Dec. 3, 1963 R. W. JONES 3,112,566

GUNSIGHT

Filed Nov. 9, 1962 2 Sheets-Sheet 1

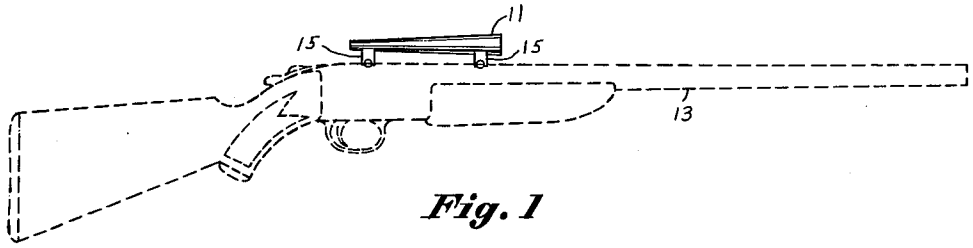


Fig. 1

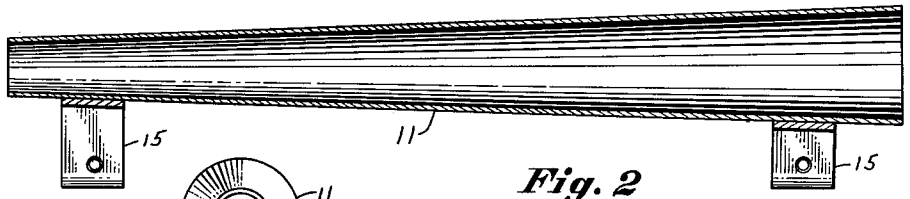


Fig. 2

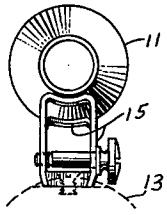


Fig. 3

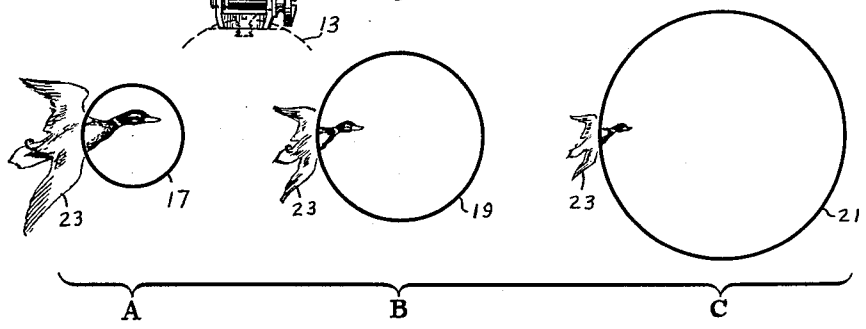


Fig. 4

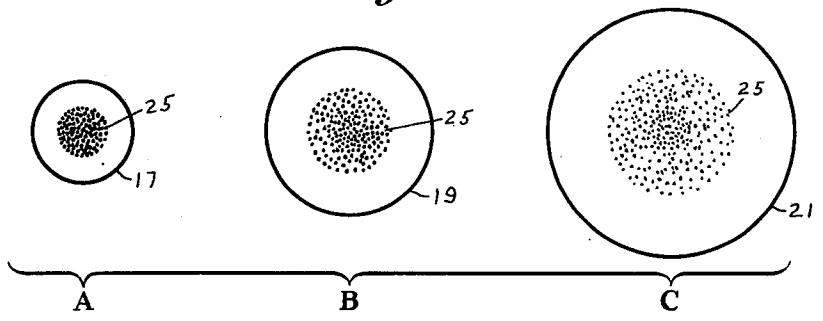


Fig. 5

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Dec. 3, 1963 R. W. JONES 3,112,566

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Filed Nov. 9, 1962 2 Sheets-Sheet 2

