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6. AUTHOR(S) James B. Sheehy Kenneth W. Gish John J. Sprenger William H. Finkbeiner, Jr.		5d. PROJECT NUMBER		
		5e. TASK NUMBER		
		5f. WORK UNIT NUMBER		
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9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Naval Air Systems Command 47123 Buse Road Unit IPT Patuxent River, Maryland 20670-1547		10. SPONSOR/MONITOR'S ACRONYM(S)		
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14. ABSTRACT A variable focus adapter is disclosed that comprises the combination of a lens and an aperture provided by a plate all lodged in a housing that is placed so that the lens is in proximity with each objective lens of a binocular arrangement to change the focal range from greater than 20 ft. to seven (7) ft. with a depth of field spanning from 5 to 15 ft.				
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[45] Date of Patent: Apr. 1, 1997

[54] VARIABLE FOCUS ADAPTER

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4,116,529	9/1978	Yamaguchi	359/894
4,249,799	2/1981	Iglesias	359/818
4,251,127	2/1981	Yamaguchi	359/894
5,221,992	6/1993	Park	359/894
5,289,320	2/1994	Kobayashi	359/823
5,361,162	11/1994	Goebel	359/418

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[22] Filed: Jul. 11, 1995

[51] Int. Cl.⁶ G02B 7/02

[52] U.S. Cl. 359/818; 359/823; 359/827;
359/894; 359/418; 359/403; 359/425; 359/428

[58] Field of Search 359/818, 823,
359/827, 894, 403, 404, 405, 406, 418,
419, 425, 426, 427, 428, 429

[57] ABSTRACT

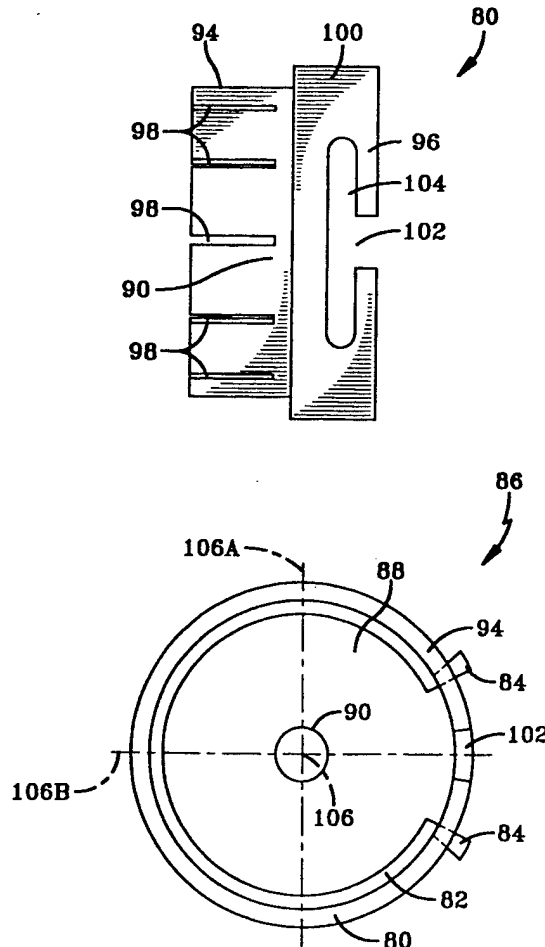
A variable focus adapter is disclosed that comprises the combination of a lens and an aperture provided by a plate all lodged in a housing that is placed so that the lens is in proximity with each objective lens of a binocular arrangement to change the focal range from greater than 20 ft. to seven (7) ft. with a depth of field spanning from 5 to 15 ft.

