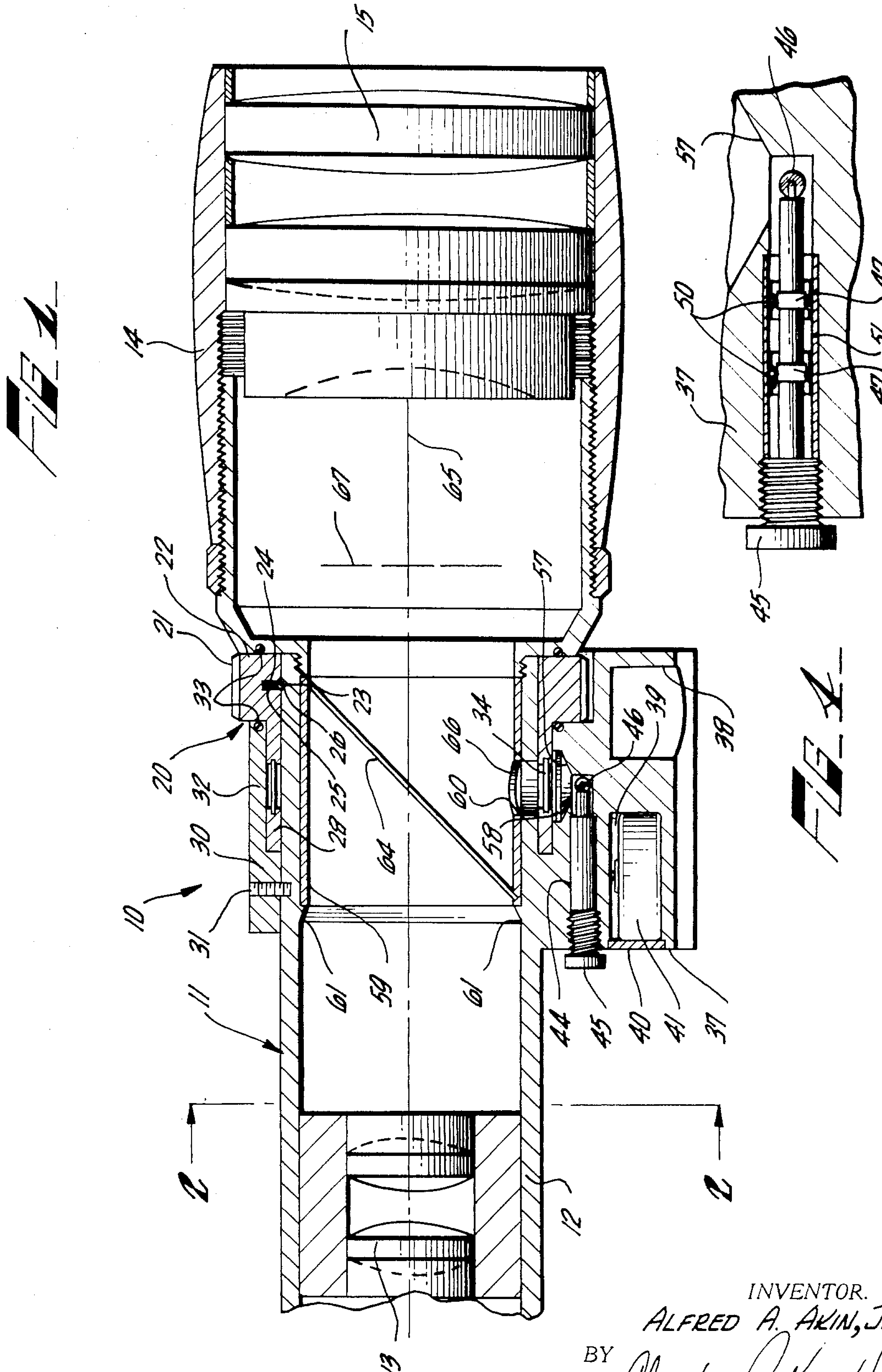
June 27, 1972 A. A. AKIN, JR 3,672,782

RIFLESCOPE WITH MULTIPLE RETICLES SELECTIVELY PROJECTED ON A TARGET

Filed Feb. 22, 1971 7 Sheets-Sheet 1



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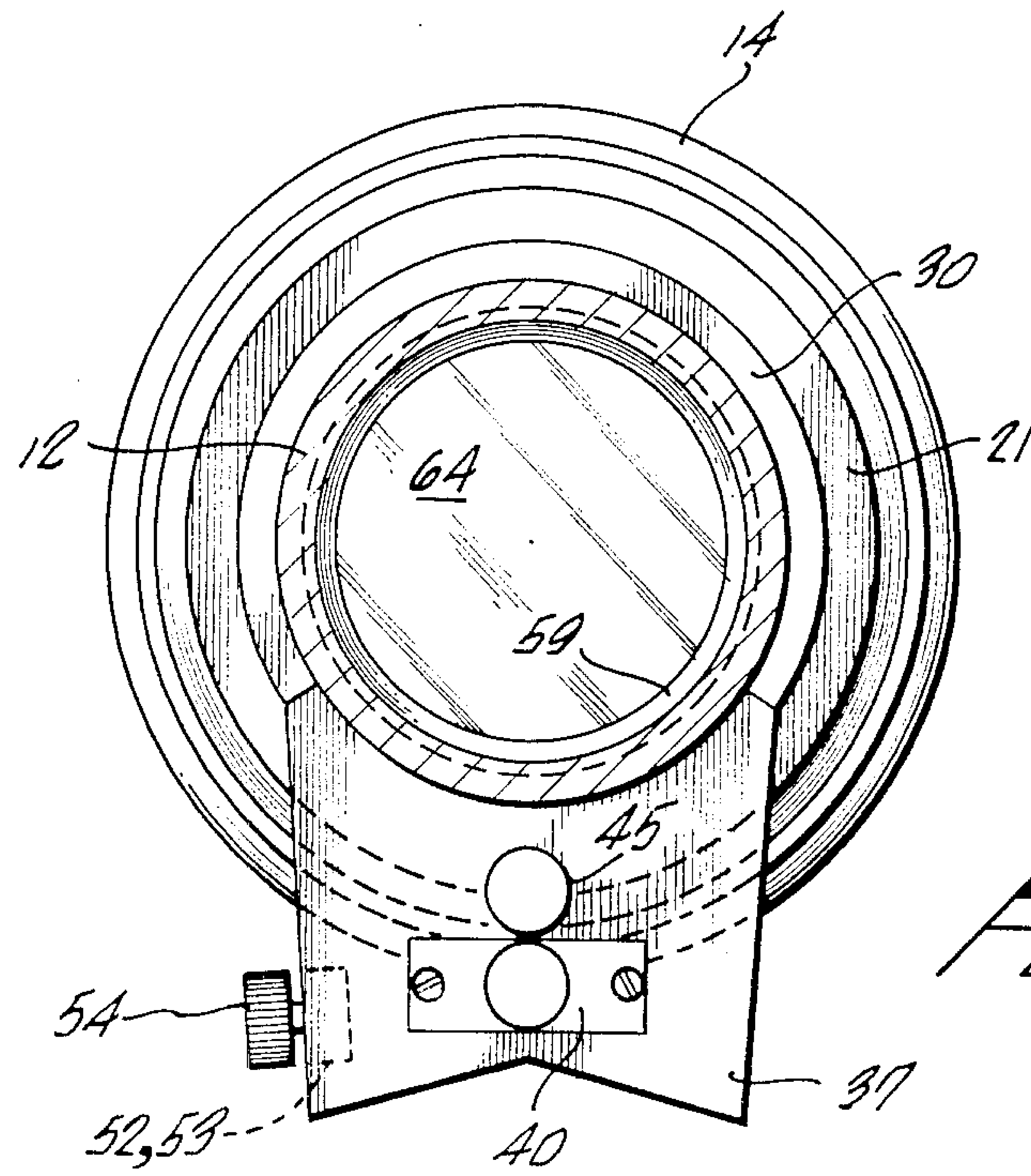

