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May 20, 1930. R. KAUCH ET AL 1,759,012

RANGE FINDER AND GUN SIGHT

Filed March 18, 1924

FIG. 1.

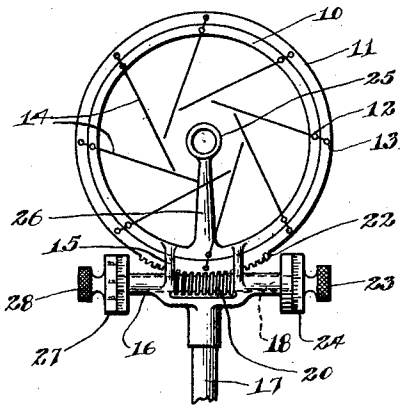


FIG. 2.

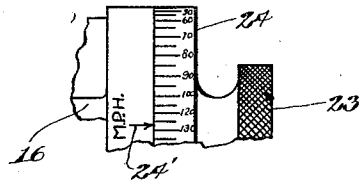


FIG. 3.

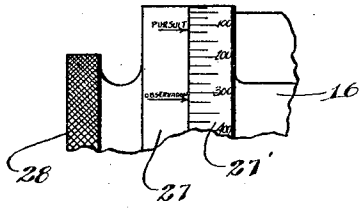


FIG. 4.

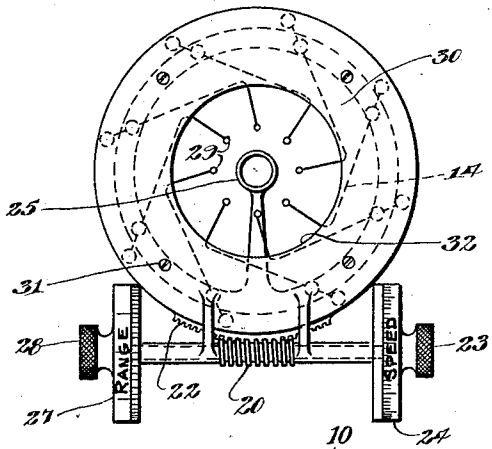
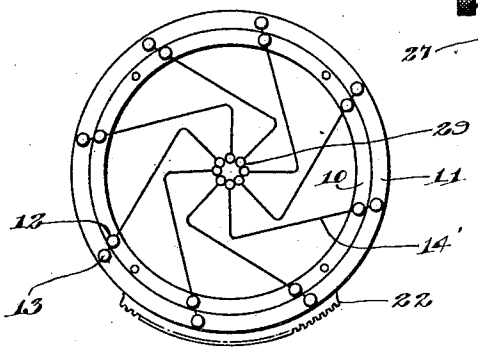


FIG. 5.



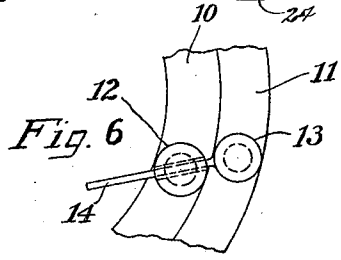


Fig. 6

1410

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29

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33. GEOMETRICAL INSTRUMENTS.

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Patented May 20, 1930 1,759,012

UNITED STATES PATENT OFFICE

ROBERT KAUCH AND CHARLES L. PAULUS, OF DAYTON, OHIO

RANGE FINDER AND GUN SIGHT

Application filed March 18, 1924. Serial No. 700,098.

This invention relates to improvements in range finders and gun sights herein combined in a single device for use as a gun sight and range finder on machine guns for air combat and capable of use on either fixed or flexibly mounted guns of this type.

One of the principal objects of the invention is to provide a unitary gun sight and range finder by means of which an aviator observing the silhouette of an approaching enemy air craft, can adjust the sight on his gun in accordance with what he knows to be the approximate speed of the kind of plane in question so that when the plane comes into view through the sight, he is in a position to know at what range his objective is flying and can determine about when to commence firing.

