

[54] **LASER DEVICE FOR MOVING TARGET MARKSMANSHIP TRAINING**

[75] Inventors: **Albert H. Marshall**, Maitland;
George A. Siragusa, Winter Park,
both of Fla.

[73] Assignee: **The United States of America as
represented by the Secretary of the
Navy**, Washington, D.C.

[22] Filed: **June 8, 1973**

[21] Appl. No.: **368,160**

[52] U.S. Cl. **35/25, 273/101.1**

[51] Int. Cl. **F41c 27/00**

[58] Field of Search..... 35/25; 273/101.1;
240/6.41

[56] **References Cited**

UNITED STATES PATENTS

1,144,656	6/1915	Hise et al.	240/6.41
3,026,615	3/1962	Aubert.....	35/25
3,339,293	9/1967	Kuhlo et al.	35/25
3,471,945	10/1969	Fleury.....	35/25
3,609,883	10/1971	Erhard.....	35/25

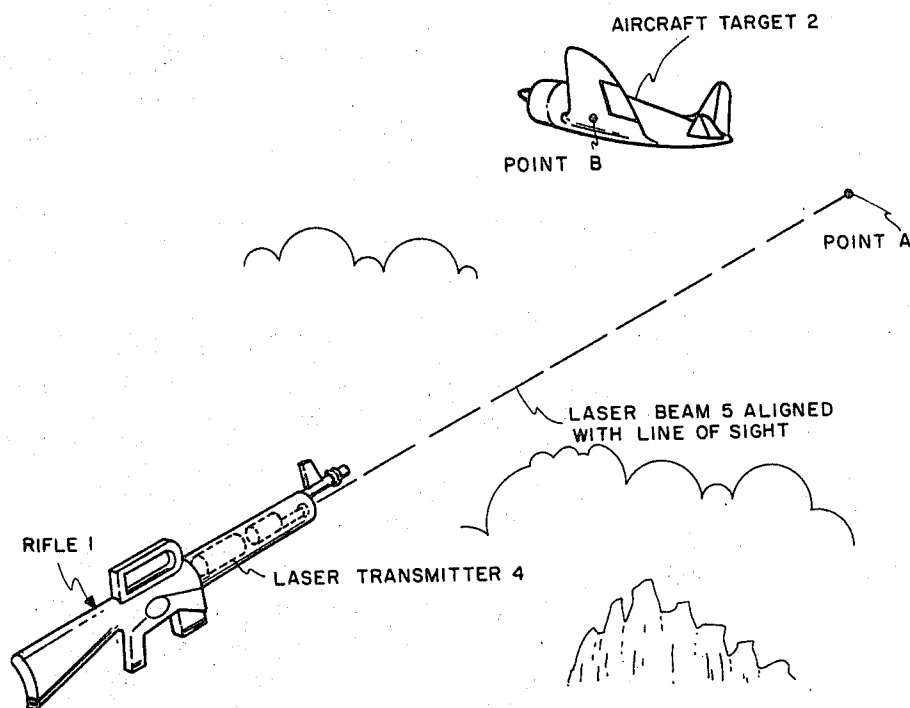
3,633,285	1/1972	Sensney	35/25
3,657,826	4/1972	Marshall et al.	35/25
3,748,751	7/1973	Breglia et al.	35/25