FIG. 2

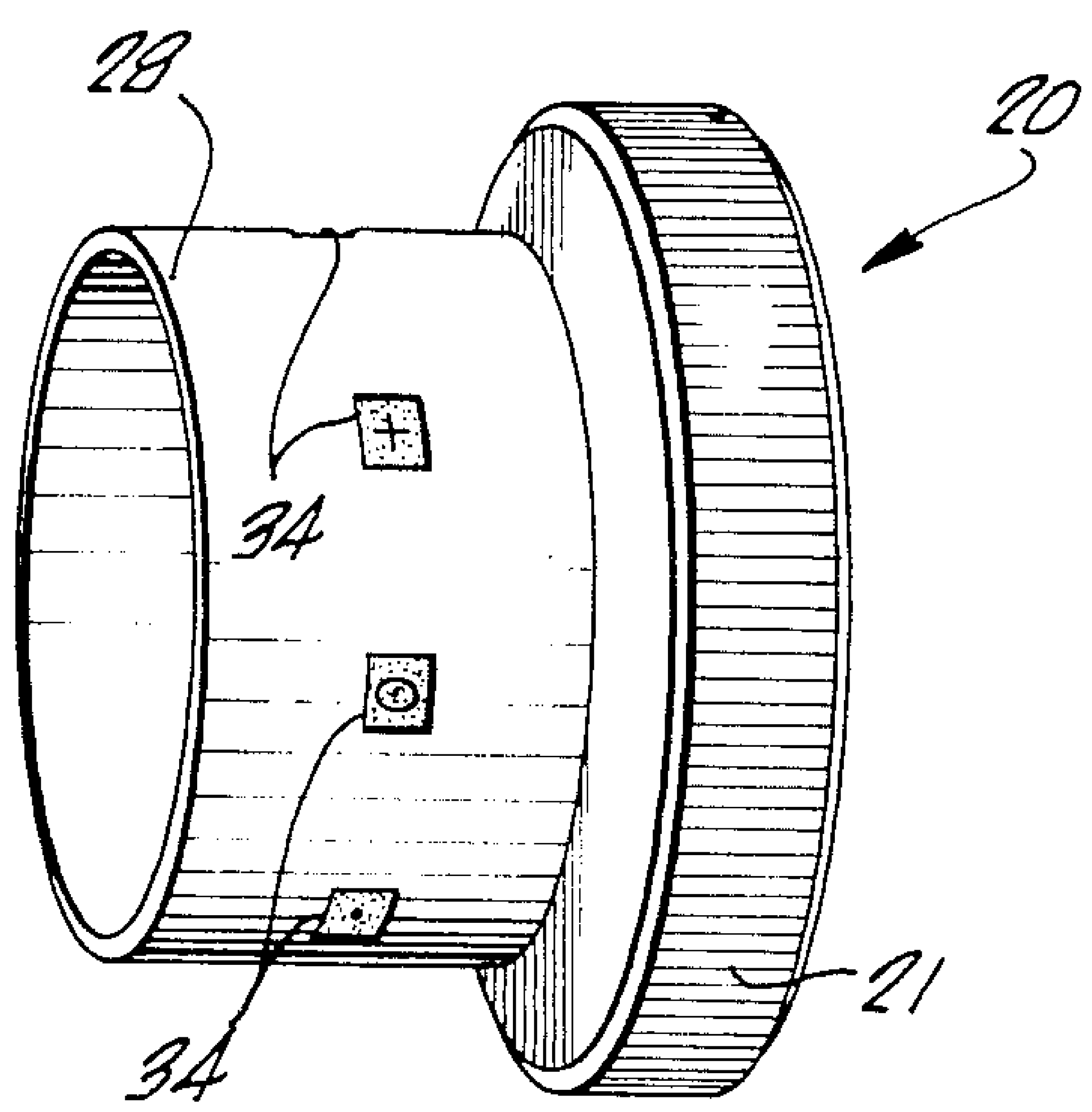

FIG. 3

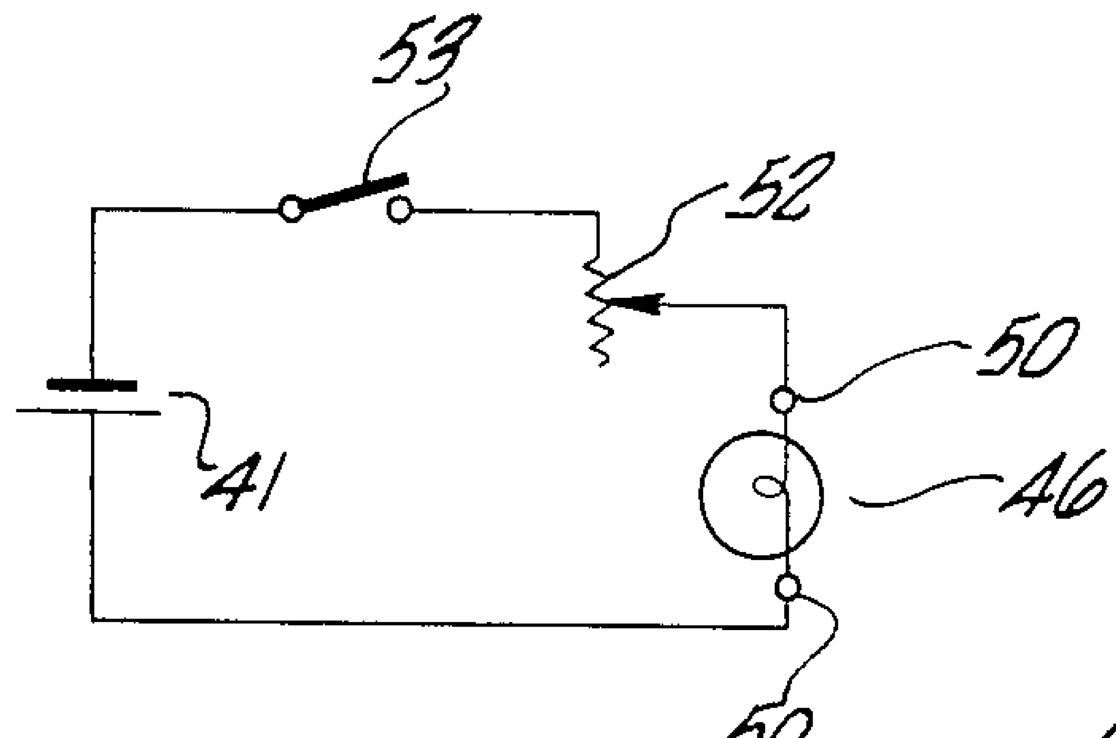

FIG. 5

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June 27, 1972 A. A. AKIN, JR 3,672,782