[56] References Cited

U.S. PATENT DOCUMENTS

3,782,822 1/1974 Spence 359/428

17 Claims, 4 Drawing Sheets



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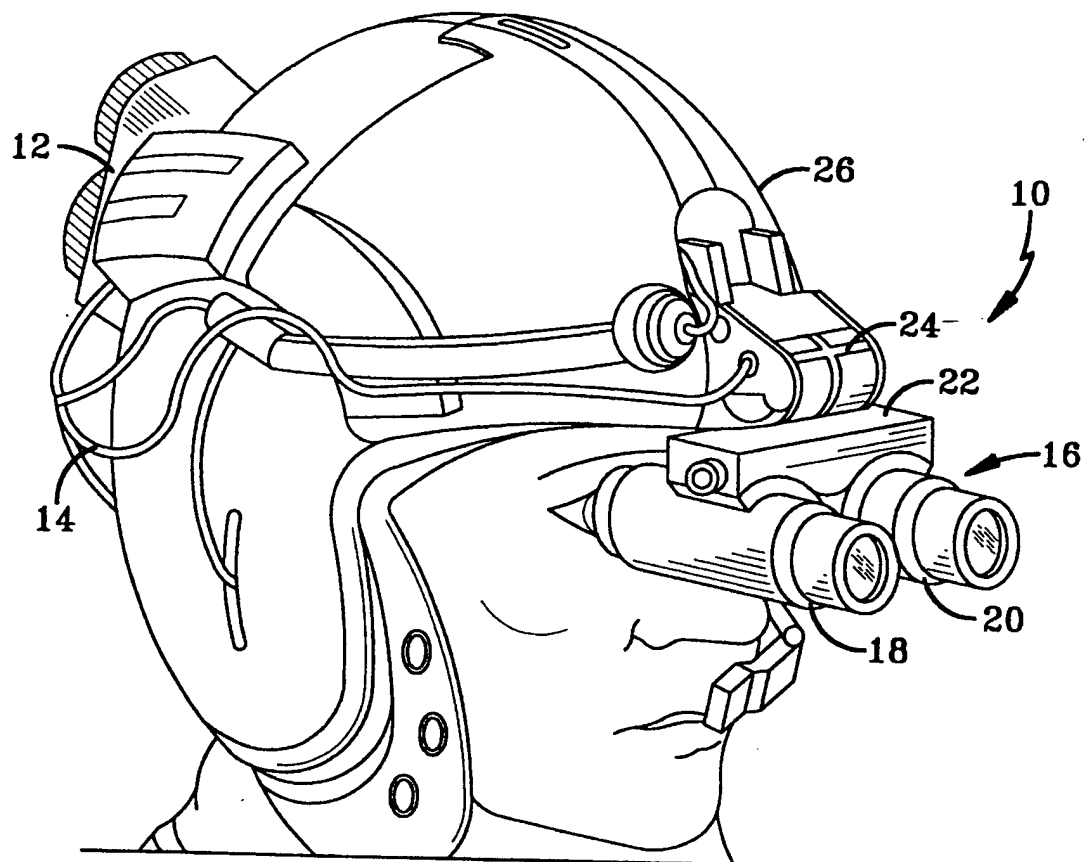