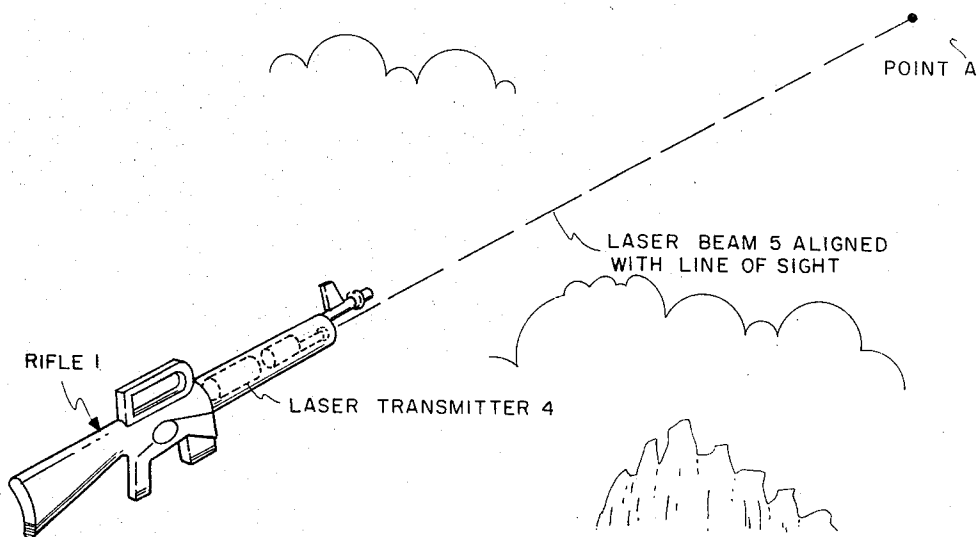
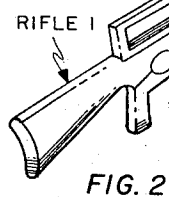
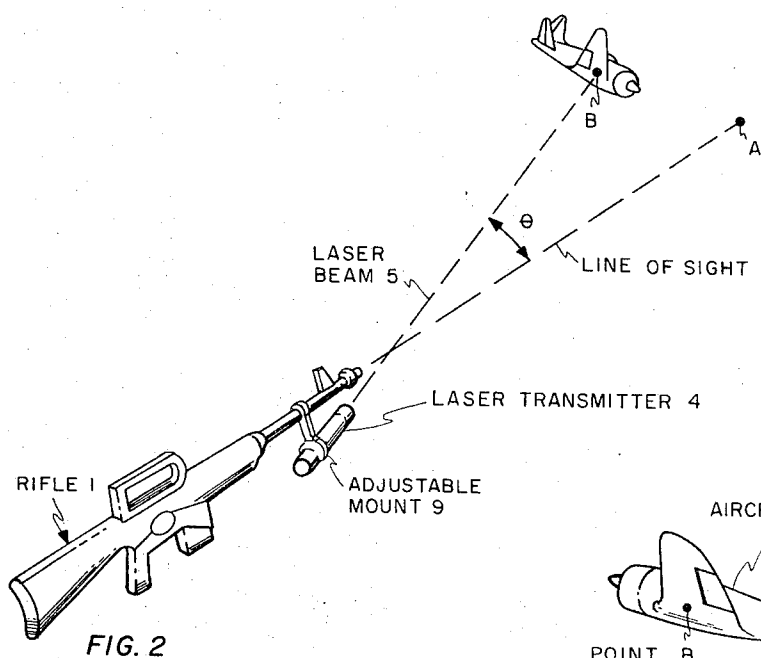
Primary Examiner—Robert W. Michell
Assistant Examiner—J. H. Wolfe
Attorney, Agent, or Firm—R. S. Sciascia; J. W. Pease;
J. F. Miller

[57] **ABSTRACT**

A rifle or light machine gun is equipped with a transmitter for projecting a laser beam and an adjustable beam aiming mechanism. A moving target having a laser beam receiver affixed thereto is provided. When a trainee aims his rifle at the target and pulls the trigger a laser beam is projected towards the target. If the beam strikes the target, the receiver emits a signal. Since the target is moving the trainee must "lead" it correctly to score a hit. The aiming mechanism is adjusted to compensate for the difference in the time of flight of a bullet and the laser beam. Therefore a trainee firing the laser beam learns the leads required to hit targets of various speeds with a particular weapon.