RIFLESCOPE WITH MULTIPLE RETICLES SELECTIVELY PROJECTED ON A TARGET

Filed Feb. 22, 1971 7 Sheets-Sheet 3

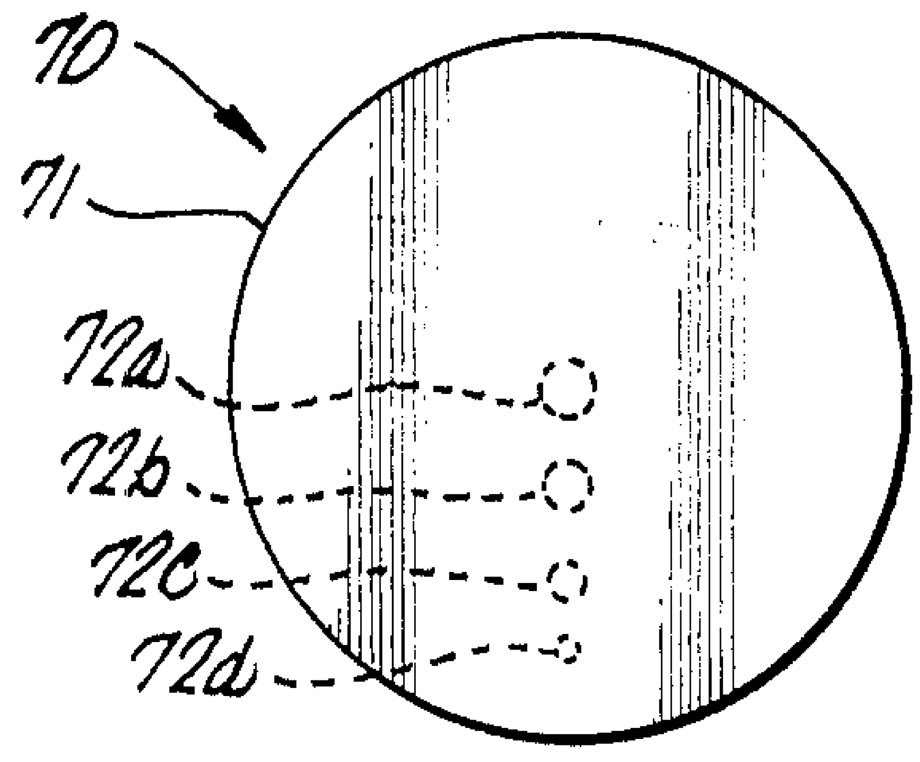

FIG. 6

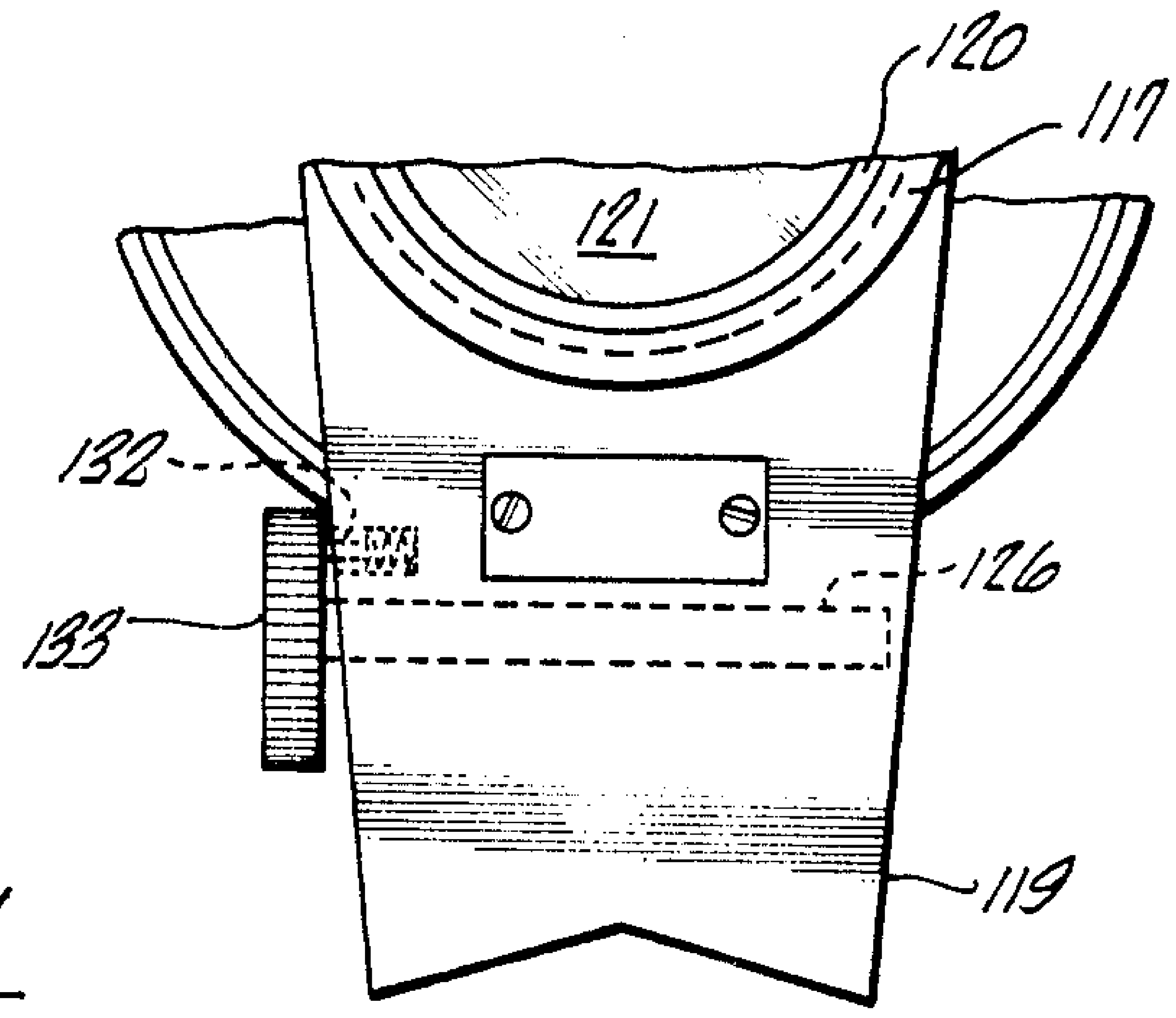

