

[54] AIMING DEVICE

[75] Inventors: **Jean-Luc Vogel**, Meudon; **Jacques Francois Dominique De Bernardi**, Rueil Malmaison; **Claude Moulinard**, Poissy-Beauregard, all of France

[73] Assignee: **Etat Francais**, Paris, France

[22] Filed: **Oct. 20, 1972**

[21] Appl. No.: **299,328**

[52] U.S. Cl. **74/471 XY**

[51] Int. Cl. **G05g 9/04**

[58] Field of Search **74/471 XY, 471 R**

[56] **References Cited**

UNITED STATES PATENTS

3,394,611 7/1968 Beurrier **74/471 XY**

Primary Examiner—Milton Kaufman

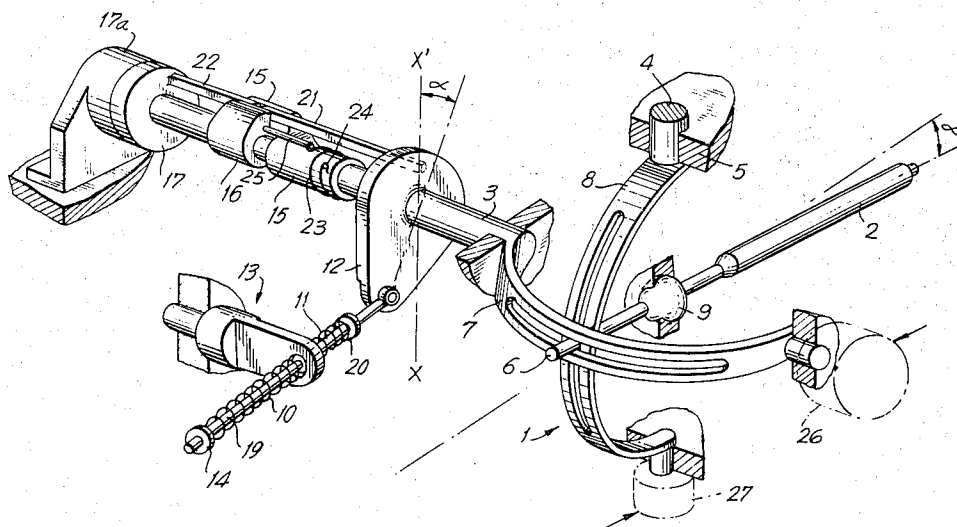
Attorney—Eric H. Waters et al.

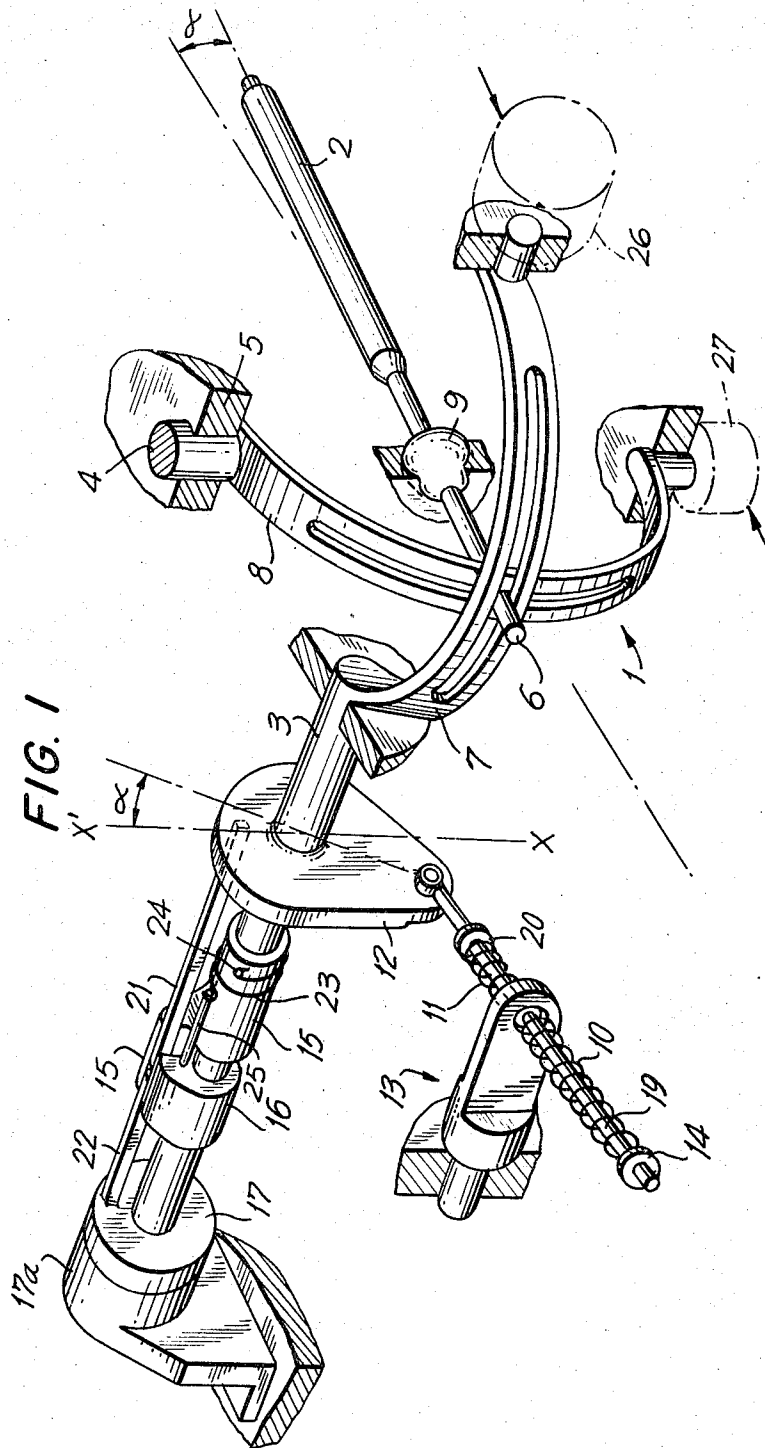
[57]