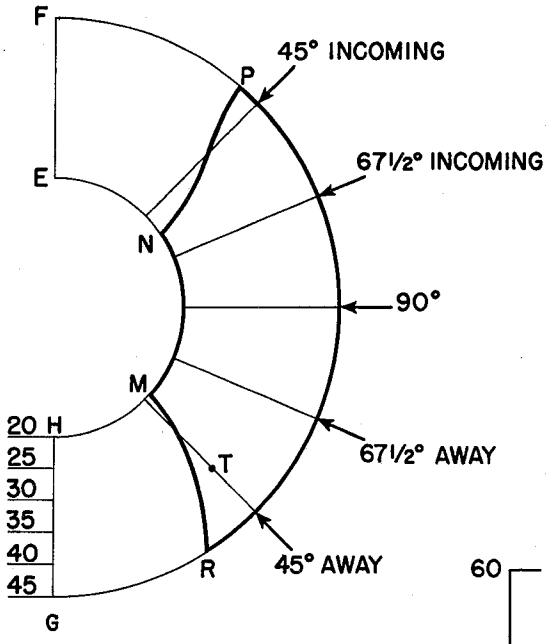


Fig. 6

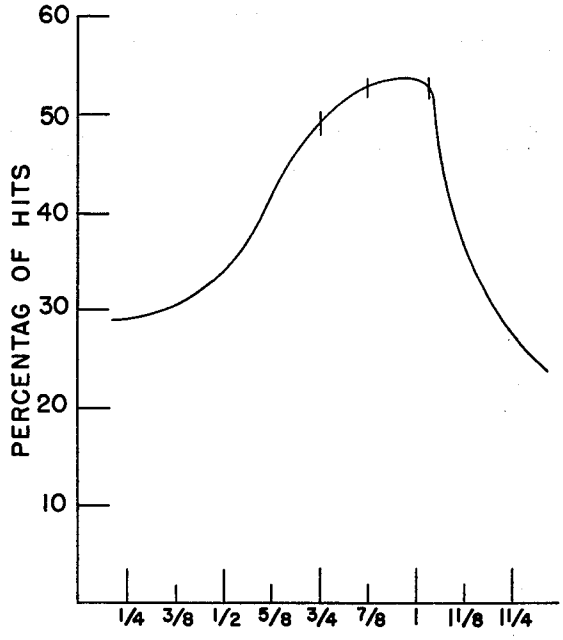


Fig. 7

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United States Patent Office 3,112,566
Patented Dec. 3, 1963

3,112,566

GUNSIGHT

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Filed Nov. 9, 1962, Ser. No. 238,319
3 Claims. (Cl. 33—47)

My invention relates to gunsights, and more particularly to gunsights of a type suitable for use with a gun having a shot pattern which diverges with distance from the gun muzzle, as for example in the case of a shotgun.

Such guns are often employed to hunt game birds such as ducks, geese, quail and the like. Since such game is ordinarily shot while in flight, the problems of flight speed, target distance, flight course, shot pattern, and, ultimately, lead angle are involved. In many cases, the lead angle is determined by estimation based mostly on the hunter's experience. Various types of gunsights have been devised to aid the hunter in his aiming technique and to thereby improve his effectiveness. While some such gunsights of the prior art of which I am aware have been partially effective, yet they still leave much to be desired.

It is accordingly an object of my invention to provide an improved sight for use with guns of the diverging shot pattern type.

Another object of my invention is to provide an improved gunsight for use with guns of the diverging shot pattern type, which sight will enable the hunter to provide the proper lead angle when shooting at objects in flight.

Another object of my invention is to provide a gunsight for use with guns of the diverging shot pattern type, wherein a visual reference is established which the shooter may apply to obtain an optimum number of hits within the range of the shells fired.

These and other objects are effected by my invention as will be apparent from the following description taken in accordance with the accompanying drawings forming a part of this application, in which:

FIG. 1 is a schematic side elevational view showing a gunsight in accordance with a preferred embodiment of my invention, mounted on a gun;

FIG. 2 is an enlarged schematic longitudinal section view of the sight of FIG. 1;

FIG. 3 is an end elevation view of the sight of FIG. 1 with portions of the gun omitted;

FIG. 4 is a schematic diagram showing the relation of a typical target to the sight visual image for three different ranges;

FIG. 5 is a schematic diagram showing the relation of the shot pattern to the sight visual image for the ranges shown by FIG. 4;

FIG. 6 is a typical schematic diagram showing the relative area within which hits are obtained for given criteria; and

FIG. 7 is a schematic diagram showing the average percentage of hits plotted against various sight divergence ratios.