3 Claims, 4 Drawing Figures





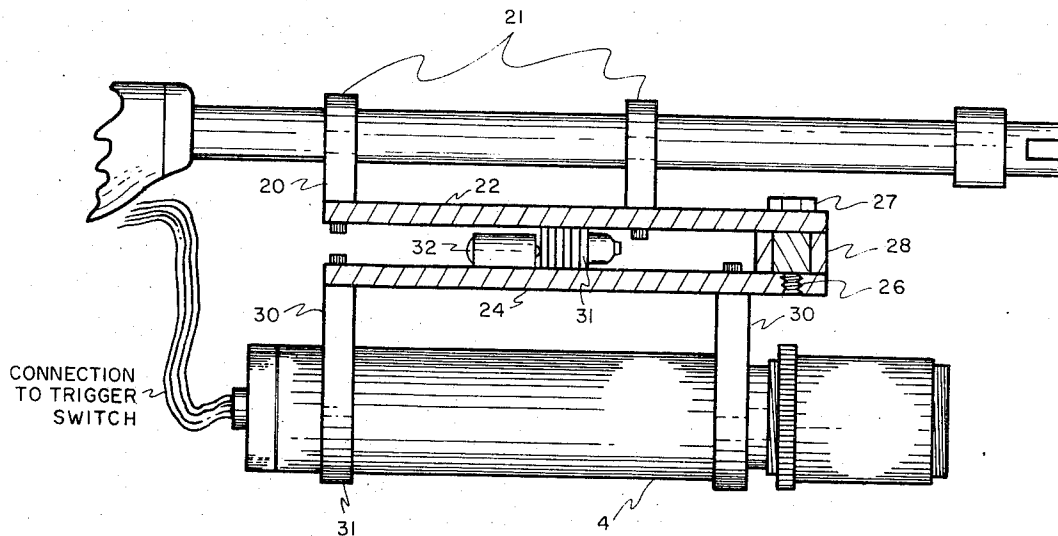


FIG. 3

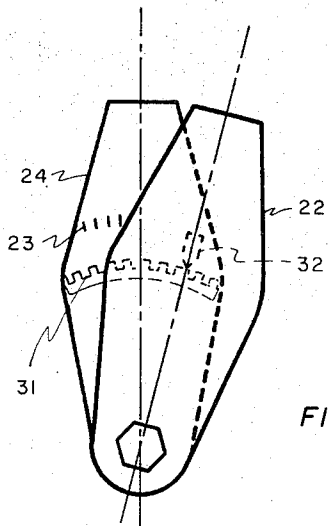


FIG. 4

LASER DEVICE FOR MOVING TARGET MARKSMANSHIP TRAINING

BACKGROUND OF THE INVENTION

The invention is in the field of training devices. In the past great effort and expense have been applied to teaching ground troops to use small arms fire against low flying aircraft and armored vehicles. Such training is highly desirable because it is well known that small arms fire can be very effective against aircraft and vehicles. Even armored vehicles are vulnerable to small arms fire in critical areas. They are also vulnerable because of the propensity of their crews to ride topside in an exposed position. Most armored vehicles are cramped, hot, noisy, and generally uncomfortable to the extent that crews will take considerable risks by riding on top instead of inside. Another reason for riding on the top is that visibility is limited from inside most armored vehicles.

Notwithstanding the known effectiveness of small arms fire when properly employed, it is equally well known that it is generally ineffective against moving targets such as planes and vehicles because the average marksman simply cannot hit a moving target. Estimates by inexperienced marksmen of the amount of "lead" required, that is the distance the point of aim must be ahead of a moving target, even though marksmen are thoroughly instructed in the necessity for lead and told the approximate leads required in various situations, are almost invariably inaccurate. Novice marksmen usually grossly underestimate the amount of lead required, particularly when aiming at a fast moving target.

Laser beam guns for marksmanship training are known. For example, U.S. Pat. No. 3,657,826 to applicants, dated Apr. 25, 1972 discloses a greatly improved laser beam gun which because of its safety, economy, and convenience has revolutionized military small arms marksmanship training. However, a problem arises in the use of laser beam guns for training troops to hit moving targets because of the great difference between the speed of a laser beam (the speed of light) and the speed of a projectile fired from a conventional gun. A laser beam strikes a distant target almost instantly after firing; the "flight time" of a laser beam between gun and target is inconsequential. In a real gun such as a military rifle or machine gun, a considerable length of time may elapse between the time that a marksman decides to fire and the time that a bullet reaches the target. A first component of this elapsed time arises from the delay or reaction time of the person firing the gun. This reaction time varies with individuals and cannot be compensated for mechanically. Compensation must be made by the individual marksman and its accomplishment is an objective of marksmanship training. A second component arises from the mechanical lag in the firing mechanism, propellant combustion time and the time required for a bullet to travel the length of the gun barrel. The firing pin strikes the primer of the projectile some "lock" time after the trigger is pulled, and a bullet leaves the cartridge case some time after the primer fires depending on propellant characteristics, bullet weight and other factors. Some time elapses between the instant a bullet separates from the cartridge case and when it leaves the gun barrel. This second component can be compensated for mechanically in a simulated weapon such as a laser gun by building a

delay between trigger activation and beam firing into the mechanism. An additional delay can be added to compensate for the time of flight of the bullet. This works well when training is limited to stationary targets at fixed ranges. However when training involves firing at moving targets and at different ranges time of flight of the bullet cannot be successfully compensated by an additional delay in the firing mechanism of the laser gun. This is so because when firing a real gun, if the gun is properly aimed at a moving target when a bullet leaves the barrel the bullet will intercept the target when the flight time elapses. But in a laser gun if flight time delay is added to the other two components of total delay in the gun mechanism, a trainee may have the gun properly aimed at bullet departure time but may move the gun off target before the laser fires, since the beam does not leave the gun until the flight time has elapsed.

The invention overcomes this problem of the prior art so that laser guns can be successfully employed in training troops to hit moving targets.

SUMMARY OF THE INVENTION

The invention comprises an improved sight or aiming mechanism in combination with an improved laser beam gun. The mechanism is adapted to be preset to furnish a built-in lead sufficient to hit a target moving at a particular speed and range. When a trainee practices firing at a moving target while progressively increasing the lead until he begins to register hits on the target, the amount of lead required is firmly fixed on his mind. No other known apparatus or method has proven as effective in teaching the difficult art of leading targets correctly.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a prior art laser beam gun.