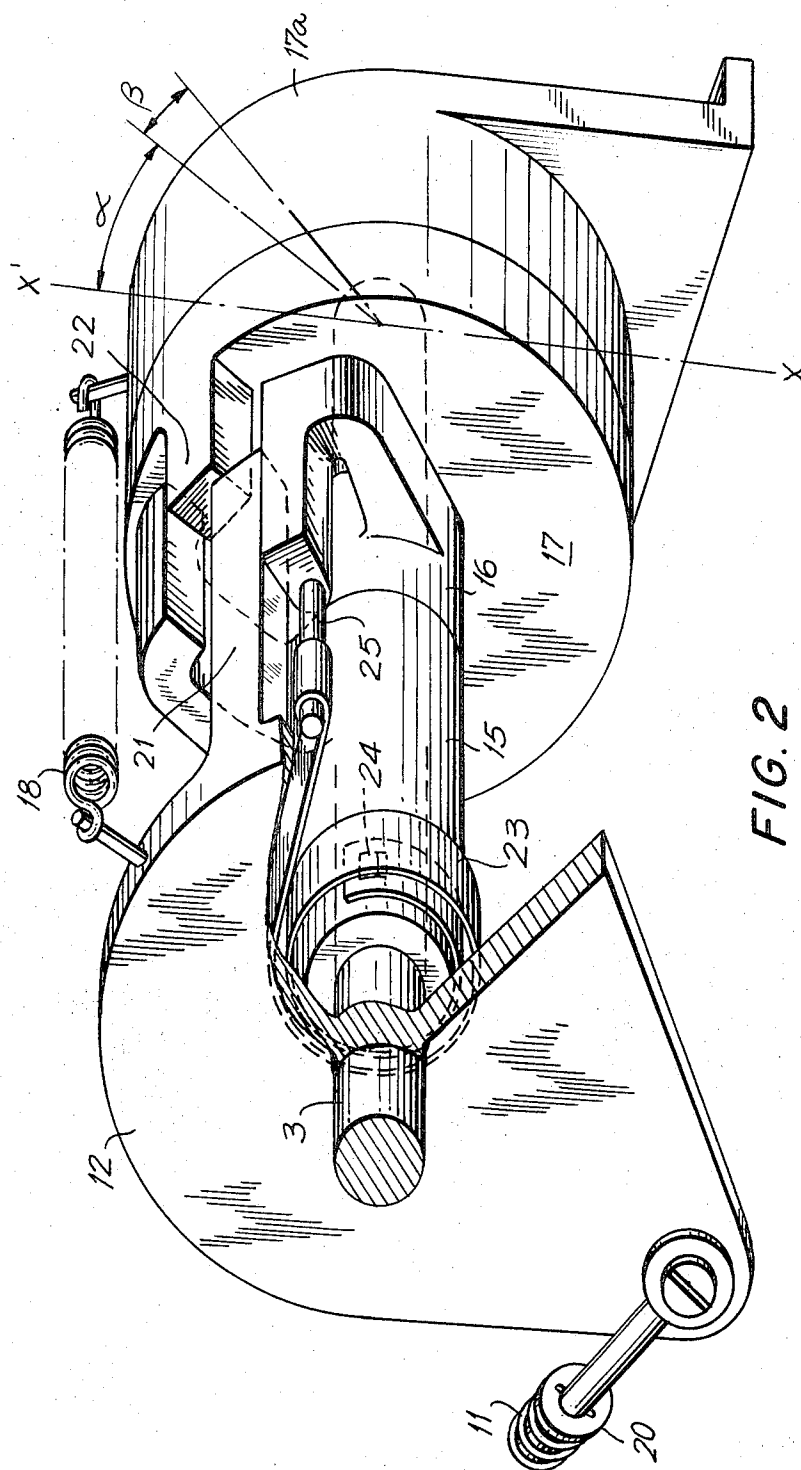
ABSTRACT

An aiming device comprising an aiming control rudder bar having at least one shaft rotatably mounted in a fixed frame and urged by a first elastic means to a neutral position. The position of the shaft is associated with the movements of a line of sight of a target to be checked in a predetermined relation. A plate is rotatably mounted on said shaft and the plate and shaft are coupled together through the intermediary of jaws and a second elastic means of higher strength than the first, to drive the plate from the shaft away from the neutral position. The plate can be held by an electromagnetic lock or the like in any fixed position to keep the shaft in a frozen position under the action of the second elastic means. The rotation of the aiming control shaft is thus principally effected against the first elastic means from the neutral position when the plate is not locked and against the second elastic means from the freeze position when the plate is locked in a fixed position.

8 Claims, 2 Drawing Figures







AIMING DEVICE

BACKGROUND

1. Field of the Invention

The present invention relates to an aiming device adapted to improve the aiming effectivity during transitory disturbances which are detrimental to sighting.

2. Prior art

In target or other tracking operations, the operator or aimer uses a control stick usually called the rudder bar, to keep the objective in his line of sight. The action by the operator on the rudder bar shifts the line of sight by means of a suitable mechanism which is itself conventional.

According to the design of the aiming stand and more especially according to that of the mechanism, a set stationary position of the rudder bar can correspond to a fixed value of any parameter of the target track, i.e. the bearing or elevation, or the angular velocity or angular acceleration of the target. The device according to the present invention is not restricted to any one of these particular aiming control arrangements, but it appears to be most applicable in the case of aiming governed by the angular velocity of the target.

It frequently happens that during target tracking, a disturbance may interfere with the aimer's observation or even make tracking impossible. Such a disturbance can be of an optical nature when the target travels behind some obstacle, such as an airplane, behind a cloud, or it can be of a mechanical nature, for example the release of an obscuring gas blast when the aiming device is used with a weapon coupled to the aiming stand.

The course of the target during the disturbance can then be evaluated by extrapolation of the route previously followed prior to the disturbance. In other words, in the case, for example, of a tracking device used for targets traveling at uniform or slowly variable velocities, where a particular position of the rudder bar corresponds to a definite angular velocity of the target, the most likely position of the target after a disturbance is the one resulting from maintaining the velocity observed just prior to the disturbance and in the same direction.

SUMMARY OF THE INVENTION

The invention is intended essentially to accomplish such extrapolation by "freezing" the aiming control element, namely the rudder bar, in the position it occupies when the disturbance starts, its fixation being controllable by a spontaneous action of the aimer, or automatically by the disturbance itself, for example by the firing circuit when the disturbance is due to the discharge by a weapon coupled to the aiming stand. The invention is also adapted to allow the aimer, nevertheless, to continue operating the control unit despite such "freezing" when the disturbance inhibits observation but does not make it impossible.