FIG. 11

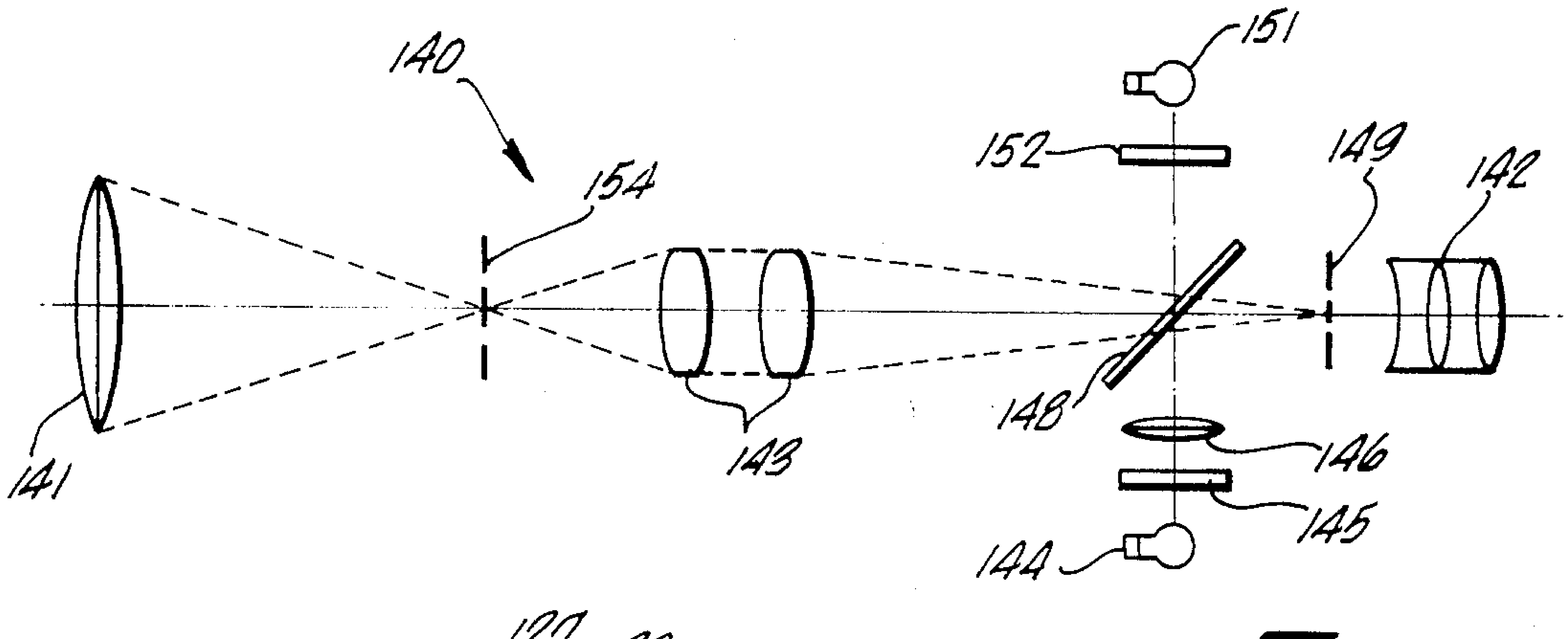

FIG. 13

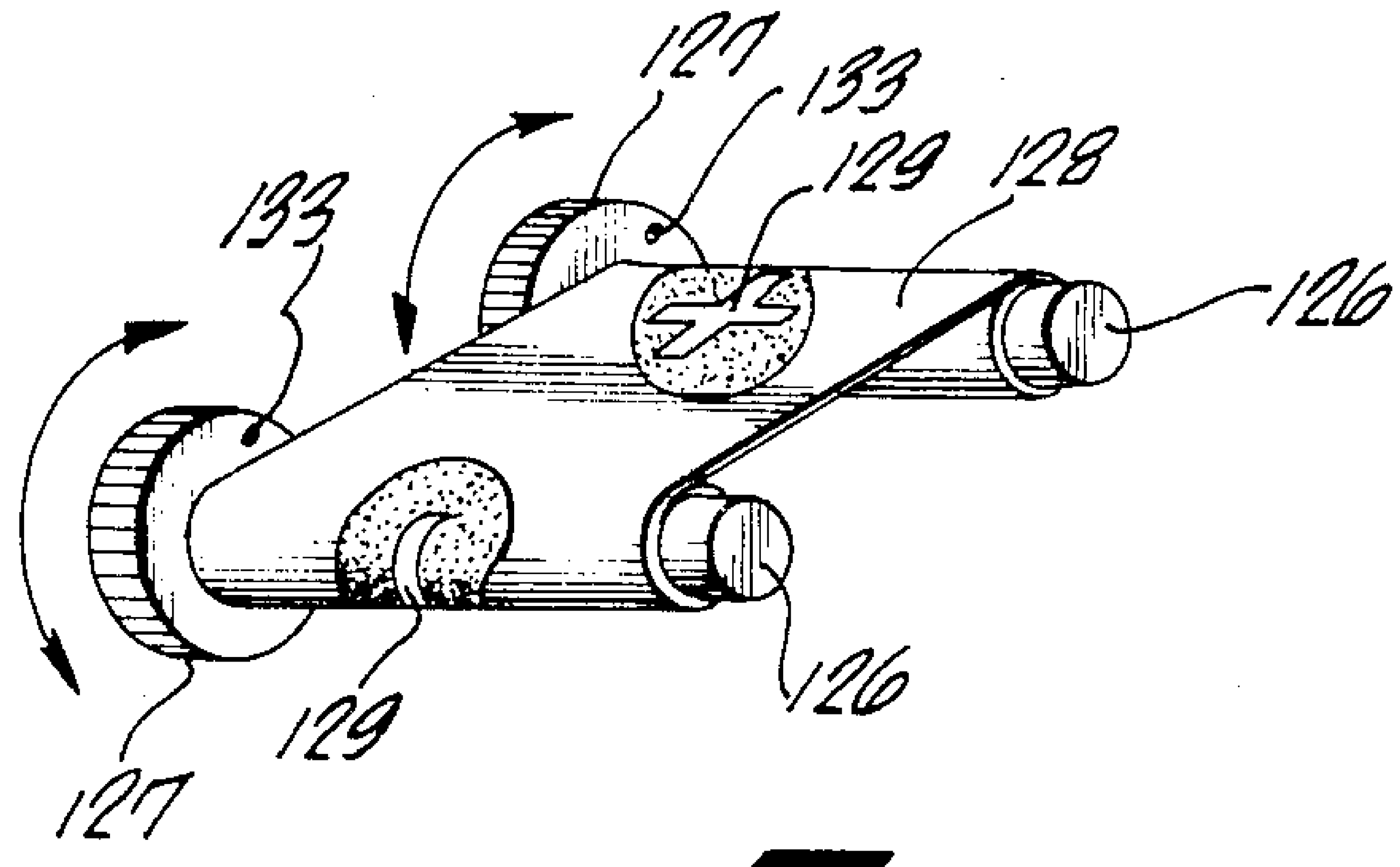

FIG. 12

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