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Waeber

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[54] **APPARATUS FOR A FIRING WEAPON MOUNTED AT A LIGHT VEHICLE**

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[51] **Int. Cl.** **F41f 23/06**

[58] **Field of Search** ..... 89/36 H, 36 K, 37 B, 37 K, 89/37 F, 37.5 A, 40 B

[56] **References Cited**

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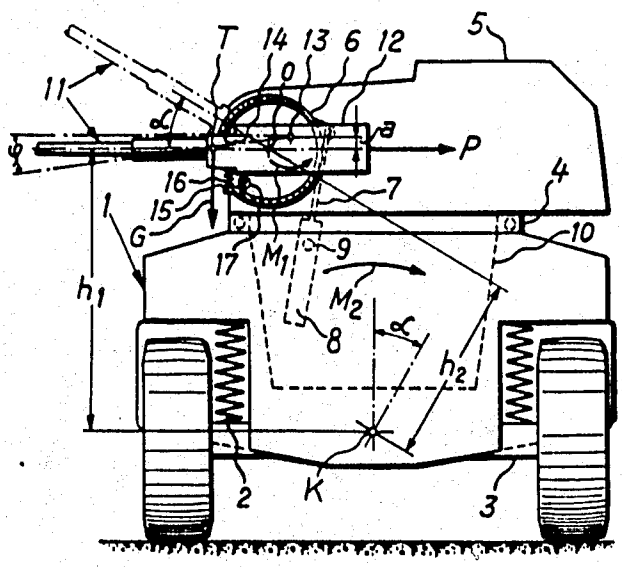
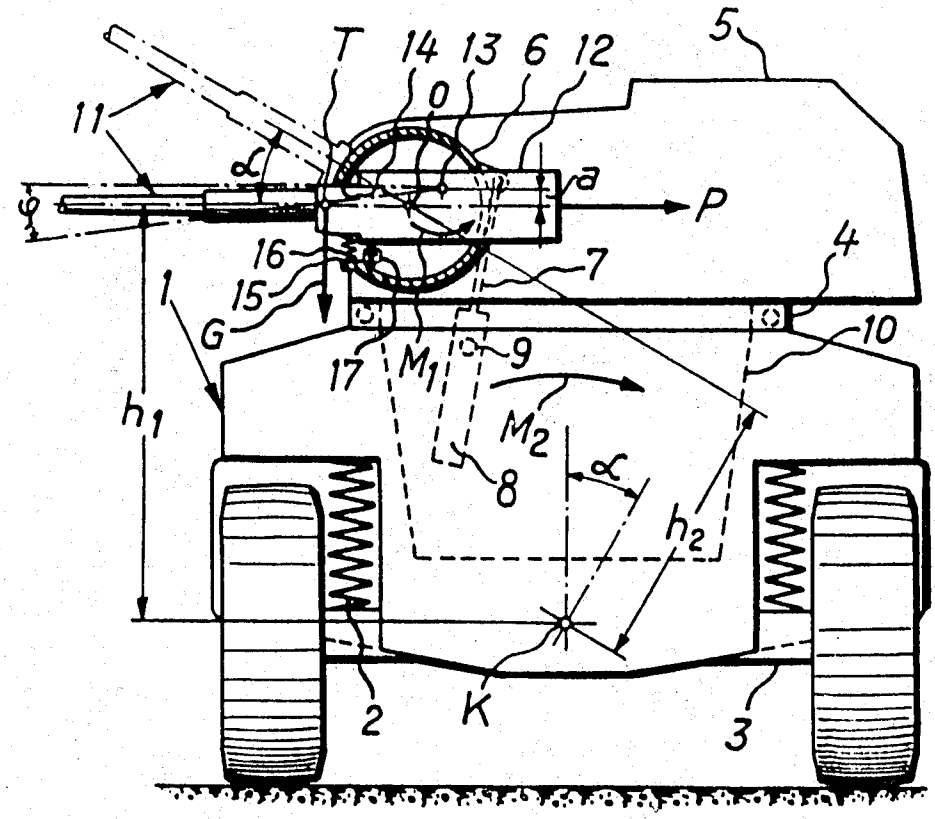
[57] **ABSTRACT**

An apparatus for a firing weapon mounted at a light vehicle, said firing weapon having a cradle arranged at an elevating rim and the recoil force of the weapon during firing bringing about a tilting movement of the vehicle. The cradle is pivotably arranged for movement against the action of a spring at a pivot pin which is offset with respect to the pivot axis of the elevating rim, in order to bring about a movement of the cradle which is opposite to the tilting movement of the vehicle.

3 Claims, 1 Drawing Figure

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APPARATUS FOR A FIRING WEAPON MOUNTED AT A LIGHT VEHICLE

BACKGROUND OF THE INVENTION

The present invention relates to a new and improved apparatus for a firing weapon mounted at a light vehicle, the firing weapon being arranged by means of its cradle at an elevating rim and the recoil force of such firing weapon during firing thereof causing a tilting movement of the vehicle.

It is well known in this art that if one or a number of firing weapons are mounted at a light vehicle such will be subjected to a tilting movement under the action of the recoil forces of the firing weapons, this tilting movement producing a reduced firing accuracy of the mounted weaponry.

SUMMARY OF THE INVENTION

Hence, it is a primary object of the present invention to overcome or at least markedly reduce such impairment in the firing accuracy of the weapon.

Still a further significant object of the present invention relates to a new and improved apparatus for firing weapons mounted at a light vehicle capable of compensating for the tilting movement of the vehicle owing to the recoil action prevailing during firing of the weapon so as to improve the firing precision of such weapon.