For this purpose, the invention contemplates an aiming device comprising an aiming control rudder bar including at least one shaft rotatably mounted in a fixed frame, the angular position of the shaft being adapted to control the line of sight to a target, first elastic means acting on said shaft to urge the same to a neutral position, a plate mounted on said shaft, means coupling said shaft and said plate in rotation and including second elastic means of greater strength than the first elas-

tic means, the latter means enabling the plate to follow movement of the shaft from said neutral position, and temporary locking means for holding said plate in any fixed angular position to keep the shaft in a position frozen by the coupling means, under the action of said second elastic means, the rotation of the aiming shaft thus being principally effected against the first elastic return means from the neutral position when the plate is not locked and against the second elastic means from the frozen position when the plate is locked in a fixed position.

In this aiming device, the coupling means advantageously comprises two jaws mounted for rotation around the shaft and angularly urged towards each other by the second elastic means until respectively contacting opposite sides of stop elements secured respectively to said plate and a disk integral with the shaft.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 diagrammatically shows in perspective view an aiming device according to the invention, wherein the aiming control rudder bar comprises two similar shafts with perpendicular axes of rotation; and

FIG. 2 illustrates in perspective and partly in cross-section the various elements individually mounted on one of the shafts.

DETAILED DESCRIPTION

FIG. 1 shows an aiming device which comprises a rudder bar 1 of intrinsically conventional design and including a control stick 2 and shafts 3 and 4. The two shafts 3 and 4 are mounted in a fixed frame 5 for rotation about two mutually perpendicular axes intersecting at a point at which the stick 2 is pivotally supported by a swivel joint 9 in the fixed frame 5. Stick 2 has an extension 6, beyond the swivel joint 9 which is engaged in slots provided in respective cradle hoops 7 and 8. Hoop 7 is integral with shaft 3 and hoop 8 is integral with shaft 4. The hoops are of circular shape and have a common center at the swivel joint 9. This assembly allows decomposition of the movements imparted by an operator to the control stick 2 into two movements of rotation transmitted to shafts 3 and 4 respectively.

Next will be described an assembly of elements coupled to shaft 3, a similar assembly being coupled to shaft 4 and therefore neither discussed nor illustrated.

The assembly is illustrated for shaft 3 in FIG. 1 schematically and with the elements separated to aid in understanding the invention, whereas in FIG. 2 the components are depicted in accurate arrangement.

In its rotary movements around its axis, the shaft 3 is subjected to the action of an elastic return means which urges the shaft to a neutral position indicated at axis X-X' in FIG. 1.

The elastic return means, in the particular case, comprises an assembly of two springs 10 and 11 acting on a disk 12, integral with shaft 3, along a line of action which is offset from shaft 3. The two springs are mounted on a stem 19 pivotably connected to disk 12 and slidably mounted in a strap 13 attached to the frame 5. The springs 10 and 11 are compressed respectively between the two side surfaces of strap 13 and two shoulders 14 and 20 formed on the stem 19.

Mounted behind the disk 12 on shaft 3 are two jaws 15 and 16 rotatable on shaft 3 and the jaws are followed by a circular plate 17 also rotatable around the

shaft 3. A spiral spring 18 has ends attached to pins respectively secured on the periphery of disk 12 and plate 17. The spring 18 keeps the assembly in position by clamping the jaws 15 and 16 between disk 12 and plate 17.

Disk 12 and plate 17 are provided on their opposed faces with respective feelers 21 and 22 extending towards each other parallel to the shaft axis. The feelers 21 and 22 are of square cross-section. The two jaws 15 and 16 receive the feelers and together therewith serve as a means to drive plate 17 in rotation with disk 12 and the shaft 3.

For this purpose, there is provided a spiral spring 23 wound around a cylindrical extension of jaw 15 and attached to an anchoring point 24 on the extension and to a further anchoring point 25 integral with the jaw 16. Under the action of this return spring 23, the two jaws 15 and 16 are angularly urged towards each other and in that position abut against the fingers 21 and 22 whereby disk 12 and plate 17 undergo common rotation, the stiffness of spring 23 exceeding that of springs 10 and 11.

The combined movements of shafts 3 and 4 control, through a suitable conventional mechanism, the movements of the line of sight of an eyepiece of a viewer to allow the operator to follow the path of travel of a target. Such mechanism uses the information received by two primary sensing elements 26, 27 of the angular position of shafts 3 and 4. The elements 26, 27 are located respectively at the ends of the hoops 7 and 8 which are diametrically opposite those carrying the assemblies already described.

