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MULTIPLE-SCALE RETICLE FOR A FIRE CONTROL SYSTEM WITH MEANS
FOR ADJUSTING THE SERVOSYSTEM TO
A SELECTED ONE OF THE SCALES

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4 Sheets-Sheet 1

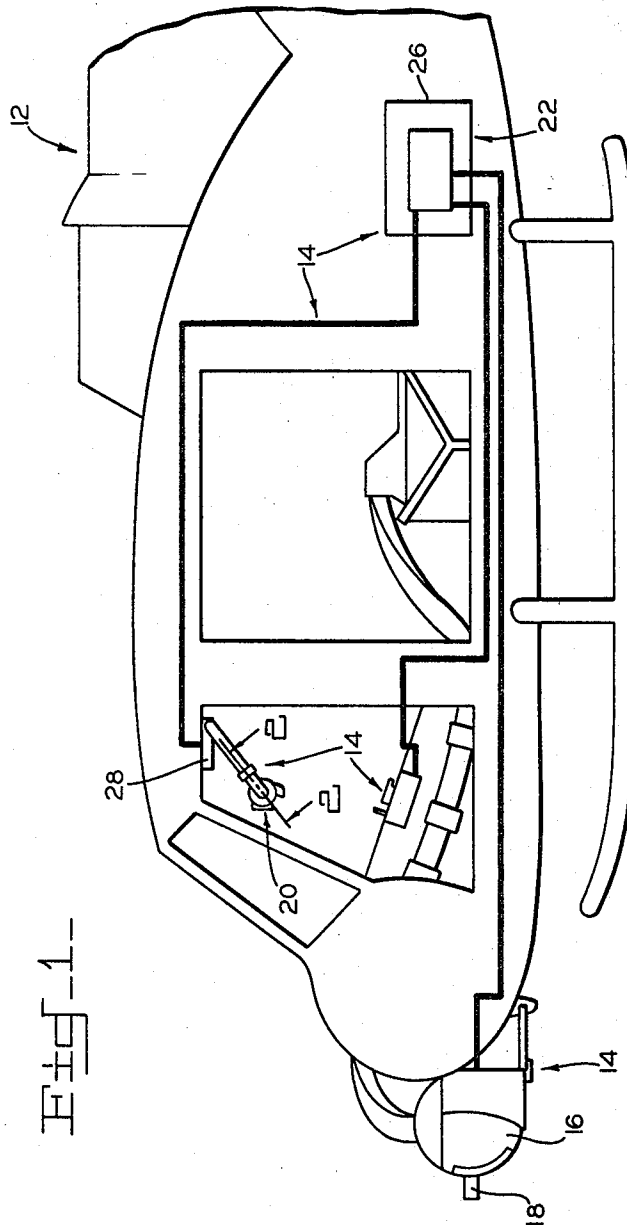


Fig. 1--

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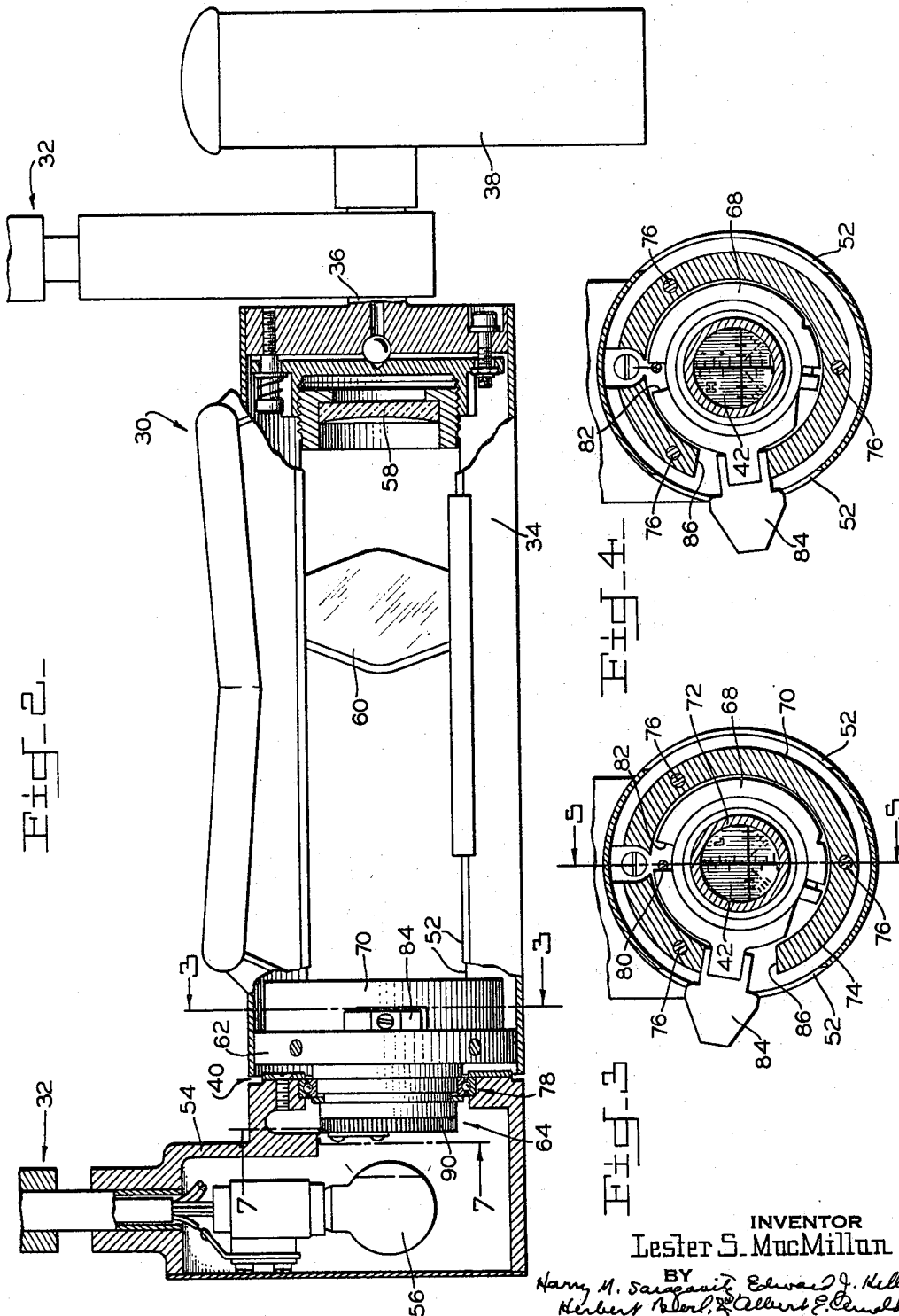
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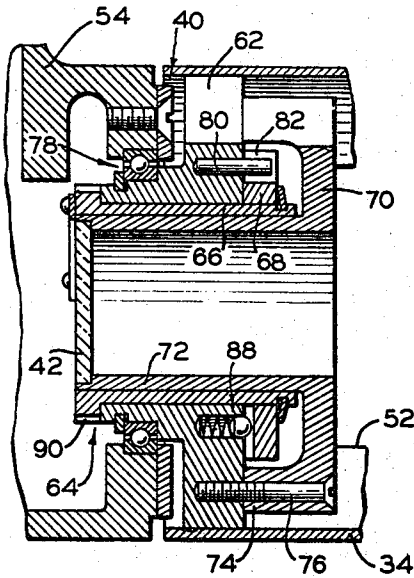