Referring now to the drawings, and particularly to FIGS. 1 and 2, it will be seen that the gunsight **11** is simply a hollow cone frustum. The sight is preferably made of thin metal material, for example steel or brass, although it could be plastic. The primary requirement is that the sight should have the proper relative size and shape, the material used being of secondary importance so long as it is satisfactory from the standpoints of economy, quality, and durability. The sight may be fixed onto the gun **13** in any suitable manner, for example, by screw clamps **15** as shown by FIGS. 2 and 3. The sight **11** is fixed to the gun **13** so as to be above the rear end portion of the gun barrel and with the sight central axis parallel to the gun bore, and with the sight cone diverging in the forward direction.

The characteristic feature of my invention is a frusto-conical gunsight having an optimum sight divergence ratio. A sight constructed in accordance with a preferred embodiment of my invention creates a visible indicium which, when properly applied, aids the shooter in obtaining the maximum percentage of hits within the ranges of the selected shell.

In FIGS. 4A, 4B and 4C, the circles **17**, **19** and **21** represent the visible indicium in idealized form as it would appear to the shooter for three different ranges, as he looks through the gunsight in the normal manner. The shooter would not of course observe any details of the target. FIG. 4A shows a typical target **23** at a relatively close range; FIG. 4B at an intermediate range; and FIG. 4C at a relatively distant range. In each case it is important to notice that the visible indicium which the shooter observes is a circular ring. The proper application of this visible indicium will be disclosed hereinafter.

In FIGS. 5A, 5B and 5C there is shown in generalized form the typical shot pattern **25** in relation to the visible indicium at the same ranges of FIG. 4. The shot pattern illustrated in FIG. 5 is typical of the type produced by a full-choke gun.

Many observations of various types of game birds in flight has established the fact that their maximum flight speeds are between 35 and 72 miles per hour. Now, if reasonable adjustments are made to allow for group flight conditions and for the fact that jumped birds seldom reach their normal flight speeds before the hunter shoots, then the average flight speeds of these same types of game birds at the time a hunter shoots is found to be between 30 and 45 miles per hour.

At the present time most shotgun barrels and choke devices are most effective at ranges between 19 and 50 yards. The shotgun shells, as presently manufactured, have muzzle velocities and energies which are reasonably constant for a quantity of powder and a size of shot. It is well known, also, that the diameter of the field of view, as observed through a frusto-conical gunsight, is different than the calculated diameter for any particular range and angle of divergence of the cone. It has occurred to the applicant that it is possible to determine the number of hits on a target of a given speed and direction when the characteristics of the shot shell, the sight divergence ratio, the shot pattern diameter, the elapsed time for human and mechanical action, the ignition time, and the time for the shot to travel down the barrel, are known. The "sight divergence ratio" is herein defined as the ratio of the difference between the diameters of the ends of a frusto-conical sight that is one foot long, to one foot. Sights which are longer or shorter than one foot may, of course, have dimensions which are proportional to a standard sight one foot long having the same sight divergence ratio. For example, a frusto-conical sight that is only 7" long and has a sight divergence ratio of $15/16$" to one foot, might have a $3/8$" diameter smaller end and a $59/64$" diameter larger end. In accordance with a preferred embodiment of my invention, a typical sight may have a length of 7", an inside diameter of $7/16$" at the small end and 1" at the large end, and consequently a divergence ratio of 0.965.

Applicant has made many diagrams, FIG. 6 being typical of such, which show the area within which hits are obtainable for established criteria. When the area within which hits are obtained is divided by the area within which hits are possible, a relative percentage of hits is obtained. The percentage of hits obtained in this manner may be plotted against one of the established criteria and the sight divergence ratio to obtain a family of diagrams. From this family of diagrams, the diagram of FIG. 7 is readily obtainable. It represents a single average diagram of the family of diagrams and is conveniently plotted as shown in FIG. 7.

The established criteria on which the plot of FIG. 6 is based is: a sight divergence ratio of 0.965" to one foot; a shell having the characteristics 12 ga., 3 x 1¼ x 7½ c. and and effective range of 20 to 45 yards; a gun having a full choke; and a bird speed of 30 miles per hour. The elapsed time for human and mechanical action, the ignition time and the barrel time are, for this purpose, considered constant criteria. The applicant has found that under these criteria a shooter may expect to score hits on birds that are within the area defined by the lines connecting points NPRMN. For purposes of illustration, assume that a target is at point T and is moving on a flight course oriented at an angle of 45° to and directed away from the shooter. The distance between the shooter and point T is 30 yards, which is within the range of the shell used. The shooter then may expect to hit this target. In like manner, the shooter may expect hits on targets anywhere within the area NPRMN. Now, this area is only a proportionate part of the semi-annular area defined by lines connecting points EFGH, and it is the area EFGH which represents the maximum area within which hits are possible. Hence, the ratio of area NPRMN to area EFGH is the ratio of expected hits, which, of course, may readily be expressed as a percentage of hits. In the instant case, shown by FIG. 6, the area NPRMN is about 53 percent of the area EFGH. And so, the shooter may expect to obtain 53 percent hits.