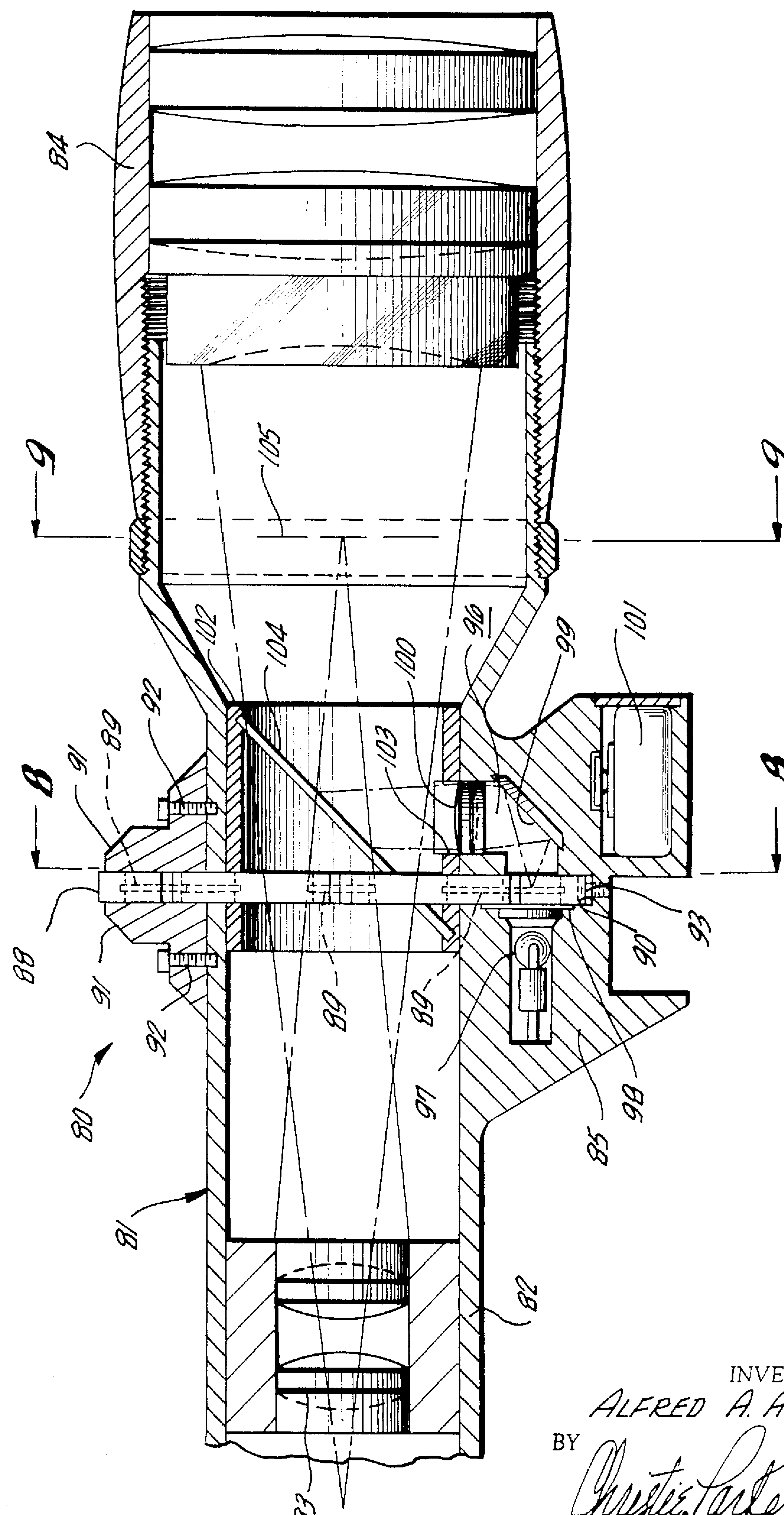

FIG. 7

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FIG. 9

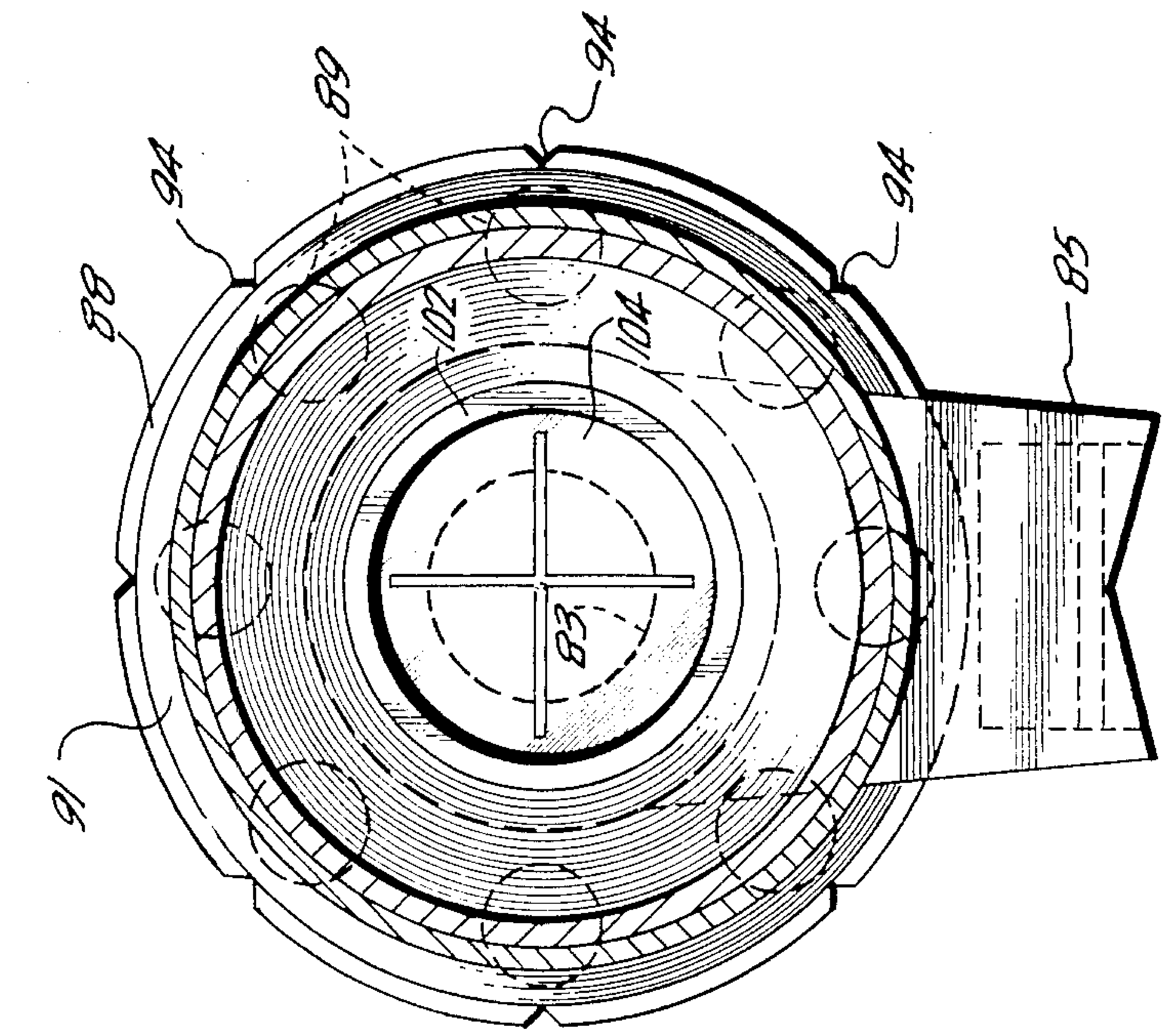
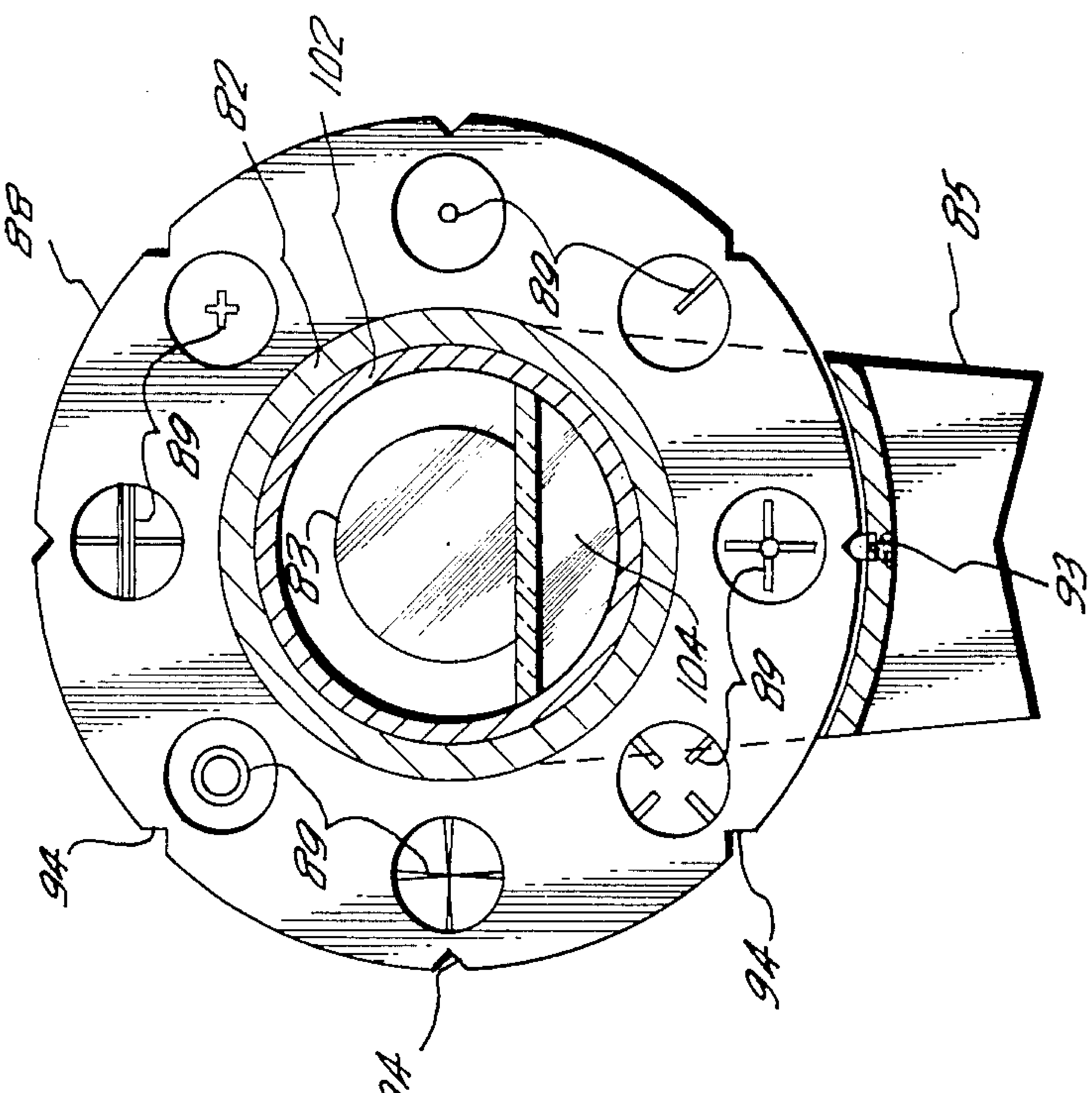