In the embodiment described and according to one preferred method of operation of the invention, such mechanism can be constructed to make the angular velocity of the line of sight movement correspond to each particular position of the control stick 2. It follows that if shafts 3 and 4 are immobilized in a frozen position, the line of sight continues following the target in an extrapolated, constant-velocity trajectory equal to that just prior to the freeze. Such mechanism is entirely conventional and is connected between the eyepiece (not shown) and the sensors 26, 27, and is not described in any detail as it forms no part of the present invention.

In normal target tracking, the rotation of shafts 3 and 4 is controlled by the operator acting on stick 2 from the neutral position against the action of springs 10, 11 until the time of a freeze position or, if there is no freeze until the stops at the end of compression of the spring. The "freeze" can be effected by locking the disk 17, as for example by an electromagnetic device 17a when a disturbance occurs in viewing of the target. When there is no locking of disk 17 by the electromagnetic device, the jaws 15 and 16 are kept against feelers 21 and 22. Hence, when shaft 3 turns through angle α , the disk 17 will turn through a corresponding angle. When a disturbance upsets target observation, a deliberate or automatic control of the electromagnets of the two freezing assemblies associated with shafts 3 and 4 simultaneously, generate a freeze of the drive. The operator can nevertheless effect a voluntary correction by exerting a force sufficient to overcome the action of spring 23 to turn shaft 3 through angle β . When the

plates 17 of both shafts 3 and 4 are simultaneously released when the disturbance is over, the action of springs 23 and jaws 15 and 16 brings each plate immediately back to the same position as disk 12 at the end of the freeze, thus taking into account any correction effected by the operator during the freeze.

The invention of course is not limited in any way to the specific embodiment described above by way of example but rather contemplates all variations and modifications falling within the bounds of the appended claims.

What is claimed is:

1. An aiming device comprising an aiming control rudder bar including at least one shaft rotatably mounted in a fixed frame, the angular position of the shaft being adapted to control the line of sight to a target, first elastic means acting on said shaft to urge the same to a neutral position, a plate rotatably mounted on said shaft, means coupling said shaft and said plate in rotation and including second elastic means of greater strength than the first elastic means, the latter means enabling the plate to follow movement of the shaft from said neutral position and temporary locking means for holding said plate in any fixed angular position to keep the shaft in a position frozen by the coupling means, under the action of said second elastic means, the rotation of the aiming shaft thus being principally effected against the first elastic means from the neutral position when the plate is not locked and against the second elastic means from the frozen position when the plate is locked in a fixed position.

2. An aiming device as claimed in claim 1, wherein said coupling means comprises two jaws rotatably mounted on the shaft, and stop members operatively on said shaft and on said plate, said second elastic means acting on said jaws to urge the same into abutment with respective stop members.

3. An aiming device as claimed in claim 2 wherein the coupling means further comprises a disk integral with said shaft, one stop member being on said disk and facing the stop member on the plate, said first elastic means act on said disk.

4. An aiming device as claimed in claim 2 wherein said second elastic means comprises a coil spring connected to said jaws and extending around said shaft.

5. An aiming device as claimed in claim 2 wherein said rudder bar comprises two of said shafts mounted for rotation in two mutually perpendicular directions and a common stick controlling the respective rotation of said shafts.

6. An aiming device as claimed in claim 3 wherein said stop members extend parallel to one another and to said shaft.

7. An aiming device as claimed in claim 3 wherein said first elastic means is connected to said disk at a location offset from said shaft to apply a force to said disk to turn said shaft.

8. An aiming device as claimed in claim 3 wherein the jaws are mounted on the shaft between the disk and plate, said coupling means comprising spring means acting on said disk and plate for urging the same together to clamp the jaws therebetween.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,757,597 _____ Dated September 11, 1973
Jean-Luc Vogel, Jacques Francois Dominique de Bernardi,
Inventor(s) Claude Moulinard

It is certified that error appears in the above-identified patent
and that said Letters Patent are hereby corrected as shown below:

In the Heading add:

Claims priority, Application France October 25,
1971, 7138264.

Signed and sealed this 23rd day of April 1974.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents