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(54) **RETICLE**

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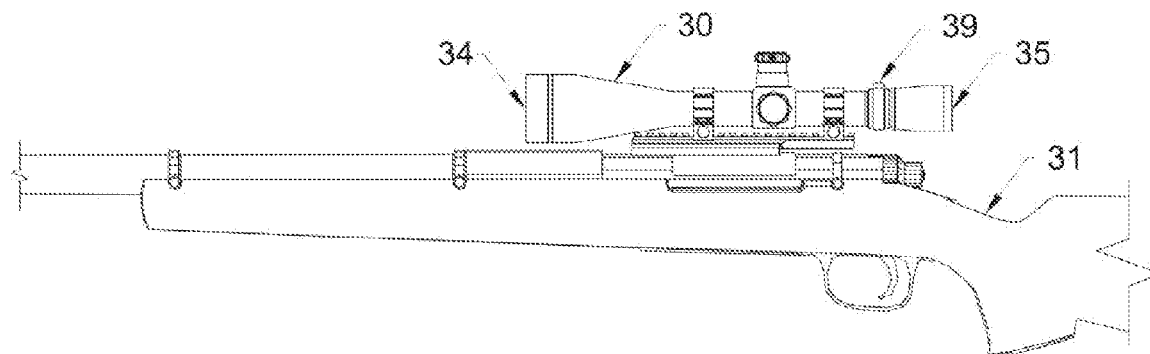
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(57) **ABSTRACT**

A reticle of a projectile weapon aiming system, such as a scope for a rifle, includes a ranging system using a predetermined theoretical target image (51, 53) in circular form and size such as to represent a target, such as an animal, wherein the target images would represent the size of that target at different multiple distances. The target images are placed at specific position on the reticle below or above the zero point (50) of the reticle representing the holdover area, inside of which is the actual holdover point, which may be indicated for that target at that designated distance, for a specific projectile with predetermined ballistic performance. This ranging system eliminates the need for range calculations and scope adjustments to correlate to that range. Additionally specific wind calculations (54, 55) may be marked and designated for different wind speeds adjacent to the different target images.