FIG. 8



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June 27, 1972 A. A. AKIN, JR 3,672,782

RIFLESCOPE WITH MULTIPLE RETICLES SELECTIVELY PROJECTED ON A TARGET

Filed Feb. 22, 1971 7 Sheets-Sheet 6

FIG. 10

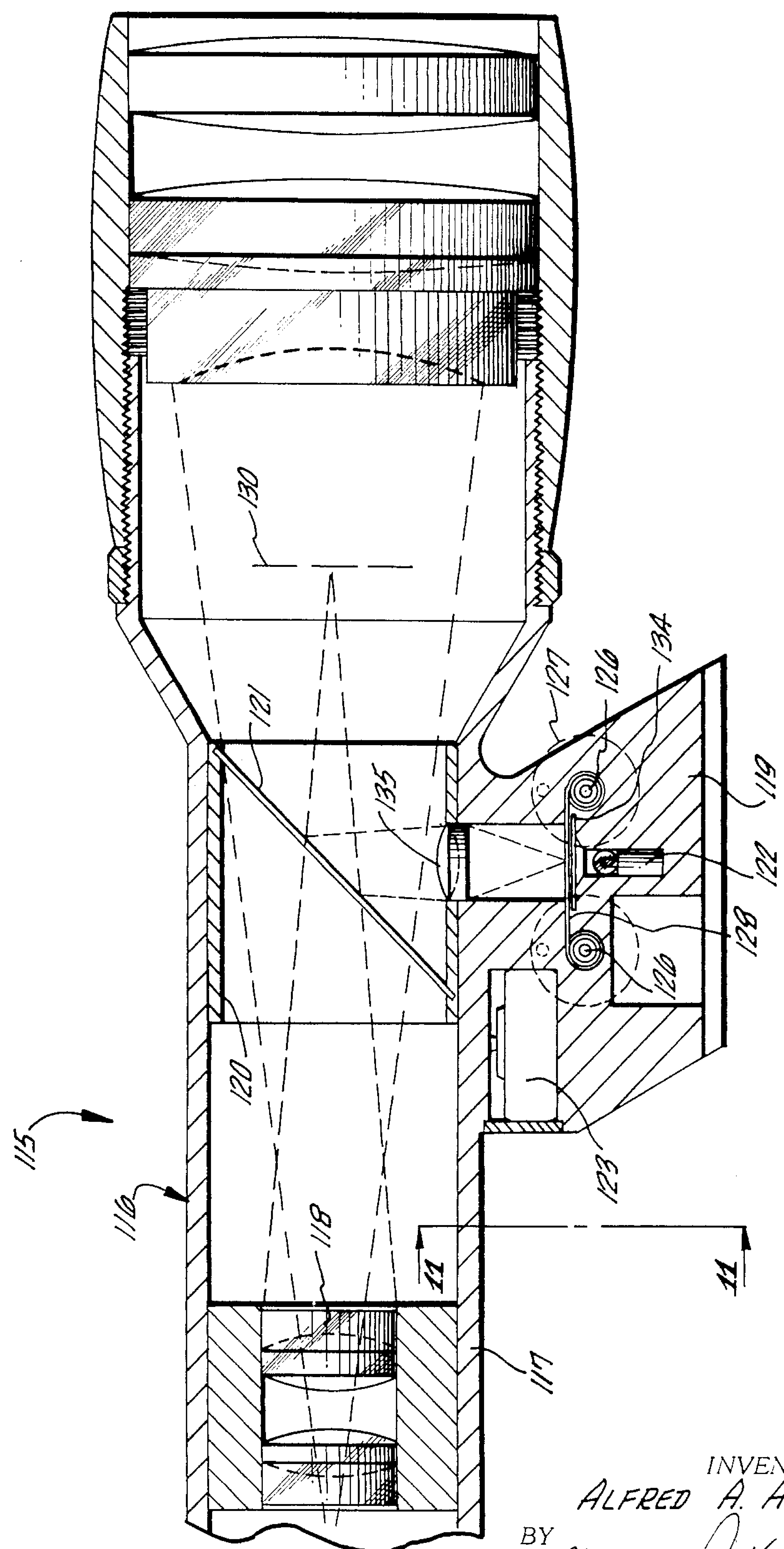

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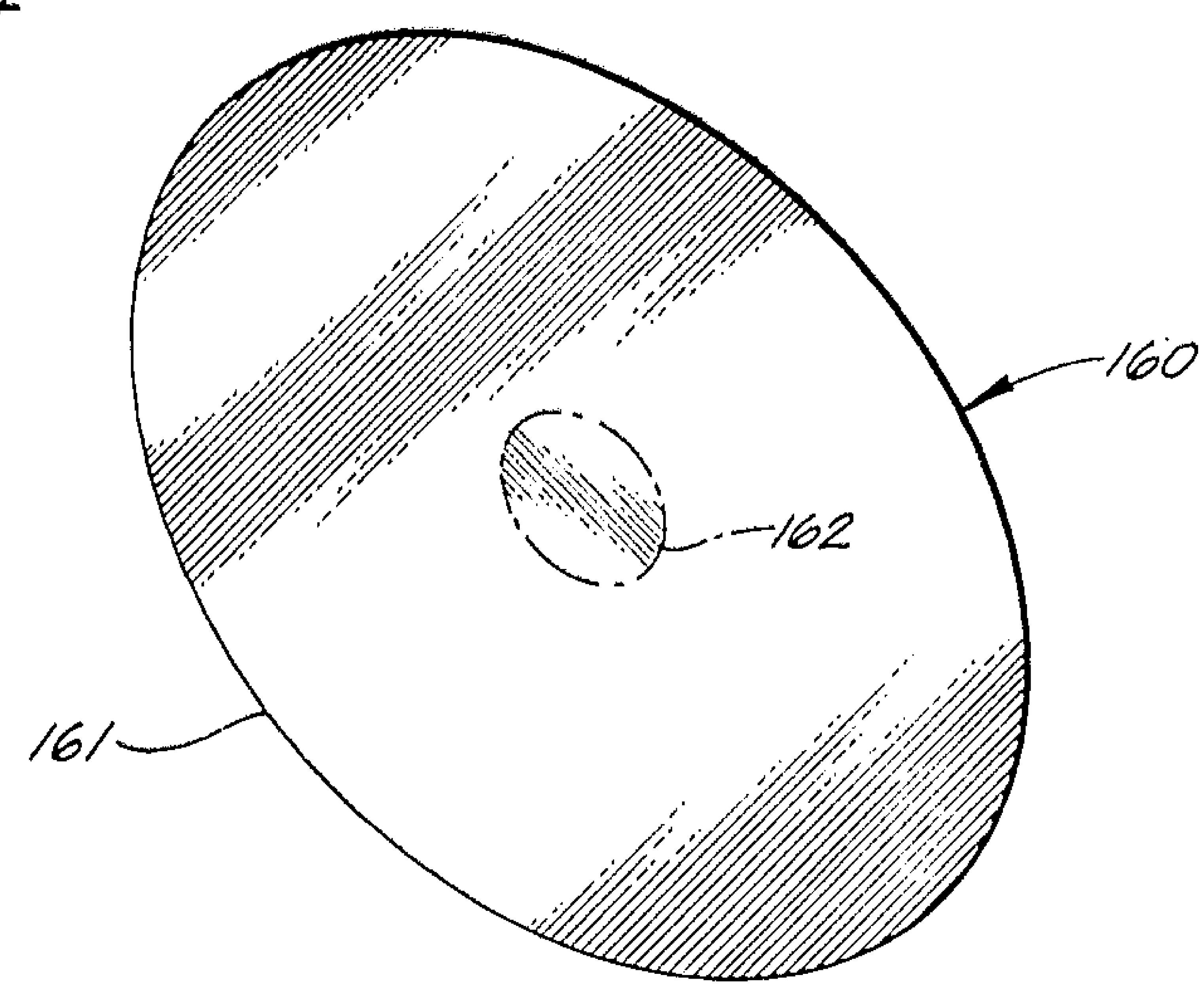
FIG. 14



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United States Patent Office

3,672,782

Patented June 27, 1972

1

3,672,782

RIFLESCOPE WITH MULTIPLE RETICLES SELECTIVELY PROJECTED ON A TARGET

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Continuation-in-part of abandoned application Ser. No. 769,136, Oct. 21, 1968. This application Feb. 22, 1971, Ser. No. 117,340

Int. Cl. G02b *27/34*

U.S. Cl. 356—251 5 Claims

ABSTRACT OF THE DISCLOSURE

A firearm optical sight having a plurality of relicles which are selectably indexed and projected within the sight to appear as an illuminated reticle superimposed on a target image viewed by a shooter. A choice of many different reticles adapts the sight for use under varying lighting conditions and at varying range with different types of ammunition. A small battery-operated lamp projects the reticle on a beam-splitting device such as a partially transparent pellicle or mirror which reflects the reticle image onto the focal plane of the target image. The pellicle is partially coated with a reflection-reducing coating to maintain a bright target image. The reticles are mounted in a ring or similar assembly which is movably supported on the sight to permit a desired reticle to be indexed into a projected position.

CROSS REFERENCE TO RELATED APPLICATION

This is a continuation-in-part of my application Ser. No. 769,136 filed Oct. 21, 1968 now abandoned.

BACKGROUND OF THE INVENTION

Telescope sights or riflescopes are widely used by shooters to assure accurate aiming of firearms such as rifles, pistols, shotguns and the like. These optical sights are typically mounted in an elongated tubular barrel or housing carrying conventional ocular and objective lens systems. An erector-lens system is provided between the ocular and objective systems to provide an erect target image for viewing by the shooter.

A conventional riflescope includes a reticle, typically of cross hair or post form, which is seen by the shooter in silhouette and superimposed over the target image. The position of the firearm is adjusted until the reticle is positioned on an aiming point on the target image. The primary advantage of an optical sight is that the target image and reticle are in the same focal plane, eliminating any need for the shooter to shift eye focus between the sight and the target as must be done with conventional open sights on a rifle. The optical sight may provide fixed or variable magnification of the target image, but such magnification is not an essential feature and it is subsidiary to the primary goal of providing a target image and reticle in a single focal plane.

While conventional reticles are highly satisfactory during conditions of full daylight, most huntnig for game animals is done under restricted lighting conditions before sunrise or just before dark. This is because most game animals are nocutrnal feeders, and their search for food is made in darkness or in the relatively short periods just before or after full darkness. A conventional optical sight is difficult to use in these conditions of subdued lighting because the reticle is seen in silhouette against a low-contrast dimly lit image of the target and target background. It is not uncommon for a hunter to lose sight of the reticle entirely while attempting to aim at a game animal standing or moving against a dark background of brush or trees. In such conditions, the firearm cannot be

2

accurately sighted, and the animal will probably escape.

This problem is overcome by the telecope sight of this invention which incorporates means for projecting an illuminated reticle on the target-image focal plane. The shooter thus sees a luminous cross hair (or other reticle configuration) superimposed on the target image, and is thereby assured that the aiming point of the rifle will not be lost in even the most difficult lighting conditions. The reticle is formed as one or more transparent lines on an otherwise opaque plate, and a small electric lamp projects the reticle through a reflecting and focusing system onto the target-image focal plane.

An important advantage of the sight of this invention is that multiple reticles are provided for selection by the shooter. For example, the sight may incorporate broad- and fine-line cross hair reticles, as well as post, dot, circular, and other forms of reticles. Several sets of reticles can also be provided to provide an immediate, simple adjustment of the rifle aiming point for different types of ammunition. A single reticle can also include several lines or dots providing aiming points at varying target ranges, and the sight is also useful with a range-finding reticle.

SUMMARY OF THE INVENTION

Briefly stated, the invention is an improvement in a firearm optical sight which includes an elongated housing with a hollow interior having ocular and objective lenses mounted therein to define ocular and objective focal planes in which a target image is in focus. The improvement comprises a projected-reticle system having a reticle means which is mounted on the sight housing and carries a plurality of reticles. An illumination means is mounted on the housing and is adapted to project an image of a selected reticle of the group of reticles laterally into the interior of the housing. An optical means is provided for directing and focusing the reticle image on one of the focal planes, whereby an illuminated reticle is superimposed on the target image.

Preferably, the reticle means is movably mounted on the housing whereby a selected reticle can be manually indexed into position before the illumination means. A miniature lamp, battery and switch are built into the sight housing to provide a light source for projecting the reticle image. The optical means includes a lens for fousing the reticle image on the focal plane, and also includes a semitransparent reflector such as a pellicle mounted within the sight housing for reflecting the reticle image and transmitting light forming the target image to the ocular focal plane. Preferably, the pellicle is partially coated with a reflection-reducing coating, but a small portion of the pellicle is left uncoated to provide efficient reflection of the illuminated reticle.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional elevation of a portion of a riflescope embodying a projected-reticle system according to the invention;

FIG. 2 is a view on line **2—2** of FIG. 1;

FIG. 3 is a perspective view of a cylindrical reticle mount used in the riflescope shown in FIGS. 1 and 2;

FIG. 4 is an enlarged view of a portion of FIG. 1 showing a lamp mounting post;

FIG. 5 is a schematic wiring diagram of a lamp circuit used in the riflescope;

FIG. 6 is a plan view of a multi-dot reticle useful in the invention;

FIG. 7 is a cross-sectional elevation of a second form of a riflescope embodying the invention;

FIG. 8 is a view on line **8—8** of FIG. 7;

FIG. 9 is a view on line **9—9** of FIG. 7;

FIG. 10 is a cross-sectional elevation of a third version of a riflescope incorporating the invention;

FIG. 11 is a view on line 11—11 of FIG. 10;

FIG. 12 is a perspective view of a reticle strip used in the riflescope shown in FIGS. 10 and 11;

FIG. 13 is a schematic view of a fourth version of a riflescope according to the invention and incorporating dual light sources and reticle systems; and

FIG. 14 is a view of one surface of a partially coated pellicle.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1–3, a rifle telescope sight or riflescope **10** includes a conventional housing **11** with a central barrel or tube **12** having mounted therein a set of erector lenses **13** of the usual type. An ocular-lens barrel **14** is threaded into one end of tube **12**, and supports a conventional ocular-lens assembly **15** which is focusable to adapt the riflescope to the eyesight of the user. The usual objective lenses and associated mounting barrel are mounted at the other end of tube **12**, and these components are omitted in the drawings for clarity. The elements described thus far are quite conventional in rifle telescope sights, and, for brevity, will not be discussed in further detail.