Fig. 5-

Fig. 6-

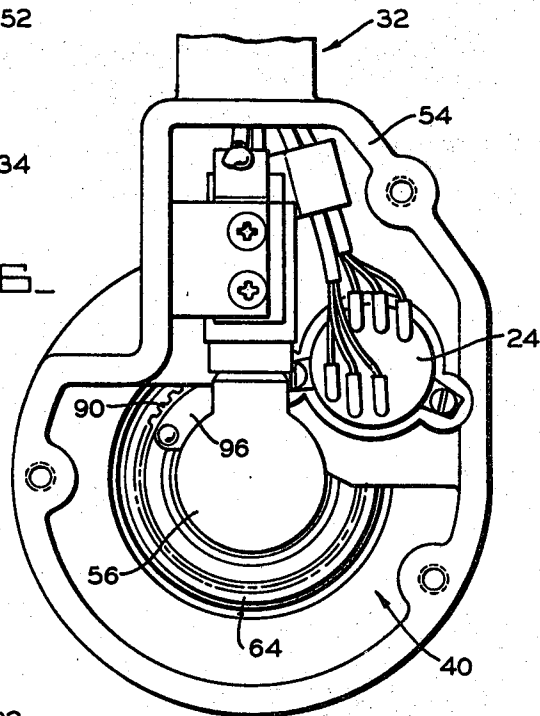
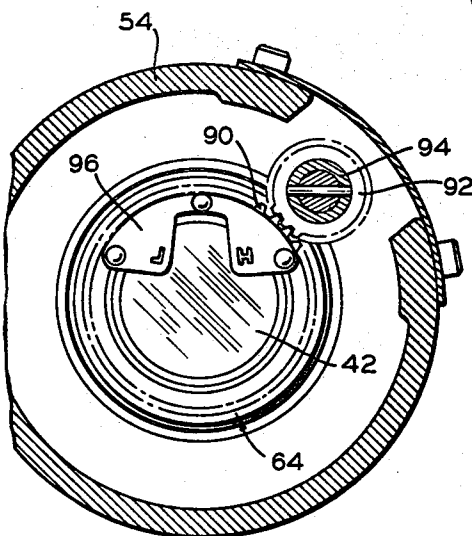


Fig. 7-



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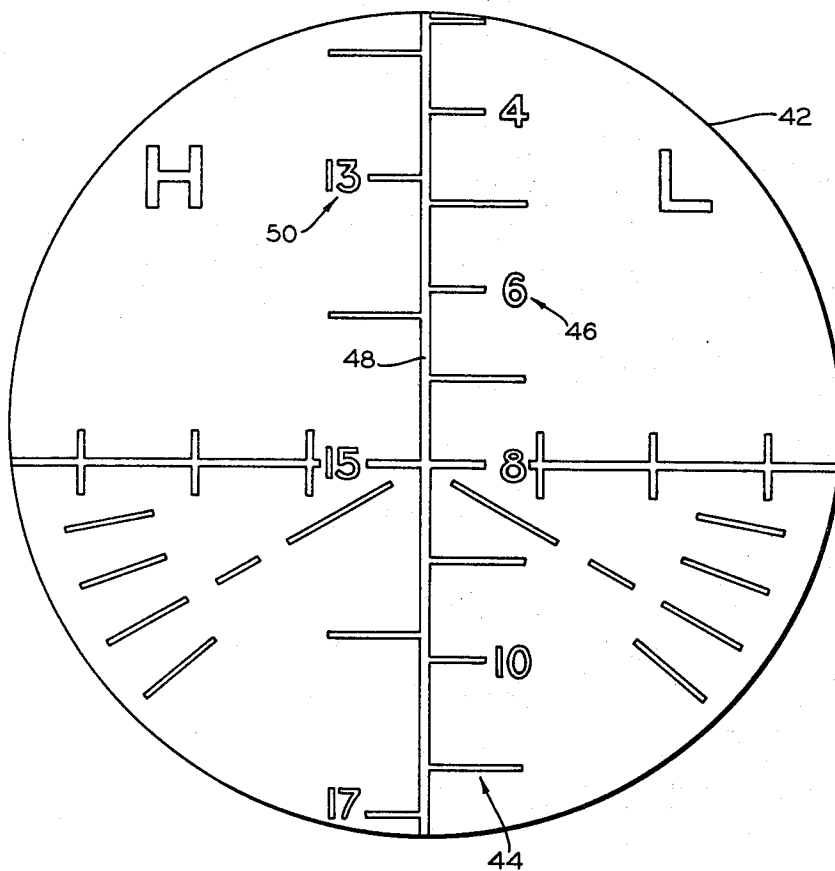
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Fig. 6.