A second object of the invention is to provide in connection with a sight such as is ordinarily provided as a rear sight on machine guns used for air combat, an adjustable sight ring which is quickly adjustable and always maintains true concentricity with the sight.

The invention embraces other objects and advantages which will be brought out in the course of the following detailed description of the invention. In the description reference is made to the accompanying drawings showing two forms of the invention, wherein

Fig. 1 is a front view of a range finder and gun sight constructed in accordance with our invention.

Figs. 2 and 3 are fragmentary enlarged details of parts of the device shown in Fig. 1.

Fig. 4 is a view similar to Fig. 1, of a modified or alternative form, and

Fig. 5 is a view of a portion of the device shown in Fig. 4 illustrating the manner and extent of adjustment of the adjustable ring sight.

Fig. 6 is an enlarged fragmentary view illustrating the manner in which the adjustable ring sight is operated.

The same or similar reference numerals are applied to corresponding parts.

The invention is illustrated detached from the gun since the general combination of a rear sight on a machine gun used in connection with the front or bead sight is well known and generally understood. The present invention is applicable to fixed and flexibly mounted machine guns and it will therefore be understood that although neither a fixed bead sight nor a wind vane sight is shown, the device herein disclosed is designed and intended for use with either.

Referring to Fig. 1 of the drawings, the device comprises an inner fixed ring 10 and an outer concentric ring 11 suitably slidable on the inner ring. Each of the rings has studs 12 and 13 mounted for swivel movement therein at regularly spaced intervals about concentric circumferences. An encompassing device comprising a plurality of vanes or needles 14 are fixed at their outer ends to the studs 13 said vanes having their inner ends circumferentially slidably disposed in guideways provided with the studs 12 to permit of their assuming a concentric relation with respect to the rings 10 and 11 forming together a circular sight opening at the center of the rings. It is apparent that upon relative movement of one ring with respect to the other, the vanes 14 are moved together through equal degrees to enlarge or restrict the sight opening and that the sight opening in any state of adjustment is generally circular in form and maintains concentric relation with the rings 10 and 11.

The inner ring 10 is supported by webs 15 above a pair of trunnion bearings 16 extending in opposite directions from a standard 17, which is received in a suitable socket on the machine gun in the usual manner. The trunnions 16 receive a spindle 18 on which a worm 20 is mounted between the bearings 16. The worm 20 engages sector gear teeth 22 in the periphery of the outer ring 11 for moving the latter with respect to the inner ring 10 to enlarge or restrict the sight opening formed by the vanes 14. The spindle 18 has a thumb piece 23 on one end thereof formed suitably integral with a dial 24. The latter is calibrated in units pertaining to the speed of travel of the objective, preferably in miles per hour, and is movable with reference to an index mark 24′ on the bearing 16. A small ring sight 25 carried on a radial arm 26 by the

inner ring 10 is concentric with the rings 10 and 11 and disposed in the center of the sight opening. The ring sight 25 is used in connection with a wind vane sight on a flexibly mounted machine gun or with a fixed bead sight on a fixedly mounted machine gun to determine the line of sight through the device.