A reticle means such as a multiple-reticle assembly **20** is rotatably mounted on tube **12** adjacent ocular-lens barrel **14**. Assembly **20** includes an externally knurled ring **21** which makes a rotatable slip fit over the end of tube **12** and abuts a shoulder **22** on the ocular-lens barrel. A detent plunger **23** is positioned in a radially extending bore **24** in ring **21**, and the plunger is urged toward tube **12** by a compression spring **25**. Tube **12** has a plurality of circumferentially spaced detent sockets **26** formed therein beneath ring **21**, and plunger **23** engages these sockets serially as the reticle ring is rotated.

An annular reticle-mounting flange **28** is secured to and extends axially from ring **21** toward the objective-lens end of the riflescope. The end of this flange remote from ring **21** abuts a stop ring **30** secured to tube **12** by screws **31**. A cover flange **32** extends from the stop ring toward ring **21** over the outer surface of flange **28**, and a pair of O-rings **33** provide seals between ring **21**, flange **32** and shoulder **22** to prevent entry of moisture or dust into the interior of the riflescope.

A plurality of thin and generally opaque reticle plates **34** are secured in circumferentially spaced apertures in flange **28**. Alternatively, the reticle plates can be formed on a continuous circular band (not shown) secured to the flange with the reticle lines or zones in alignment with the flange apertures. Each reticle plate has transparent lines or zones therein which define a reticle pattern such as a cross hair, post, dot, circle, etc. Light is thus transmitted through the reticle plate only in those transparent zones which define the reticle pattern.

A mounting leg **37** extends laterally from one end of tube **12** adjacent the ocular-lens barrel, and the leg defines a socket **38** adapted to mate with a mounting post (not shown) on the rifle barrel. Setscrews (not shown) are threaded into the mounting leg to extend into the socket and engage the post to secure the riflescope to the rifle. Other types of mounting arrangements can of course be used, and this post-and-socket system is simply illustrative of one form.

A battery chamber **39** is defined within mounting leg **37**, and is closed by a cover plate **40**. A miniature battery **41**, preferably of the mercury type used in hearing aids, is disposed in chamber **39**. A bore **44** extends partway through mounting leg **37** above battery chamber **39**, and a lamp-mounting post **45** is threaded into the bore. A miniature lamp **46** of the "grain-of-wheat" type is mounted on the end of the post, and is electrically connected to a pair of contact rings **47** (see FIG. 4) on the post.

A pair of spaced annular contact fingers **50** are mounted on an insulating sleeve **51** secured to mounting leg **37** within bore **44**. A rheostat **52** of a conventional type which incorporates an ON-OFF switch **53** is mounted in leg **37** (see FIG. 2) and has a control knob **54** secured thereto. The battery, switch, rheostat, contact fingers and lamp are coupled together in series fashion by conventional wiring to form a circuit means as shown schematically in FIG. 5. Rheostat **52** permits adjustment of the intensity of lamp **46**.

A conical bore **57** is formed in mounting leg **37** in communication with bore **44** and extending laterally toward the interior of tube **12** above lamp **46**. A frosted light-diffusing plate **58** is secured in bore **57** adjacent flange **28** of the rotatable reticle assembly. A mounting cell **59** is disposed within tube **12**, and has an aperture **60** therethrough in alignment with the diffusing plate. Cell **59** abuts an inwardly extending shoulder **61** on the interior of the tube, and is held in position by the inner end of ocular-lens barrel **14**.

A thin light-transmitting plate or pellicle **64** is secured within cell **59**, and is oriented at an angle of 45° to an optical axis **65** of the riflescope. The pellicle has a back surface (facing the ocular-lens assembly) which is coated to reflect light received from lamp **46** toward the ocular lenses. Pellicles of this type are commercially available, and have the characteristic of transmitting say 95% of the light received from the target, while at the same time reflecting a portion of the lateral illumination from the reticle lamp. Alternatively, a partially transparent mirror of the beam-splitter type can be used in place of the pellicle. A projection lens **66** is disposed in aperture **60** and secured to cell **59**.

In operation, ring **21** is rotated to index a desired reticle into position between diffusing plate **58** and projection lens **66**. Light from lamp **46** shines through the transparent lines or zones in the selected reticle plate and is projected by lens **66** and the reflecting surface of pellicle **64** to be superimposed on a target image in focus on a focal plane **67** of the ocular lenses. Intensity of the reticle is set to a desired level by adjusting rheostat **52**.

FIG. 6 shows a typical reticle **70** useful in the mutiple-reticle riflescope of this invention and adapted for sighting on targets at different ranges from the shooter. Reticle **70** is a thin glass plate having an opaque surface **71** with a plurality of transparent circles or sighting dots **72***a*, *b*, *c* and *d* formed therethrough. Sighting dot **72***a* is centered in the reticle and subtends about three minutes of angle. This dot would be "sighted in" at a shooting range of 100 yards with a cartridge having a known ballistic curve.

Sighting dot **72***b* is positioned below dot **72***a* and subtends about two minutes of angle. The separation of the two dots is selected such that dot **72***b* is sighted in at a target range of 200 yards. Dot **72***c* subtends about one minute of angle, and is positioned below dot **72***b* to be sighted in at a target range of 300 yards. Dot **72***d* subtends about one-half minute of angle, and is positioned below dot **72***c* to be sighted in at say 400 yards. A plurality of additional reticles similar to reticle **70** can be provided with differently spaced sighting dots to compensate for the ballistic curves of different types of ammunition selected by the shooter.

Another form of a riflescope **80** according to the invention is shown in FIGS. 7–9. This riflescope is generally similar to riflescope **10** in that it incorporates a housing **81** having an elongated central barrel or tube **82** with a set of erector lenses **83** secured therein. An ocular-lens assembly **84** is secured at one end of tube **82**, and an objective-lens assembly (not shown) is positioned at the other end of the tube. A mounting leg **85** extends laterally downwardly from tube **82**, and is arranged to be secured to a rifle barrel.

A reticle disk **88** carrying a plurality of circumferentially spaced reticles **89** makes a rotatable slip fit around tube **82** and extends into a slot **90** formed in mounting leg **85**. A pair of retaining members **91** are secured to tube **82** by screws **92**, and are positioned on opposite sides of the reticle disk to protect the reticles from exposure to moisture and physical contact. A spring actuated detent plunger **93** is mounted in mounting leg **85**, and engages detent sockets **94** circumferentially spaced around the periphery of the reticle disk in alignment with reticles **89**.

A chamber **96** is formed in mounting leg **85** on opposite sides of the reticle disk, and a lamp **97** is mounted in the chamber just forward of the reticle disk. A frosted light-diffusing plate **98** is secured between the lamp and reticle disk. A plane mirror **99** is positioned in chamber **96** at 45° to the optical axis of the riflescope. Mirror **99** reflects light transmitted through a reticle laterally into tube **82** through a lens **100**. A battery **101** is housed in the mounting leg, and is connected through an intensity-adjusting rheostat and switch (not shown) in the same fashion as described above in connection with riflescope **10**.

A pellicle cell **102** is secured within tube **82** and has an opening **103** therethrough in alignment with lens **100**. A partially transparent mirror or pellicle **104** of the type described above is positioned in the pellicle cell at 45° to the optical axis of the riflescope and parallel to plane mirror **99**. A luminous reticle is thus projected on an ocular focal plane **105** to be superimposed on an image of a target at which the shooter is aiming. As suggested in FIG. 8, reticles **89** are provided in a variety of different formats, and the specific reticle best suited to a particular shooting situation is selected by rotating disk **88** to position the desired reticle into the projection position.

Yet another form of a riflescope **115** according to the invention is shown in FIGS. 10–12. This unit is similar to the sights already described in that it includes a housing **116** having a central elongated mounting tube **117** carrying a set of erector lenses **118**. The usual ocular and objective lens assemblies are mounted on opposite ends of the tube, and a mounting leg **119** extends laterally from tube **117** adjacent the ocular-lens housing. A pellicle cell **120** is secured within tube **117** and carries a partially transparent mirror or pellicle **121** at 45° to the optical axis of the sight. A miniature lamp **122** and battery **123** are mounted in the mounting leg, and are connected together in circuit with a rheostat and switch (not shown) in the same fashion as shown in FIG. 5.

A pair of shafts **126** are rotatably mounted in mounting leg **119**, and have control knobs **127** secured to the ends thereof. A flexible strip **128** of plastic material is wound on and extends between shafts **126**. Strip **128** is generally opaque, but defines specific transparent zones forming a plurality of reticles **129**. Rotation of the shafts moves strip **128** in curtain fashion within a chamber in the mounting leg, and rotation is continued until a selected reticle is positioned for projection onto an ocular focal plane **130** of the sight. A pair of spring-actuated detent plungers **132** engage detent sockets **133** in control knobs **127** for proper positioning of a selected reticle.

A frosted light-diffusing plate **134** is positioned between lamp **122** and the reticle strip, and a lens **135** is mounted in pellicle cell **120** to project light transmitted through the selected reticle onto pellicle **121** for reflection onto the ocular focal plane. The flexible reticle-strip configuration of riflescope **115** is especially suitable for applications in which a large number of reticles are to be available for selection by the shooter.