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MULTIPLE-SCALE RETICLE FOR A FIRE CONTROL SYSTEM WITH MEANS FOR ADJUSTING THE SERVOSYSTEM TO A SELECTED ONE OF THE SCALES

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ABSTRACT OF THE DISCLOSURE

This invention provides for the sight of a fire control system with an electric servosystem a reticle divided into two range scales positioned side by side and an indexing device for adjusting the servosystem to the selected one of the two range scales through predetermined displacement of the sight actuated potentiometer relative to the sight.

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment to me of any royalty thereon.

With the M5 helicopter armament subsystem, which includes a turret mounted M75 Grenade Launcher and a sighting station with a hand operative reflex sight connected by an electric servosystem to the turret, the full range of the launcher cannot, practically, be inscribed vertically on the sight reticle in a continuous scale because it would cause the sight to be excessively large. Consequently, only a mean portion of the range scale is provided on the reticle and this means that when the target is closer than the lowest range distance on the reticle or beyond the highest range distance the gunner has to aim without the assistance of a sight.

It is, therefore, the object of this invention to improve the sight in such a fire control system by including on the sight reticle the full range scale of the related gun, which is divided into two sections including a low range scale and a high range scale which are placed side by side, to bring the overall length of the reticle scale within practical limits, and to provide simple selective means for adjusting the servosystem to the two range scales.

Further objects and advantages of the invention will be apparent from the following specification and the accompanying drawings which are for the purpose of illustration only and in which:

FIG. 1 is a fragmentary, elevational view of a helicopter showing schematically the fire control system therein; FIG. 2 is an enlarged view taken along line 2—2 of FIG. 1;

FIG. 3 is a view taken along line 3—3 of FIG. 2 with the indexing device in the "L" position;

FIG. 4 is a view similar to FIG. 3 but showing the indexing device in the "H" position;

FIG. 5 is an enlarged view taken along line 5—5 of FIG. 3;

FIG. 6 is a view of the left end of the hand sight with the cover plate removed;

FIG. 7 is a view taken along line 7—7 of FIG. 2; and FIG. 8 is an enlarged view of the reticle.

Shown in the figures is a helicopter 12 with a fire control system 14 such as the M5 helicopter armament subsystem. Fire control system 14 includes a grenade launcher 18, as the M75, which is mounted in a turret 16 arranged for rotation about both a vertical and a lateral axis, a sight assembly 20 and a servosystem 22 for electrically actuating the turret responsive to displacement of the sight assembly. Servosystem 22 includes a potentiometer

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24 mounted in sight assembly 20 as hereinafter described, a servo amplifier 26 electrically connected to the potentiometer and arranged to receive an electric signal therefrom and transmit it amplified to servo motors (not shown) in turret 16 for rotation thereof about its lateral axis in synchronization with the displacement of the sight assembly for elevational sighting. Servosystem 22 is also adapted for transmitting azimuth displacement of sight assembly 20 to turret 16 but that portion of the servosystem is not part of this invention.

Sight assembly 20 includes a hanger 28 mounted to the ceiling of the pilots station in helicopter 12 for rotation about a vertical axis and a handsight 30 mounted between a pair of depending arms 32 of the hanger for rotation in elevation about a lateral axis. Handsight 30 includes an essentially cylindrical sighting tube 34 having an axial shaft 36 that extends from the left end for journaled support by the corresponding one of the arms 32. A pistol grip 38 is fixed to an extending end of shaft 36 to provide manual means for rotating handsight 30 for elevational sighting. A reticle assembly 40, to be more fully described hereinafter, is mounted to the opposite end of sighting tube 34 and attached to the corresponding one of arms 32 so as to assist in rotational support of handsight 30.