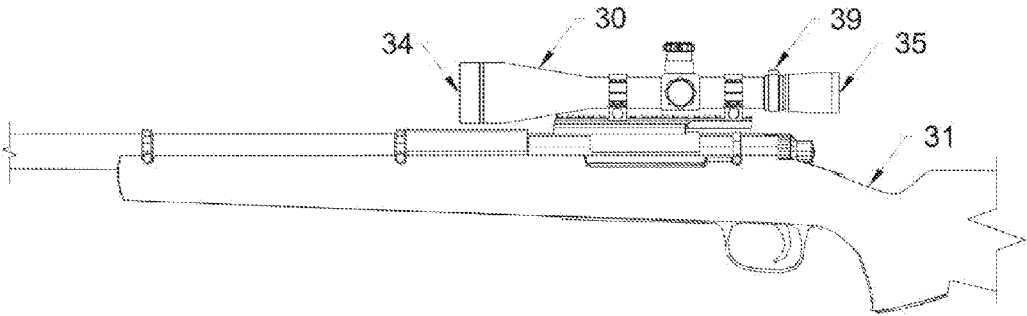


FIG. 1

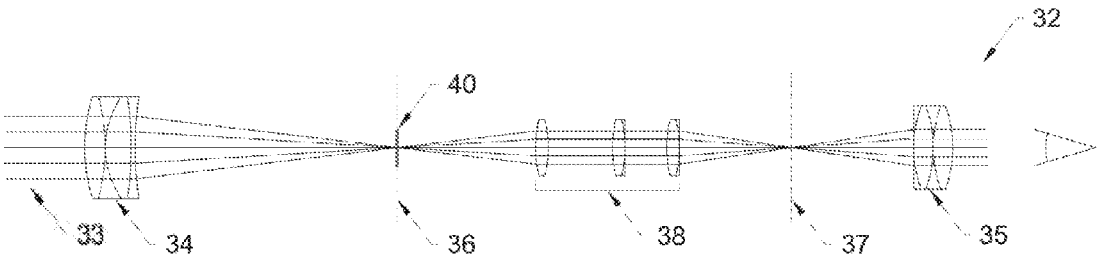


FIG. 2

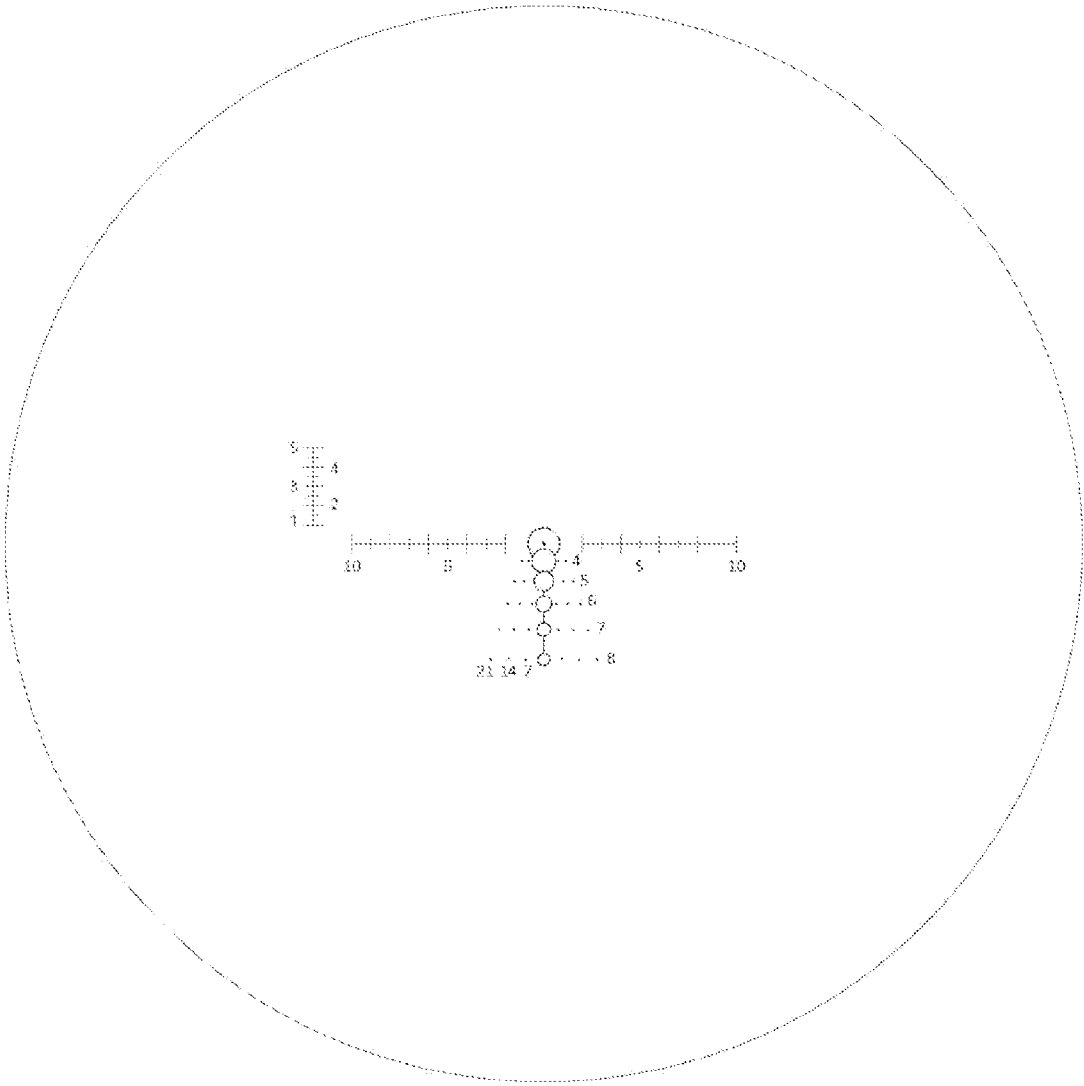


FIG. 3

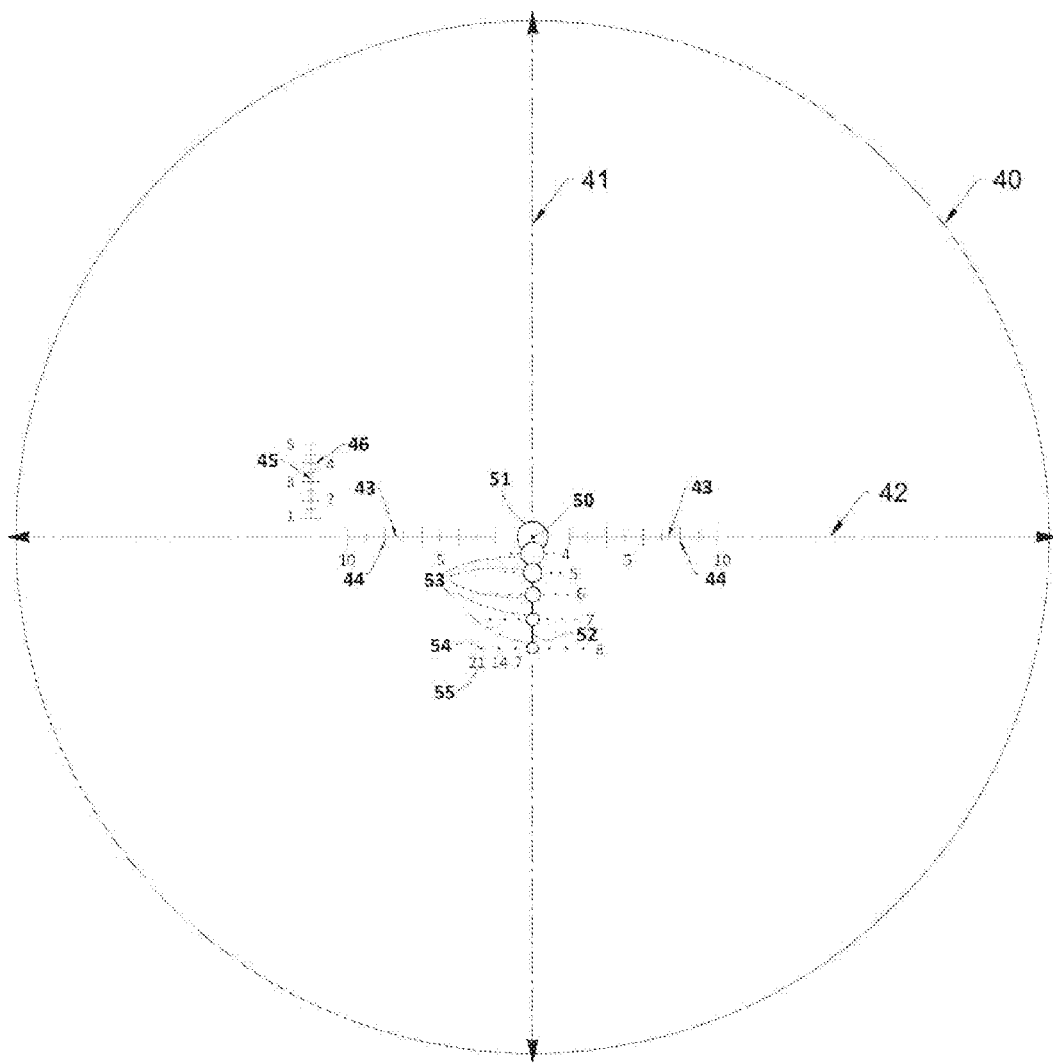


FIG. 4

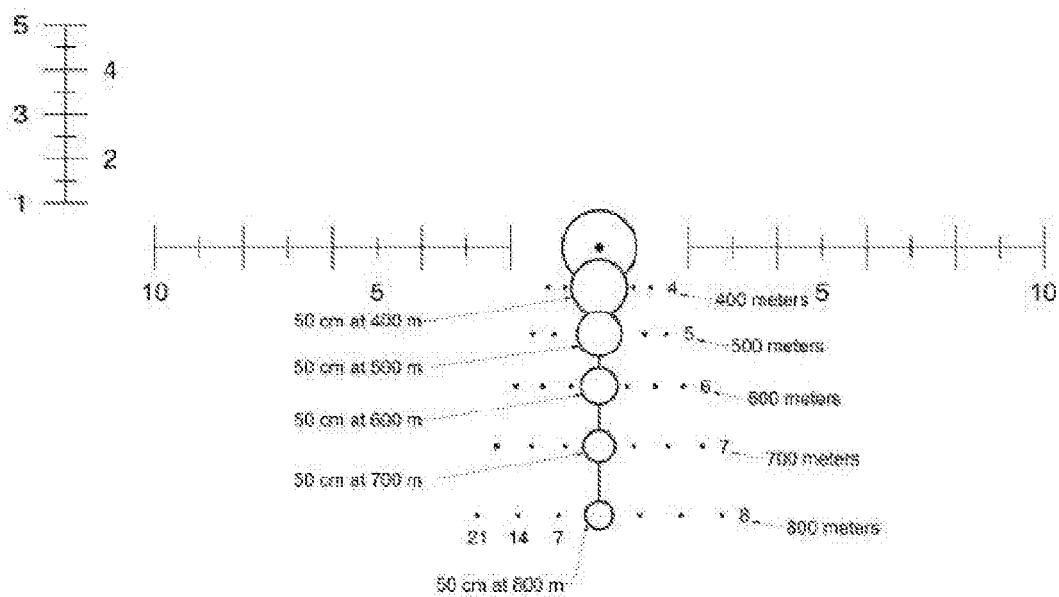


FIG. 5

RETICLE

FIELD OF THE INVENTION

[0001] The invention relates to a reticle of a projectile weapon aiming system, such as a scope for a rifle.

[0002] It is a goal of the invention to provide a ranging system which assist in aiming at a target of given size, i.e., a known size which is generally known beforehand, for a target of certain type such as an animal or objects of certain dimension or height.

SUMMARY OF THE INVENTION

[0003] This goal is achieved by a reticle of a projectile weapon aiming system, such as a scope for a rifle, which comprises a ranging system, the ranging system including a zero point (or primary aiming point) and at least one target image mark having a geometric form, said at least one target image mark representing a theoretical target image corresponding to a theoretical target of given size as seen through the reticle.

[0004] Preferably, the target image may, by its size, represent the given size of the theoretical target at a predetermined distance. In the advantageous case that multiple target images are provided, they will represent the size of the theoretical target at respective different multiple distances.