Now, in order to implement these and still further objects of the invention, which will become more readily apparent as the description proceeds, the invention contemplates pivotably mounting against the action of a spring, the cradle at a pivot pin which is offset with respect to the axis of rotation of the elevating rim, in order to bring about a movement of the cradle which opposes the tilting movement of the vehicle.

BRIEF DESCRIPTION OF THE DRAWING

The invention will be better understood and objects other than those set forth above, will become apparent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawing wherein the single FIGURE thereof schematically illustrates an exemplary embodiment of inventive apparatus.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Describing now the drawing, it is to be understood that a vehicle chassis **1** is supported through the agency of springs **2** or equivalent structure at a vehicle axle **3**. The vehicle chassis **1** is provided at its upper region with a rotatable rim **4** at which there is mounted for lateral alignment an armored turret **5**. Laterally of the armored turret **5** there is mounted an elevating mechanism in the form of an elevating rim **6**. A piston rod **7** of a hydraulic cylinder **8** operatively engages with this elevating rim **6**. This hydraulic cylinder **8** is pivotably mounted at a pivot pin **9**. Pivot pin **9** in turn is arranged at a portion **10** of the turret **5** which extends into the region of the vehicle chassis **1**. An automatic firing weapon **11** is mounted by means of its cradle **12** at the elevating rim **6**. This cradle **12** is pivotably mounted for movement about a pivot pin **13** at elevating rim **6**. Pivot pin **13** is upwardly offset by an amount *a* with respect to the action of the line of force P which extends through the center of gravity T of the weapon system. The upper region of the cradle **12** bears against a stop **14** at the elevating rim **6**, so that in the elevation direction it can not carry out any relative movement with respect to the elevating rim **6**. On the other hand, the lower region of the cradle **12** bears against a stop **15** through the agency of an intermediately arranged spring **16**. Furthermore, between the cradle **12** and the stop **15** there is also arranged a suitable damping element **17**. The center of gravity T of the weapon system or arrangement as well as the support locations for the spring **16** and the damping element **17**—viewed in the direction of firing — are located in front of the pivot pin **13**. The spring **16** is pre-stressed so that when the weapon is not operated, the cradle **12** will be held against its upper stop **14**. The tilt point of the vehicle chassis **1** has been designated by reference character K. The respective lever arms prevailing for two different elevation angles α of the weapon with regard to the tilt point K have been designated by reference characters h_1 and h_2. The angle ϕ defines the angle of pitch of the weapon produced by the inventive apparatus for compensating the tilting movement of the vehicle.

Now with the benefit of the foregoing description of such apparatus, the mode of operation thereof will now be described and is as follows:

When the firing weapon **11** fires, then a tilting moment M_2 appears which acts upon the vehicle chassis **1** and slightly tilts such about the tilt point K. The magnitude of this tilting moment is dependent upon the elevation angle α of the firing weapon **11**. As this elevation angle α increases, then the lever arm by means of which the recoil force P acts upon the tilt point K, becomes shorter. On the other hand, a moment M_1 is exerted upon the firing weapon mounted at the pivot pin **13** when there occurs the recoil force P, and which moment is opposite to the moment M_2 exerted upon the vehicle chassis **1** and allows the firing weapon **11** to tilt downwardly through the angle ϕ in opposition to the spring **16** and the damping element **17**.

With knowledge of the geometric dimensions of the vehicle and the weapon mounting as well as the masses and spring constants, it is possible to simply calculate the spring **16**. Similarly, it is possible to determine the design of a suitable damping element **17** which suppresses vertical oscillations of the weapon and the transient behavior of the vehicle tilting movement and the opposite weapon movement approach one another.

In the illustrated exemplary embodiment, there is shown a weapon which fires transverse to the vehicle. It should be apparent that in the case of a longitudinally directed weapon, the compensation apparatus must be designed somewhat differently. In practice, the calculations are undertaken for the compensation apparatus from an intermediate position between both aforementioned positions, so that with a transversely directed weapon there exists a slight under-compensation and with longitudinally directed weapon a slight over-compensation. The desired improvement in contrast to a non-stabilized system is however apparent in any case.

Since with increasing elevation angle α the vertical components of the weight G engaging at the center of gravity T of the weapon **11** reduces and, on the other hand, also the lever arm by means of which the recoil force P engages at the tilt point K reduces with increasing elevation angle α, the quality of the compensation is extensively independent upon the elevation angle α. In a certain elevational range, in the illustrated embodi-

ment from 73° to 90°, the compensation apparatus no longer functions, since then the moment M_2 exerted upon the vehicle chassis 1 reverses its rotational sense. However, this elevational range is of secondary significance.

While there is shown and described present preferred embodiments of the invention, it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied and practiced within the scope of the following claims. Accordingly,

What is claimed is:

1. A mounting apparatus for a weapon for mounting the same at a light vehicle, said weapon having a weapon axis and said vehicle having a tilt axis, said vehicle being pivotable about said tilt axis due to the recoil force of the weapon, said weapon having a cradle, an elevating mechanism rotatable about an axis of rotation, said weapon being mounted via said cradle at said elevating mechanism, pivot pin means for the cradle about which is pivotably mounted the cradle at said elevating mechanism, said pivot pin means being arranged above the weapon axis, said weapon being pivotable about said pivot pin means due to its recoil force and opposite the tilting motion of the vehicle, a prestressed spring bearing at one end at the cradle and at the other end at the elevating mechanism, said elevating mechanism being provided with a stop against which there is pressed the cradle under the action of the force of said pre-stressed spring.

2. The mounting apparatus as defined in claim 1, further including a damping element located substantially parallel to the pre-stressed spring.

3. The mounting apparatus as defined in claim 1, wherein the center of gravity of the firing weapon is located in front of the pivot pin means viewed in the direction of firing.

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