Reticle assembly 40 includes a reticle disc 42 which is opaque with reticle scale 44 transparently formed thereon. Reticle scale 44, as shown in FIG. 8, includes a low range scale 46 formed on the right side of a vertical division line 48 and a high range scale 50, which is a continuation of the low range scale, formed on the left side of the line. Both low range scale 46 and high range scale 50 are calibrated so that the range distances thereon increase reading from top to bottom.

Reticle scale 44 is calibrated in 100 meter units to simplify the markings on disc 42. Low range scale 46 is calibrated from 3 to 11 and high range scale 50 is a continuation thereof, reading up to 17. Low range scale 46 is readily identified by the letter "L" transparently formed in the upper part of reticle disc 42 on the corresponding side of division line 48 and high range scale 50 is similarly identified by the letter "H" on the opposite side of the line.

Tube 34 is provided with diametrically opposed openings 52 along the length thereof to provide clear vision of the target area through the tube by the gunner. Reticle assembly 40 includes a housing 54 which is fixed to the left one of the arms 32. An electric light 56 is located in housing 54 for illuminating disc 42 so as to form an image from the transparent markings thereon, which image is projected to and reflected by a concave mirror 58 mounted in the right end of tube 34. The reflected collimated image is displayed on a transparent reflector 60 mounted in tube 34, as shown in FIG. 2, at 45° to the gunner's line of sight.

Reticle assembly 40 also includes a hub 62 which is fixedly mounted within the left end of tube 34, an indexing device 64 having a sleeve 66 which is journaled in a mating hole axially formed in the hub and a collar 68 mounted on the inner end of the sleeve, and a mount 70 for reticle disc 42. Mount 70 has a tubular portion 72, which is received by sleeve 66 and which holds reticle disc 42, and a coaxial cylindrical flange 74. Flange 74 is recessed on the inside to receive collar 68 and is fixed against displacement to tube 34 as by screw means 76.

A bearing 78 is mounted between hub 62 and housing 54 to facilitate rotation of tube 34 in elevation. Limited rotation of indexing device 64 relative to hub 62 is provided through the cooperation of a pin 80 extending from the hub with a rectangular recess 82 in the periphery of collar 68. Manual actuation of indexing device 64 between the limits of its displacement is provided by a knob 84 which is fixed to collar 68 and which extends outwardly

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through a clearance 86 in flange 74. Indexing device 64 is releasably held at the extreme limits of its displacement by detent means as shown at 88.

Formed around the outside end of sleeve 66, so as to be located outside of hub 62, are gear teeth 90 which engage a gear 92 mounted on shaft 94 of the rotating control element of potentiometer 24 which is fixedly mounted within housing 54, so that rotation of indexing device 64 changes the signal produced by the potentiometer.

Thus, with indexing device 64 resiliently held to hub 62 by detent means 88, rotation of handsight 30 in elevation will cause gear teeth 90 to rotate gear 92 to vary the signal produced by potentiometer 24 and this signal in amplified form is transferred to turret 16 which is rotated thereby through a cooperating servomotor (not shown) to synchronize launcher 18 with the handsight. The predetermined amount of displacement of indexing device 64 relative to hub 62 and reticle disc 42 fixed thereon adjusts potentiometer 24 so that the signal produced thereby at the low range scale 46 is the same as that produced at the beginning of high range scale 50.