[0005] One target image may be located centered at the zero point. Instead or in combination, one or more target images may be placed, at a specific area respectively, on the reticle below or above the zero point, representing a holdover area. The holdover area as represented by said target image may further contain an actual hold over point with regard to a specific type of projectile with predetermined ballistic performance, for a distance value designated to the target image. Moreover, the actual holdover point may or may not be indicated or shown in said target image.

[0006] The geometric form of the target image may be a circular form; other forms may be suitable as well, such as an oval, rectangular or quadratic shape. Furthermore, the zero point may be marked with a dot or another type of centering symbol.

[0007] The reticle of the invention may further comprise one or more wind calculation marks, which serve to indicate positions of wind calculations for compensating for different wind speeds adjacent to corresponding target images. These wind calculation marks may be represented as dots or other suitable symbols, such as crosses or lines or ranging fiducials.

[0008] Summarizing, the reticle of the invention includes a ranging system using a predetermined theoretical target image in circular form and size such as to represent a target, such as an animal, wherein the target images would represent the size of that target at different multiple distances. The target images are placed at specific position on the reticle below or above the zero point of the reticle representing the holdover area, inside of which is the actual holdover point, which may be indicated for that target at that designated distance, for a specific projectile with predetermined ballistic performance. This ranging system eliminates the need for range calculations and scope adjustments to correlate to that range. Additionally specific wind calculations 54, 55 may be marked and designated for different wind speeds adjacent to the different target images.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is a side elevation view of a riflescope mounted on a rifle in accordance with one embodiment.

[0010] FIG. 2 is a schematic diagram showing optical elements of a riflescope in accordance with one embodiment.

[0011] FIG. 3 is a view of a reticle in accordance with one embodiment as viewed through an ocular of a riflescope.