FIG-1
PRIOR ART

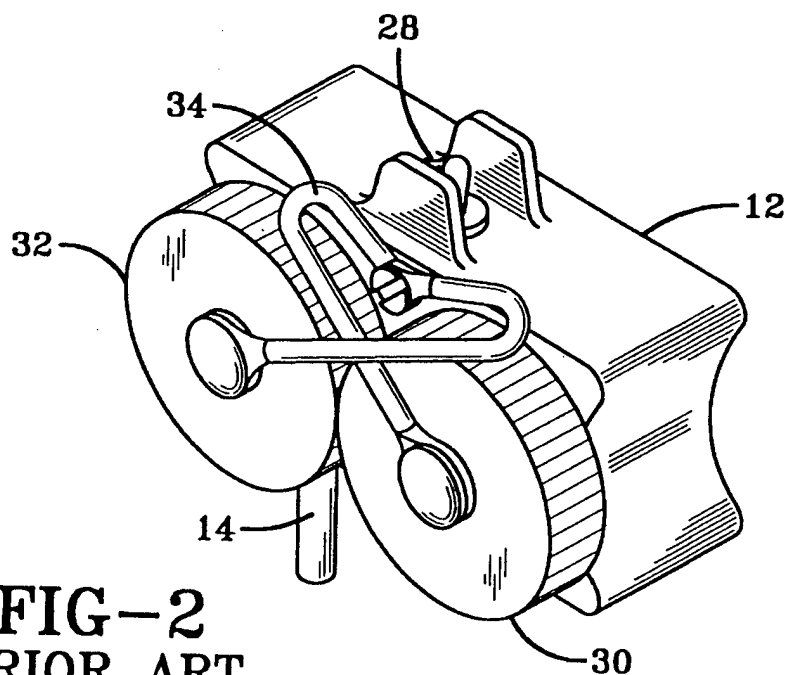


FIG-2
PRIOR ART

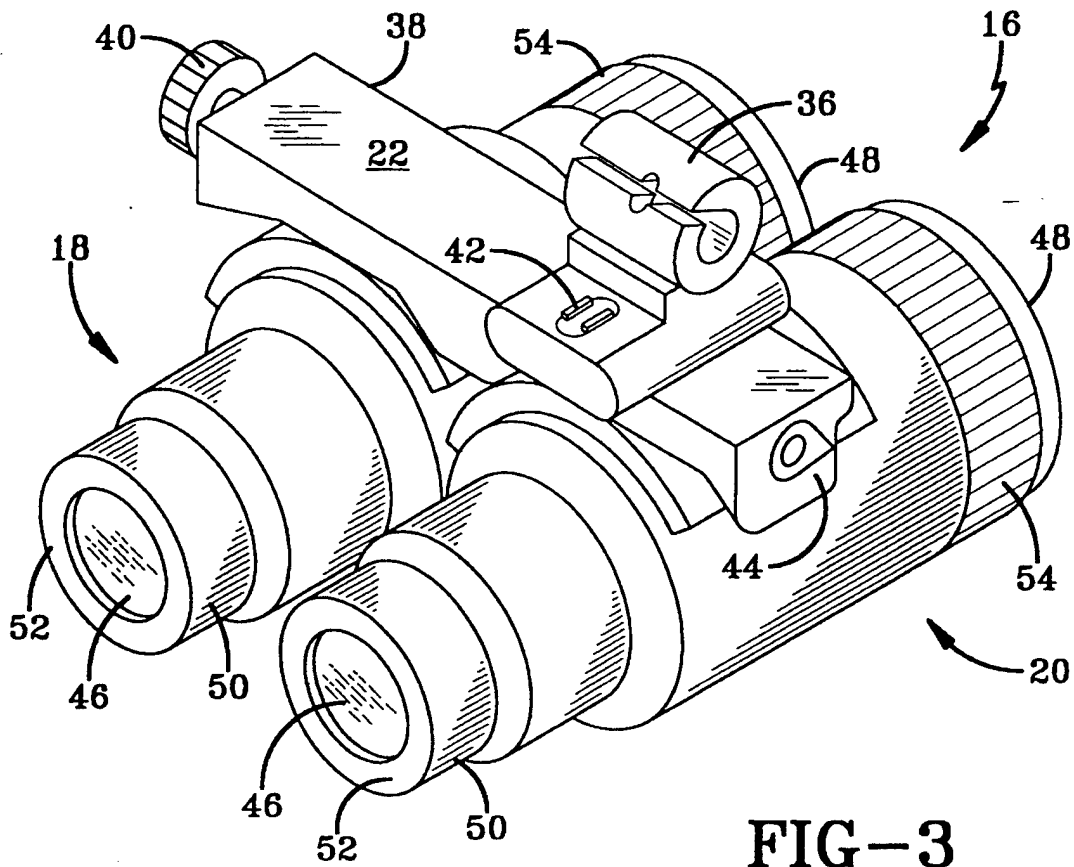


FIG-3
PRIOR ART

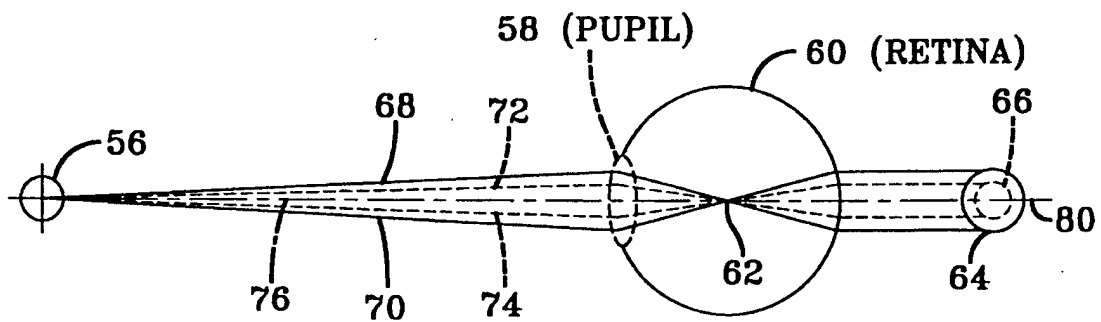


FIG-4

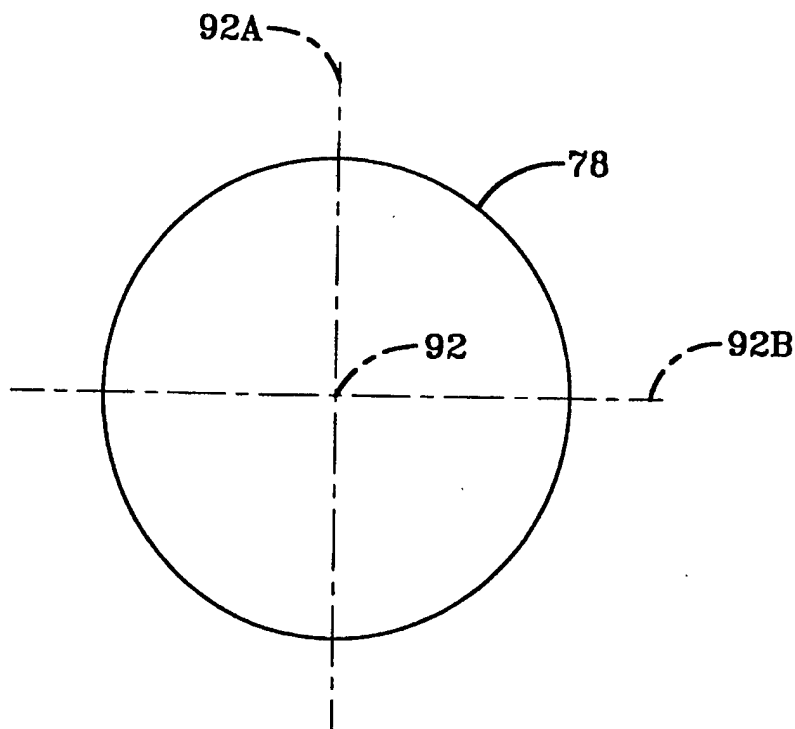


FIG-5A

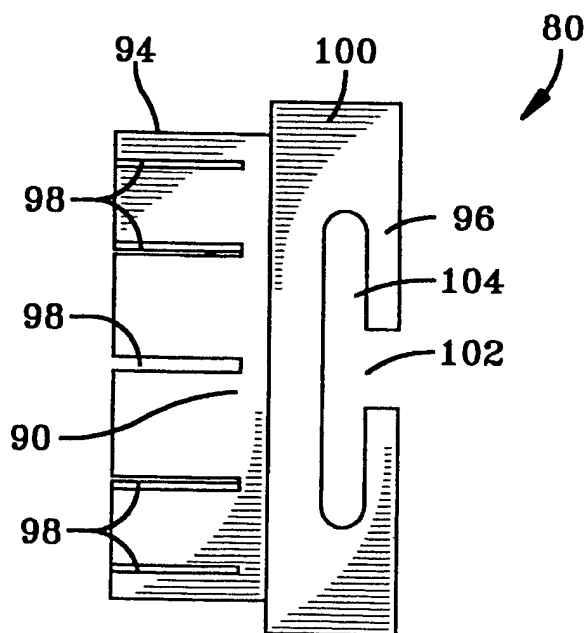


FIG-5B

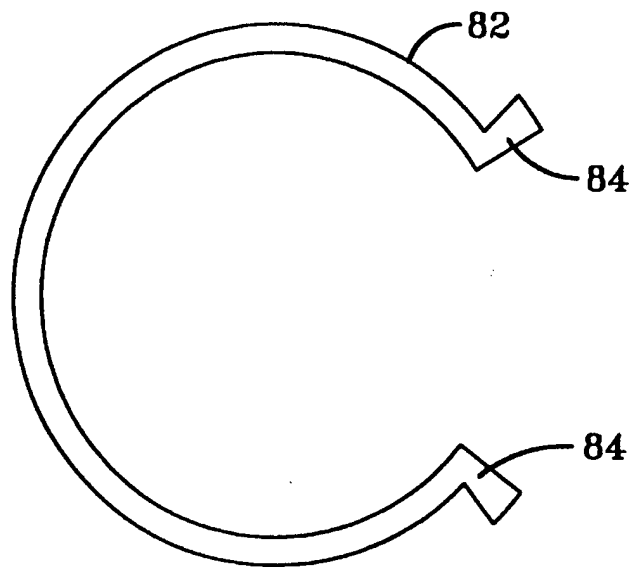


FIG-5C

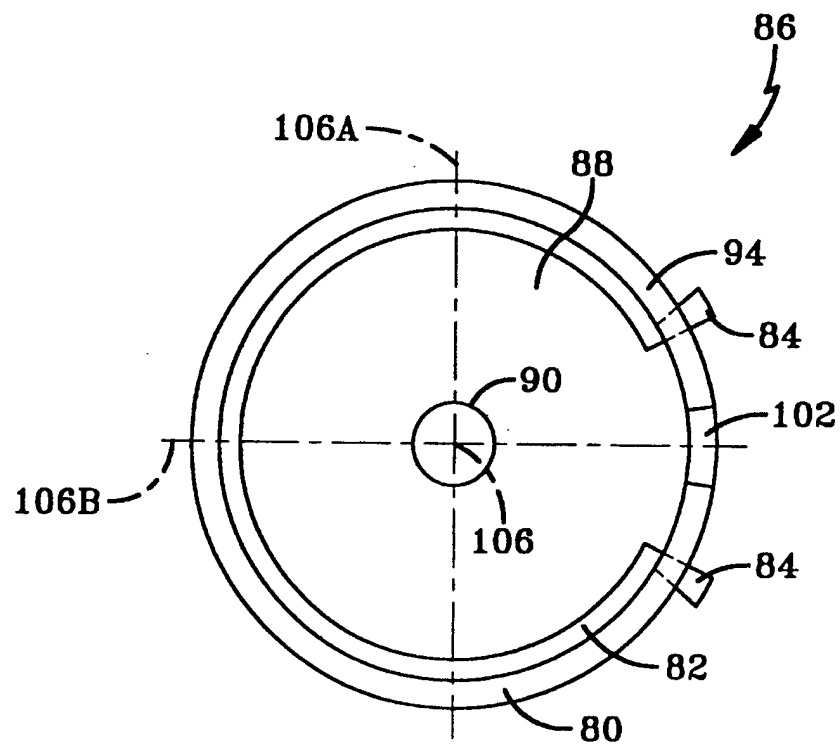


FIG-5D

88 having an aperture 90 all lodged in a housing 80 that is placed in close proximity to the objective lens of an optical instrument, such as a NVG 10, to quickly change the existing focal range to a desired focal range.

Further, it should be appreciated that the practice of the present invention provides a split-retainer ring 82 that is easily insertable and removable from the housing 80 so that the adapter lens 78 may be easily cleaned or replaced, thereby, facilitating maintenance of the optical instrument 10.

Although the description of the variable focus adapter herein is directed to night vision goggles, the basic principles of the invention are applicable to any fixed focus optical instrument whose focal range must be easily and quickly changed to a predetermined focal range that is suited to a particular application.

Many modifications or variations of the present invention are possible in view of the above disclosure. It is, therefore, to be understood, that within the scope of the appended claims, the invention may be practiced otherwise as specifically described.

What we claim is:

1. An adapter for varying the focus and depth of field of an optical instrument having at least one objective lens having forward and aft ends with the forward end facing an object to be focused by said optical instrument, said adapter comprising:

- (a) an adapter lens having a predetermined optical power and an optical axis;
- (b) a plate having a centrally located aperture with a predetermined diameter and an optical axis; and
- (c) a housing having provisions for holding said plate and said adapter lens at said forward end of said at least one objective lens so that said optical axis of said lens is coaxial and in correspondence with said optical axis of said aperture, said housing having means so that said adapter lens and said aperture are placed in close proximity with said objective lens of said optical instrument.

2. The adapter according to claim 1 further comprising a split-retainer ring having an ear at each end and said housing further having means to accept said ears so that said adapter lens is fixed in position in said housing.