It has been explained hereinbefore that the diagram of FIG. 7 is an average curve obtained from numerous plots similar to FIG. 6. The significance of FIG. 7 is apparent. Firstly, it shows that the percentage of hits varies markedly with changes in divergence ratio; secondly, it shows that a small change in the divergence ratio value may produce a large difference in the percentage of hits; thirdly, it shows that the percentage of hits reaches a rather distinct maximum; and lastly it shows that the greatest percentage of hits occurs within a critical range of sight divergence values which may be considered as being between about ¾" to one foot and substantially 1$\frac{1}{32}$" to one foot; the maximum being very close to 1$\frac{15}{16}$" to one foot. It is to be noted that outside this critical range, the change in percentage of hits is quite rapid, particularly above the 1$\frac{1}{32}$" value. It may also be noted that the percentage of hits does not vary greatly between the values of ⅞" to 1$\frac{1}{32}$".

It is clear, therefore, that the gunsight of my invention may have a sight divergence ratio between ¾" and 1$\frac{1}{32}$" to the foot. The optimum gunsight would have a sight divergence ratio of substantially 1$\frac{15}{16}$" to one foot.

Now, in using the gunsight of my invention in the preferred manner, it is only necessary that the shooter sight and track a target in flight in such a way that, when he pulls the trigger, the target is disposed on a diameter of and advancing toward the center of the visual image pattern **17**, **19** and **21**. When a shooter properly uses a gunsight made in accordance with my invention, he may expect to achieve about 53 percent hits on game bird targets moving at average flight speeds within the range of normally selected shells.

It should be apparent therefore that I have provided an improved and effective gunsight which, when used on guns producing a diverging shot pattern, enables the shooter to sight and place the target quickly and easily in proper relation to the visual image pattern so as to obtain the maximum number of percentage of hits.

While I have shown my invention in only one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof.

I claim:

1. For use with a firearm of the shotgun type having a diverging shot pattern and for game bird targets of types that are normally moving at speeds of between 30 and 45 miles per hour when fired upon at ranges normally between 20 and 50 yards and with ammunition of the type normally selected for such targets, a sight comprising: a hollow right circular conical frustum adaptable for mounting on said firearm so as to be diverging toward the muzzle end of said firearm, said conical frustum having dimensions substantially proportional to a frustum seven inches long, seven-sixteenths inch diameter at the smaller end and one inch diameter at the larger end, said sight to be mounted on said firearm in the position relative to the normal position of the user's eye that will produce for the user a visible indicium in the form of a circular ring of apparent minimum thickness.

2. For use with a firearm of the shotgun type having a diverging shot pattern and for game bird targets of types that are normally moving at speeds of between 30 and 45 miles per hour when fired upon at ranges normally between 20 and 50 yards and with ammunition of the type normally selected for such targets, a sight comprising: a hollow right circular conical frustum adaptable for mounting on said firearm so as to be diverging toward the muzzle end of said firearm, said sight cone having a sight divergence ratio in the range between seven-eighths and one and one-thirty-second inches per foot, said sight to be mounted on said firearm in the position relative to the normal position of the user's eye that will produce for the user a visible indicium in the form of a circular ring of apparent minimum thickness.

3. For use with a firearm of the shotgun type having a diverging shot pattern and for game bird targets of types that are normally moving at speeds of between 30 and 45 miles per hour when fired upon at ranges normally between 20 and 50 yards and with ammunition of the type normally selected for such targets, a sight comprising: a hollow right circular conical frustum adaptable for mounting on said firearm so as to be diverging toward the muzzle end of said firearm, said sight having a sight divergence ratio in the range between three-quarters inch and one and one-thirty-second inches per foot, said sight to be mounted on said firearm in the position relative to the normal position of the user's eye that will produce for the user a visible indicium in the form of a circular ring of apparent minimum thickness.

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