[0012] FIG. 4 is a view of the reticle of FIG. 3 including reference numerals referred to in the detailed description for describing the various features of the reticle.

[0013] FIG. 5 is an enlarged view of the reticle of FIG. 3 including dimension lines referred to in the detailed description for describing the various features of the reticle.

DETAILED DESCRIPTION OF THE INVENTION

[0014] FIG. 1 is a side elevation view of a riflescope 30 mounted to a rifle 31 in accordance with one embodiment. FIG. 2 is a schematic diagram showing an arrangement of optical elements 32 of riflescope 30, together with ray trace lines 33 indicating the path of light from an observed object (not shown) located to the left of the assembly of optical elements, as the light travels through the optical system along an optical path. Riflescope 30 includes a tubular housing that supports at opposite ends an objective or objective lens assembly 34 and an ocular or ocular lens assembly 35 (sometimes referred as an eyepiece or eyepiece lens assembly). Objective 34 focuses the image of an observed object at a first (front) focal plane 36 located medially of objective 34 and ocular 35. A power adjustment erector lens assembly 38 interposed between objective 34 and ocular 35 inverts the image and refocuses it at a second (rear) focal plane 37 between erector lens assembly 38 and ocular 35. At least a part of erector lens assembly is movable in response to rotation of a power selector ring 39 or other power selector mechanism to adjust the optical power of riflescope 30 within a predetermined range of magnification. For example, the optical power of riflescope 30 may range between approximately 6× and 24× magnification, in accordance with some embodiments; in other embodiments, the optical power of riflescope 30 may be fixed or may be adjustable in various other magnification ranges.

[0015] A reticle 40 is perfectly positioned or superimposed in a field of view in the optical path between objective 34 and erector lens assembly 38, at or adjacent first focal plane 36. Consequently, the angles subtended by aiming marks (described below) of reticle are the same at any magnification. In a variant embodiment (not shown), this reticle may be embodied in a transparent reticle disc located at front or rear focal plane 36, 37 of riflescope 30, in which case the angles subtended by the aiming marks will vary with magnification settings of riflescope 30.

[0016] FIG. 3 is a pictorial representation of reticle 40 as viewed through ocular 35 of riflescope 30. FIG. 4 is another pictorial view of reticle 40 that includes reference numbers as explained below, and FIG. 5 is an enlarged view of reticle 40 that includes dimension lines for the various aiming marks.

[0017] The reticle 40 includes a number of marks forming a ranging system according to the invention. The arrangement and selection of aiming marks of reticle 40 are suited to tactical shooting, in which targets, such as an animal or a

hostile target, are located at close or far range, the optical power range of rifle scope 30 is moderate or low, can be aimed with the one reticle 40 without any adjustment to the sight or weapon. For example, as described in detail below, marks of reticle 40 provide aiming marks for a theoretical target image in circular form and size such as to represent a target, for instance an animal.

[0018] Reticle 40 is preferably formed on a substantially flat disc of optical quality material, such as glass or plastic, and includes a primary aiming mark 50. As can be seen in FIGS. 3 and 4, mark 50 is a centrally located dot generally aligned with the optical center of rifle scope 30. Mark 50 usually coincides with the zero point of the reticle. To draw a shooter's eye and help a shooter locate primary aiming point 50, mark 50 is wholly or partly encompassed by an aiming ring 51.

[0019] A pair of primary horizontal sight lines 43 at opposing sides of mark 50 collectively overlay a horizontal axis 42 that intersects primary aiming point 50. Dimension marks 44 on each of horizontal sight lines 43 provide user horizontal corrections calculated using mathematics or chart expressed in terms of mrad (milliradian). Vertical sight line 45 located to the upper left side of the left horizontal sight line 43 and dimension marks 46 on vertical sight line 45 provide user vertical corrections in terms of mrad.