FIG. 2 illustrates the principle of the invention.

FIG. 3 shows plates for adjustably mounting a laser transmitter to a rifle

FIG. 4 shows details of the mechanism of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows a laser beam firing rifle 1 which closely resembles an actual rifle. A laser transmitter 4 is built into rifle 1. When the trigger is pressed rifle 1 fires a laser beam in the direction in which the sights are aligned. Such a device is disclosed in previously mentioned U.S. Pat. No. 3,657,826.

A target 2 contains one or more laser beam receivers so that if rifle 1 is correctly aimed a laser beam will strike receiver elements in target 2 which will signal a hit.

When target 2 is a moving target such as the aircraft shown inexperienced marksmen invariably shoot behind it even though they have been instructed in correct sighting procedures. When a marksman aims at target 2 when it is at point A, by the time his responses enable him to pull the trigger, the weapon fires, and a projectile reaches point A, the target will have moved to point B.

FIG. 2 illustrates the principles of the invention. Laser transmitter 4 is rotatably fixed to the barrel of rifle 1 by an adjustable mount 9. Transmitter 4 can be rotated an angle θ from the axis of the gun barrel so that if a trainee aims rifle 1 at point A, when he fires

3

the gun the laser beam will strike target 2 and a "hit" will be registered. Angle θ may be preset by an instructor as a function of range, speed and direction of travel of the target. The distance between points A and B is the correct lead distance for the target range and speed selected.

Generally in a training exercise a selected target range, speed and direction is established, the instructor sets the laser transmitter to the correct angle θ and a trainee is allowed to aim and fire at the passing targets until he begins to register hits consistently. Then the amount may be adjusted for a different target range, speed, etc. for practice at other target ranges, speeds, and directions. Since a trainee may fire thousands of times during one practice session at relatively little expense, the advantages of such equipment over conventional training equipment is obvious. Vastly superior training results are accomplished at minimum cost.

FIG. 3 shows one embodiment of the invention wherein a top plate 22 is fixed to a rifle barrel by barrel bands 21 and posts 20. A bottom plate 24 is hinged to 22 by a bolt and nut 26 and 27 having a washer-spacer 28 around the bolt. Bottom plate 24 has a laser transmitter 4 fixed thereto by bands 31 and posts 30. Plate 24 can be rotated horizontally around bolt 27 to adjust the lead angle. A gear sector 31 having a plurality of teeth is fixed to plate 22. A spring loaded detent 32 is fixed to plate 24 and engages the teeth of gear sector 31 to hold the plates in position. Alternatively spacer-washer 28 may be of thin frictional material allowing plates 22 and 24 to be closer together and dispensing with gear sector 31 and detent 32.

FIG. 4 is a plan view of plates 22 and 24 and shows a scale 23 on plate 24 so that an edge of plate 22 acts as a cursor to allow a trainee to position 22 and 24 at a known angle to each other.

The invention is extremely simple and economical, yet highly effective. Superior training results are attained at the lowest possible cost per trainee.

What is claimed is:

1. In a device for lead angle instruction in moving target marksmanship training the combination comprising:

a weapon having a trigger switch and a projectile bar-

4

rel defining a projectile axis,
a laser beam transmitter for connection to a battery power source and connected for firing through operation of said trigger switch,
said transmitter having a laser beam projection axis,

compensating means for compensating for the difference between the weapon-to-target flight time of a bullet from said weapon and a laser beam from said transmitter,

said compensating means including adjustable mounting means for mounting said transmitter to said barrel,

said mounting means being adjustable for selected factors including range, target speed, target direction, and weapon type to position said transmitter with its laser beam axis at a selected angle to the projectile axis of said barrel so that a beam fired from said transmitter will hit the target when said weapon is aimed at a point a lead distance from said target dependent upon said selected factors, said lead distance being such that the flight time of a moving target traversing said distance is equal to the weapon-to-target flight time of a bullet from said weapon,

to provide for any given set of selected factors the same lead to hit a given target with said laser beam as is required to hit said given target with a bullet from said weapon, and a receiver element for signaling a hit when the target is correctly lead.

2. The apparatus of claim 1, and including a scale on said mounting means for indicating the magnitude of said angle.

3. The apparatus of claim 2, said mounting means comprising:

a first plate fixed to said gun,

a second plate fixed to said transmitter,

hinge means rotatably connecting said first plate to said second plate,

and detent means for yieldably holding said second plate in a selected position with respect to said first plate.

* * * * *

45

50

55

60

65