A variety of additional features can be incorporated in the multiple-reticle riflescopes described above. For example, one of the reticles on the multiple-reticle means can be of the range-findiing type in which a plurality of lines or other indices are arranged to indicate range of a target of approximately known size. The shooter can select the range-finding reticle to determine his distance from the target, and then immediately position a sighting reticle of say a cross-hair configuration for aiming the firearm at the target.

The projected-reticle system is also ideally suited for

incorporation of parallax correction. By varying the spacing of a selected reticle from the associated projection lens, the reticle seen by the shooter can be made parallax-free when superimposed on an image of a target at a specific range. For example, the reticles used in riflescope **80** can be moved slightly within disk **88** until a reticle-lens spacing is achieved which makes each reticle parallax-free for a particular target distance. One reticle can thus be parallax-free at 100 yards, another at 200 yards, and so forth.

A colored filter can also be incorporated in the projection optical system to provide an illuminated reticle of a desired color. For example, a red filter can be used to minimize loss of darkness adaptation of the shooter's eye in conditions of poor light. This same result can be achieved by controlling the partially reflecting surface of the pellicle such that only selected wavelengths are projected onto the ocular focal plane.

Another modification is to movably mount the reflector cell within the riflescope tube so the angulation of the pellicle (or beam-splitting mirror) can be varied with respect to the optical axis to provide an elevation adjustment for the sight. All of the riflescopes described above can also incorporate conventional reticles for use in normal daylight conditions. The projected-reticle system is also useful with riflescopes of the variable-power type, and projection on the ocular focal plane is preferred as reticle size is unaffected by adjustments in the magnification of the sight.

Still another version of the invention is shown in FIG. 13 in which the optical components of a riflescope **140** are shown in schematic form. These components include an objective lens **141**, an ocular lens **142**, and a set of conventional erector lenses **143** positioned between the ocular and objective lenses. A lamp **144**, reticle plate **145** and projection lens **146** are mounted laterally off the optical axis of the riflescope in the same geometric arrangement as described with reference to riflescope **10**. A beam-splitting mirror or pellicle **148** is positioned between the erector lenses and the ocular lens at an angle to the optical axis, whereby an image of the reticle defined by reticle plate **145** is projected onto an ocular focal plane **149** of the riflescope. The assembly thus far described is optically the same as riflescope **10** discussed above.

A second illumination source such as a lamp **151** is positioned off the optical axis of the riflescope and directed toward the surface of the pellicle which faces the objective lens. A second reticle plate **152** is disposed between lamp **151** and the pellicle. Reticle plates **145** and **152** are of the type already described in which a reticle is defined by transparent zones or lines in an otherwise opaque surface. However, it is to be understood that the invention is not limited to this style of reticle plate. For example, the reticle can be defined by etched or engraved lines in an edge-lit plate. In this type of reticle, the reticle pattern is lighted by illuminating the edge of the reticle plate in conventional fashion. Other styles of reticles are also useful, such as one or more strands of a light-conducting material as fiberglass or similar plastic material.

In operation, lamp **151** is illuminated to project an image of the reticle defined by reticle plate **152** onto the reflecting surface of pellicle **148**. The reticle image is thus projected forwardly within the riflescope through erector lenses **143** to be in focus on an objective focal plane **154**. Reticle plate **152** is spaced from the optical axis a distance equal to the distance which pellicle **148** and ocular focal plane **149** are spaced apart along the optical axis. The need for a focusing lens between lamp **151** and the pellicle is thereby eliminated because the distance from the center of objective lens **141** along the optical axis and then laterally from the pellicle to the plane of reticle plate **152** is exactly equal to the distance represented by a line delineating the center of objective lens **141** to the ocular focal plane of the instrument.

This system permits a second reticle pattern to be superimposed on the target image either separately from or along with the reticle projected through lens **146**. For example, reticle plate **152** can define a range-finding reticle which is illuminated momentarily to estimate the distance of the target. If the reticle defined by plate **152** is used for sighting, windage and elevation adjustments may also be provided by mounting the erector lenses in a conventional movable cell whereby the image in the objective focal plane is laterally shiftable.

Although this version of the invention has been described in terms of a pellicle reflector, a mirror of the beam-splitting type can also be used as described above. Similarly, other conventional beam-splitting devices such as prisms can be used. Reticle plate **152** can also be movably mounted and can define a plurality of reticles which are selectably indexed into position for projection onto the objective focal plane.

The multiple-reticle projection system can also be used with two or more lamps which are illuminated selectively by a multi-position switch to project a selected reticle on the sight focal plane. For example, a second lamp and optical-projection system can be provided to permit momentary projection of a range-finding reticle by actuation of a push-button switch. When target range has been estimated, an appropriate aiming reticle is selected to make the shot.

FIG. 14 shows a presently preferred pellicle reflector **160** which is useful in place of, for example, pellicles **64**, **104**, **121** or **148** of the projected-reticle riflescopes described above. Pellicle **160** is conventionally made of a thin transparent plastic membrane, and is elliptical in shape to fit across the interior of the riflescope barrel at a 45° angle to the barrel axis as shown, for example, in FIGS. 1 and 10.

Pellicle **160** has a rear surface **161** which faces the reticle projection system and the ocular lens of the riflescope. The rear surface is coated with a reflection-reducing coating with the exception of a central portion **162** which is masked during the coating process to remain uncoated. The coating is preferably a quarter-wavelength thickness of a conventional reflection-reducing film such as magnesium fluoride which is applied by vacuum deposition.

Light rays from the reticle projector strike uncoated central portion **162** which is sufficiently reflective that the illuminated reticle is readily seen by the shooter through the ocular lens. The reflection-reducing coating on the remaining rear surface of the pellicle improves transmission of light from the target, and target brightness is thereby improved. The opposite face or front surface of the pellicle is also coated with a similar reflection-reducing film to preserve maximum target brightness. The entire front surface is normally coated, but a small central area (aligned with central portion **162** on the rear surface) can be masked and left uncoated if a weak light source is used in the reticle projector and additional reticle brightness is needed.

The uncoated portions of the pellicle need only be large enough to accommodate the relatively small bundle of light rays transmitted from the reticle projector. With a dot reticle, for example, an uncoated portion with a diameter of one or two millimeters is normally adequate. Most of the pellicle surface can thus be coated, and maximum target image brightness is preserved in the riflescope.

There has been described a projected-reticle riflescope which provides an instant choice of a large number of illuminated reticle patterns. The shooter can select a reticle pattern best suited to the type of hunting being done, and can vary the reticle brilliance to a level compatible with the marginal lighting conditions encountered when hunting game animals. This sight is well adapted for use with a variety of firearms and different types of ammunition as sets of multiple reticles for different ballistic curves are easily provided.

What is claimed is:

1. In a firearm optical sight including an elongated housing with a hollow interior having ocular and objective lenses mounted therein to define ocular and objective focal planes in which a target image is in focus, a projected-reticle system comprising:

reticle means defining a reticle and mounted on the housing out of an optical path between the ocular and objective lenses;

illumination means mounted on the housing for projecting a reticle image into the housing interior; and

optical means for directing the reticle image on one of the focal planes whereby an illuminated reticle is superimposed on the target image in predetermined alignment with an optical axis of the sight, the optical means including a light-transmitting partially reflective member mounted in the housing interior in the optical path, the member having a first surface portion which is coated with a reflection-reducing coating to increase light transmission from the objective lens to the ocular lens, and a second surface portion which is uncoated to reflect light from the illumination means toward said one focal plane.

2. In an optical sight for a rifle, the sight including an elongated housing adapted to be secured to the rifle and having a hollow interior with ocular, erecting and objective lenses mounted therein on an optical axis and defining ocular and objective focal planes in which a target image is in focus, a projected-reticle system comprising:

reticle means movably mounted on the housing and carrying a plurality of reticles, the reticle means including an indexing means cooperating with the housing for positioning any selected reticle in a predetermined position with respect to the housing;

illumination means secured to the housing and adapted to project an image of a selected reticle laterally into the interior of the housing;

a semitransparent reflector mounted within the housing and adapted to transmit light forming the target image, and to reflect the projected reticle image to the ocular focal plane in a predetermined position with respect to the optical axis, the reflector having a first surface portion which is coated with a reflection-reducing coating to increase light transmission from the objective lens to the ocular lens, and a second surface portion which is uncoated to reflect light from the illumination means to the ocular focal plane; and

a lens disposed between the ocular focal plane and the illumination means for focusing the reticle image on the ocular focal plane.

3. The improvement defined in claim **2** in which the reticle means includes a ring mounted on the housing to be rotatable about the optical axis to index a selected reticle into a projection position between the illumination means and the reflector.

4. The improvement defined in claim **3** in which the indexing means comprises detent means disposed between the housing and ring for positioning the ring in a plurality of predetermined positions.

5. The improvement defined in claim **4** in which the illumination means comprises a lamp, a battery, and circuit means connected between the lamp and battery; in which the reticle means includes a member having an opaque surface through which transparent areas are formed to define the reticles; and in which the reflector is a pellicle.

No references cited.

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