[0020] One or more marks 53, which may be used as aiming marks, ranging marks, target image marks or marks for use as holdover areas, are provided at positions below the primary aiming point 50. The marks 53 are pre-calculated target images corresponding to different distances for a pre-calculated dimension of a target overlay a vertical axis 41 and trajectory bar 52 that intersects primary aiming point 50, spaced apart by progressively increasing incremental distances. Providing holdover aiming areas for regularly incrementing target distances based on the parabolic flight. In embodiments not shown, the holdover point may be indicated or shown in the respective mark 53, for instance at the center of the circle representing the mark.

[0021] Aiming/ranging marks 53 are spaced apart at distances from the primary aiming point 50. The marks 53 may be preselected and pre-calculated in dimension, to represent a pre-selected target image at that particular range. Alternatively or in combination, the marks 53 may be preselected and calculated to compensate for bullet drop of respective ammunition at regular incrementing target distances.

[0022] Additional horizontal points aligned to some or all of marks 53 include wind adjustment dots 54 to compensate for different wind speeds offset from trajectory bar 52, corresponding to target incremental distances matching target image/holdover areas/ranging incremental distances.

[0023] In reticle 40 ranging fiducials may be provided, shown as right side numerals "4", "5", "6", "7", and "8" providing a visual indication and reminder of target distances (in unit of hundreds of meters), as indicated in FIG. 5. In reticle 40 ranging fiducials may be provided, shown as bottom side numerals "7", "14", and "21" providing a visual indication and reminder of wind speed (in unit of meter per second).

REFERENCE SYMBOLS

[0024] 30 Rifle scope.
 [0025] 31 projectile-weapon such as Rifle.
 [0026] 32 Optical elements.
 [0027] 33 Ray trace lines.

[0028] 34 Objective or objective lens assembly.
 [0029] 35 Ocular or ocular lens assembly.
 [0030] 36 First (front) focal plane.
 [0031] 37 Second (rear) focal plane.
 [0032] 38 Erector lens assembly.
 [0033] 39 Power selection ring.
 [0034] 40 Reticle.
 [0035] 41 Vertical axis.
 [0036] 42 Horizontal axis.
 [0037] 43 Primary horizontal sight lines.
 [0038] 44 Dimension marks.
 [0039] 45 Vertical sight line.
 [0040] 46 Dimension marks.
 [0041] 50 Zero point.
 [0042] 51 Target image/Holdover area/Ranging.
 [0043] 52 Vertical alignment.
 [0044] 53 Target image/Holdover area/Ranging.
 [0045] 54 Wind adjustment marks.
 [0046] 55 Wind speed.

1. A reticle of a projectile weapon aiming system, the reticle comprising a ranging system, the ranging system including:

a zero point; and
 a plurality of target image marks, said target image marks having a geometric form at respective different sizes, each of said target image marks representing a size of a theoretical target at a respective distance of a plurality of different distances as seen through the reticle, wherein a largest target image mark of said plurality of target image marks is centered on the zero point.

2. The reticle according to claim 1, wherein the theoretical target image represents, by its size, the given size of the theoretical target at a predetermined distance.

3. (canceled)

4. (canceled)

5. The reticle according to claim 1, comprising at least one target image mark which is placed at a specific area on the reticle below or above the zero point, representing a hold-over area.

6. The reticle according to claim 5, wherein the holdover area as represented by said target image mark contains an actual holdover point with regard to a specific type of projectile with predetermined ballistic performance, for a distance value designated to the target image mark.

7. The reticle according to claim 6, wherein the actual holdover point is indicated in said target image mark.

8. The reticle according to claim 1, wherein the geometric form of the target image mark is a circular form.

9. The reticle according to claim 1, wherein the zero point is marked with a dot.

10. The reticle according to claim 1, further comprising one or more wind calculation marks, located adjacent to corresponding target image marks, the one or more wind calculation marks indicating positions of wind calculations for compensating for different wind speeds.

11. The reticle according to claim 1, the plurality of target image marks being spaced apart by progressively increasing incremental distances.

12. A reticle of a projectile weapon aiming system, comprising a ranging system, the ranging system including:
 a zero point,
 at least one target image mark having a geometric form,
 said at least one target image mark representing a

theoretical target image corresponding to a theoretical target of given size as seen through the reticle, and a vertical sight line located to a side of the zero point, said vertical sight line comprising dimension marks providing vertical corrections.

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