The position to which indexing device 64 is adjusted is readily identified by a segmental plate 96 mounted on the end of sleeve 66 to partially cover the top of reticle disc 42. The letter "L" is formed in plate 96 by perforation and is located so as to coincide with the letter "L" on reticle disc 42 only when indexing device 64 correctly adjusts potentiometer 24 according to low range scale 46. The letter "H" is similarly formed in plate 96. Thus, when indexing device 64 is positioned for use of low range scale 46, the letter "L" is projected onto reflector 60 as light from electric light 56 passes through this letter in reticle disc 42 and the aligned perforation in plate 96. The letter "H" is not projected because this letter in reticle disc 42 is blocked by the unperforated portion of plate 96. Similarly, when indexing unit 64 is positioned for use of high range scale 50 the letter "H" is projected onto reflector 60 and "L" is not visible thereon.

Thus, when the distance of the target from helicopter 12 is within the limits of low range scale 46, knob 84 is actuated to displace indexing unit to where the letter "L" is reflected as an image on reflector 60. Rotation of handsight 30 in elevation by pistol grip 38, to apply low range scale 46 to the target, sends an electrical signal through servo system 22 to rotate turret 16 so as to elevate the aim of launcher 18 for the determined range of the target.

When the target is beyond the range limits of low range scale 46, knob 84 is actuated to the opposite limit of displacement whereby indexing device rotates potentiometer 24 so as to adjust servo system 22 to the high range scale. When indexing unit 64 is properly positioned, the letter "H" is projected onto reflector 60.

It is obvious that, if more convenient, the total range of a gun may be divided into more than two scales and the indexing device arranged to synchronize the elevation of the gun to the selected one of the several scales.

Although a particular embodiment of the invention has been described in detail herein, it is evident that many variations may be devised within the spirit and scope thereof and the following claims are intended to include such variations.

I claim:

1. In a fire control system including a gun mounted

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in a turret arranged to rotate about a lateral axis for elevational displacement of the gun, a handsight rotatably supported for elevational sighting, an electric servosystem including a rotatably adjusted potentiometer for rotating the turret in elevation responsive to adjustment of the potentiometer, and gear means for transmitting rotation of the handsight to the potentiometer for adjusting the potentiometer according to the elevational position of the handsight, a reticle assembly for the handsight including a reticle disc mounted for displacement therewith, a reticle scale corresponding to the full range capabilities of the gun inscribed on said reticle disc and calibrated into units of range distances, a low range scale and a high range scale dividing said reticle scale and arranged side by side, and an indexing device for adjusting the potentiometer to relate the elevational displacement of the turret to the limits of the range distances of a selected one of said low and high range scales.

2. The invention as defined in claim 1 wherein said indexing device is arranged for rotational displacement relative to said reticle disc between a first position in which the potentiometer is adjusted to said low range scale and a second position in which the potentiometer is adjusted to said high range scale, wherein said gear means include a gear mounted on the potentiometer and gear teeth formed on said indexing device for engagement with said gear, and including detent means for releasably holding said indexing device in said first position or said second position whereby the potentiometer is rotated by the handsight when said indexing device is located in either said first or second positions and by said indexing device relative to said reticle disc when displaced between said first and second positions.

3. The invention as defined in claim 1 and including cooperating means on said reticle disc and in said indexing device to indicate the one of said low and high range scales to which said indexing device is adjusted.

4. The invention as defined in claim 3 wherein said handsight is of reflex type and said reticle disc is opaque with said reticle scale transparently formed thereon so that a source of light forms an image thereof receivably by a reflector, and wherein said cooperating means include a symbol respective to each of the selective positions of said indexing device transparently formed on said reticle disc and similar symbols formed by perforation in a plate mounted in said indexing device to partially cover said reticle disc, each of said symbols in said plate being arranged to be in optical alignment with the corresponding one of said symbols on said reticle disc only when said indexing device is adjusted to the related one of the two selective positions, whereby the image received by the reflector shows the symbol of the one of the two selective positions to which said indexing device is adjusted.

References Cited

UNITED STATES PATENTS

2,413,114 12/1946 Pontius et al. ----- 89-41 X

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