inner ring of said pair of rings, a main frame, and means on said main frame adapted to oscillatingly carry the outer ring of said pair of rings, said main frame being adapted to laterally move.

4. An apparatus for training pilots and observers in handling flying machines, comprising a combination, a main body of a flying machine, a motive power source mounted on said body, a propeller mounted on said body and operatively connected to said motive power source, a pair of lateral steering devices disposed within the region of action of said propeller, a ring fixedly connected to said body of a flying machine, a pair of rings interconnected on the Cardan principle, means between said first named ring and the inner ring of said pair of rings, whereby said first named ring is enabled to co-axially revolve within the inner ring of said pair of rings, and a frame adapted to oscillatingly carry the outer ring of said pair of rings, said frame being further adapted to laterally move under the action of said propeller and said lateral steering devices.

5. An apparatus for training pilots and observers in handling flying machines, comprising, in combination, a ring adapted to be fixedly connected to the body of a flying machine, a pair of rings interconnected on the Cardan principle, means between said first named ring and the inner ring of said pair of rings, whereby said first named ring is enabled to co-axially revolve within the inner ring of said pair of rings, said means comprising roller and ball bearings, and a frame adapted to oscillatingly carry the outer ring of said pair of rings.

6. An apparatus for training pilots and observers in handling flying machines, comprising, in combination, a main body of a flying machine, a motive power source mounted on said body, a propeller mounted on said body and operatively connected to said motive power source, a pair of lateral steering devices disposed within the region of action of said propeller, a ring adapted to be fixedly connected to said body of a flying machine, a pair of rings interconnected on the Cardan principle, means between said first named ring and the inner ring of said pair of rings, whereby said first named ring is enabled to co-axially revolve within the inner ring of said pair of rings, said means comprising a roller bearing disposed to take the load of said main body and a ball bearing disposed to take the pull generated by said propeller; and a frame adapted to oscillatingly carry the outer ring of said pair of rings.

7. An apparatus for training pilots and observers in handling flying machines, comprising, in combination, a ring adapted to be fixedly connected to the body of a flying machine, a pair of rings interconnected on the Cardan principle, means between said first named ring and the inner ring of said pair of rings, whereby said first named ring is enabled to co-axially revolve within the inner ring of said pair of rings, said means comprising roller and ball bearings, and a frame adapted to oscillatingly carry the outer ring of said pair of rings, said frame being further adapted to laterally move.

8. An apparatus for training pilots and observers in handling flying machines, comprising, in combination, a main body of a flying machine, a motive power source mounted on said body, a propeller mounted on said body and operatively connected to said motive power source, a pair of lateral steering devices disposed within the region of the action of said propeller, a ring fixedly connected to said body of a flying machine, a pair of rings interconnected on the Cardan principle, means between said first named ring and the inner ring of said pair of rings, said means comprising a roller bearing disposed to take the load of said main body and a ball bearing disposed to take the pull generated by said propeller, and a frame adapted to oscillatingly carry the outer ring of said pair of rings, said frame being further adapted to laterally move under the action of said propeller and said lateral steering devices.

GUIDO HORN.