The operation of the device as thus far described is as follows: The device is mounted as a rear sight on any standard machine gun with the small ring 25 aligned with the fixed bead or wind vane bead, as the case may be. If a wind vane is used compensation is made automatically for the speed of the plane on which the guns are mounted. The manual correction is made in the following manner: It is assumed that all combat pilots in wartime are conversant with the speeds of travel of the types of planes used by the enemy. The speeds of the different types may for example, vary between 70 and 200 M. P. H. In the use of the device the calibrated dial on the sight is adjusted after an observation of the silhouette of an approaching plane and a setting is made to suit the flying speed of the plane in question. Having set the sight, the pilot or gunner commences firing when the image of the plane arrives at a certain position in the sight opening formed by the vanes in their particular state of adjustment. The moment to actually open fire is determined largely by the maneuvers of the enemy plane; in case of a sudden dive, in which event the enemy plane would have a greater speed than its normal rating, firing is commenced when the image of the objective is about to enter the sight opening and is slightly outside one edge thereof. On the other hand, if the objective plane is climbing, its speed is necessarily somewhat below its rating at the time and consequently the aviator will delay opening fire until the image of the objective is somewhat inside the edge of the sight opening. The size of the sight opening for a given enemy flying speed is fixed for the enemy flying horizontally and at about right angles to the path of flight of the plane on which the guns are mounted and as a rule the aviator opens fire as the image of the objective plane is entering the edge of the sight opening. Where the enemy plane is flying horizontally but diagonally across the aviator's path, the aviator delays opening fire until the image arrives at a point substantially inside the edge of the sight opening. There is thus very little left to the judgement of the aviator and with an ordinary degree of skill his firing is quite effective. The setting of the instrument is made when the enemy plane is at a substantial distance and well out of range but where he is close enough so the aviator can determine the type of plane and make his setting accordingly. When the enemy plane comes within range nothing remains for the aviator to do but to open fire observing any change in maneuvering of his objective and opening fire sooner or later, depending upon whether the objective climbs or dives or assumes a diagonal course.

The device can be used purely as a range finder to determine the range of an enemy plane through the use of its silhouette, by simply contracting or expanding the sight opening to superimpose the limits of the sight opening on the extremities of the enemy aircraft. There is provided in connection with the dial 24 a second dial 27 inscribed with legends referring to different types of planes. This dial moves relative to a scale 27′ on the bearing 16, calibrated in yards range or in other suitable units. A thumb piece 28 is formed suitably integral with the dial 27 so that the spindle 21 may be turned from either end. When the adjustment of the sight opening has been made, the range indicated on the scale 27′ for the type of plane in question, determined by its silhouette, informs the aviator or gunner of the range of the enemy plane. The over-all dimensions of various types of planes vary on approximately the following lines: Bombers or large airplanes generally have over-all dimensions of from 70 to 100 feet; observation types, from 40 to 50 feet; and pursuit and alert types from 20 to 30 feet. The scale 27′ is so calibrated and the names of the various types of planes inscribed on the dial 27, that once the aviator has determined by the silhouette of a plane the type of plane in question and has contracted the sight ring to encircle the over-all dimensions of the plane, the approximate range of the plane may be read off. It is understood that in this use of the device the small sight ring assumes no part.

In Fig. 4 and Fig. 5 we have illustrated a modified or alternative form utilizing vanes 14′ having substantially the same form of mounting and means of adjustment as the vanes 14 above described for varying the size of the sight opening formed by the circumferentially arranged inner ends of the vanes. The vanes 14′ have their inner ends bent approximately at right angles as shown and carry on their extremities beads 29 which, in the various states of adjustment, define an imaginary circle for a sight opening more closely circular in form perhaps than the generally octagonal form made by the relative disposition of the inner ends of the straight vanes 14. This form presents some advantages over the other. The circle formed by the beaded ends of the vanes more closely resembles a circle so that the device is rendered more sensitive in that the moment at which the image of the objective plane enters the circular limits of the sight opening may be more nearly determined. There is also an advantage, where the device is used as a range finder, in being able to confine the image of

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the objective plane with greater facility within the limits of the sight opening than where the sight opening is defined by an octagon as in the form above described. In Figs. 4 and 5 the small ring sight 25 is intended for use in sighting as above described and performs no function when the device is used simply as a range finder. A cover plate 30 of approximately the same size as the outer ring 11 is fastened to the inner fixed ring 10 suitably by screws 31 and has a central sight opening 32 through which the inner ends of the vanes 14′ may be viewed in all stages of adjustment of the vanes. The plate 30 serves to obscure those portions of the device which perform no function in the operation of sighting through the device, and which would or might otherwise constitute a source of distraction to the one sighting. The plate is held in spaced relation to the rings 10 and 11 by small collets or pillars about the screws 31, so that the vanes 14′ are free to move between the plate and the rings.

We claim:

1. In a device of the character described, a sight, a support, a plurality of similar wires carried on said support spaced about a circumference concentric with said sight and adjustable together in equal degrees to assume positions with corresponding points in circular arrangements of different diameters while remaining concentric with said sight, and calibrated means for adjusting said parts predetermined desired amounts.

2. In a device of the character described, a standard to be supported on a gun, an inner fixed ring supported on said standard, an outer movable ring concentric therewith, a plurality of wires each pivoted at its outer end to the two rings and having its inner end cooperating with the others to outline a circle about the center of the rings and adjustable together toward or away from said rings in equal degrees to maintain circular relations relative to a fixed common center, gear teeth on the outer ring, a manually adjustable gear in engagement with said teeth, a thumb piece for adjusting said gear, and a dial movable relatively to an index in the adjustment of the gear, said dial being calibrated in units of speed of travel of an objective.

3. In a device of the character described, a standard to be supported on a gun, an inner fixed ring supported on said standard, an outer movable ring concentric therewith, a plurality of vanes each pivoted at their outer ends to the two rings and having their inner ends relatively disposed in a circle about the center of the rings and adjustable together toward or away from said rings in equal degrees to maintain circular relations relative to a fixed common center, gear teeth on the outer ring, a spindle, a worm thereon engaging said teeth, a thumb piece on said spindle for adjusting said worm, a dial movable relative to an index in the adjustment of the worm calibrated in units of speed of travel of an objective and a second dial movable in the adjustment of the worm relative to an index calibrated in units of distance from an objective.

4. In a device of the character described, a circular support, a plurality of sighting elements carried on said support and spaced about a circumference concentric with the center of said support, means carried by said support for adjusting, said parts together in equal degrees to assume circular arrangements of different diameters concentric with said support, calibrated means associated with said adjusting means for adjusting said parts predetermined amounts, and a second calibrated means operating with said first mentioned means, one of said means being calibrated in units of range distances and the other of said means being calibrated in units of objective speeds.

5. In a combined gun sight and range finder the combination with a fixed sight, of a support thereon, a plurality of similar wires carried on said support and spaced about a circumference concentric with said sight, means associated with said support for adjusting said wires together in equal degrees toward and away from said fixed sight to assume circular arrangements of different diameters concentric with said sight and index means connected therewith and adapted to be actuated by movement of said first mentioned means, for determining the adjustment of said wires.

6. In an adjustable gun sight, the combination with a fixed sight device thereon of a support, a plurality of wire-like vanes mounted on said support and spaced about a circumference concentric with said sight, a gear operated means for adjusting said vanes together in equal degrees toward and away from said fixed sight to space the inner ends of said vanes to form approximate circles of different diameters, and index means associated with said vanes for effecting an adjustment of said vanes in accordance with a known speed of an objective.

7. In an adjustable gun sight, the combination with a fixed sight device thereon of a support, a plurality of wire-like vanes mounted on said support and spaced about a circumference concentric with said sight, a gear operated means for adjusting said vanes together in equal degrees toward and away from said fixed sight to space the inner ends of said vanes to form approximate circles of different diameters, index means associated with said vanes for effecting an adjustment of said vanes in accordance with a known speed of an objective, and a second index means adjustable with said first mentioned index means for determining the range of said objective.

8. In a machine gun sight and range finder for aircraft, a fixed sight, encompassing means concentric therewith and adjustable in size to enclose the silhouette of an objective, a gear operative adjustive means for said encompassing means comprising a worm screw and a spindle for supporting the same, adjusting knobs on each end of said worm screw, and speed and range scales on said knobs for indicating the adjustments of said encompassing means.

In testimony whereof we affix our signatures.

ROBERT KAUCH.
CHARLES L. PAULUS.