3. The adapter according to claim 2, wherein said housing is cylindrical and has a first portion forming a wall having a plurality of slots circumferentially and equally spaced apart from each other allowing flexibility to facilitate placing said housing so that said adapter lens and said aperture are in close proximity with said objective lens, and a second portion having said means to accept said ears, said first portion comprising said means so that said adapter lens and said aperture are placed in close proximity with said objective lens.

4. The adapter according to claim 1, wherein said plate is integral with said housing.

5. An adapter for varying the focus and depth of field of an optical instrument having at least one objective lens having forward and aft ends with the forward end facing an object to be focused by said optical instrument, said adapter comprising:

- (a) an adapter lens having a predetermined optical power and an optical axis;
- (b) a plate having a centrally located aperture with a predetermined diameter and an optical axis; and
- (c) a housing having provisions for holding said plate and said adapter lens at said forward end of said at least one

objective lens so that said optical axis of said lens is coaxial and in correspondence with said optical axis of said aperture, said housing having means so that said adapter lens and said aperture are placed in close proximity with said objective lens of said optical instrument

wherein said adapter lens is a +0.25 lens and said aperture has a diameter in the range from 5 mm to 7 mm so that focus of said optical instrument is alterable from an optical infinity exceeding 20 feet to be within a range of seven (7) feet with a depth of field spanning from 5 to 15 feet when said adapter lens and said aperture are placed in close proximity to said objective lens.

6. An adapter for varying the focus and depth of field of an optical instrument having at least one objective lens having forward and aft ends with the forward end facing an object to be focused by said optical instrument, said adapter comprising:

- (a) an adapter lens having a predetermined optical power and an optical axis;
- (b) a plate having a centrally located aperture with a predetermined diameter and an optical axis; and
- (c) a housing having provisions for holding said plate and said adapter lens at said forward end of said at least one objective lens so that said optical axis of said lens is coaxial and in correspondence with said optical axis of said aperture, said housing having means so that said adapter lens and said aperture are placed in close proximity with said objective lens of said optical instrument

wherein said housing has an optical axis and wherein said provisions include means for holding said plate and said lens so that said optical axis of said adapter lens is coaxial and in correspondence with the optical axis of each of said aperture and said housing.

7. An optical instrument having at least one objective lens having forward and aft ends with the front end facing an object to be focused by said optical instrument, said at least one objective lens being confined in an enclosure having an entrance portion, said optical instrument comprising:

- (a) an adapter lens having a predetermined optical power and an optical axis;
- (b) a plate having a centrally located aperture with a predetermined diameter and an optical axis; and
- (c) a housing having provisions for holding said plate and said adapter lens at said forward end of said at least one objective lens so that said optical axis of said lens is coaxial and in correspondence with said optical axis of said aperture, said housing having means so that said adapter lens and said aperture are placed in close proximity with said objective lens.

8. The optical instrument according to claim 7, wherein said adapter lens has an optical power of +0.25 and said aperture has a diameter in the range from 5 mm to 7 mm so that focus of said optical instrument is alterable from an optical infinity exceeding twenty (20) feet to be within a range of seven (7) feet with a depth of field spanning from 5 to 15 feet when said adapter lens and said aperture are placed in close proximity to said objective lens.

9. The optical instrument according to claim 7 further comprising a split-retainer ring having an ear at each opposite end and said housing further having means to accept said ears so that said adapter lens is fixed in position in said housing.

10. The optical instrument according to claim 9, wherein said housing is cylindrical and has a first portion forming a

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wall having a plurality of slots circumferentially and equally spaced apart from each other allowing flexibility to facilitate placing said housing so that said adapter lens and said aperture are in close proximity with said objective lens, and a second portion having said means to accept said ears.

11. The adapter according to claim 7, wherein said plate is integral with said housing.

12. An optical instrument having two monocular assemblies arranged side-by-side to form a pair of binoculars sensitive to the infrared spectrum so as to provide night vision for the user of said binoculars, each of said monocular assemblies having an objective lens having forward and aft ends with the front end facing an object to be focused by said optical instrument, said at least one objective lens being confined in an enclosure having an entrance portion, said pair of night-vision binoculars comprising:

- (a) an adapter lens having a predetermined optical power and an optical axis;
- (b) a plate having a centrally located aperture with a predetermined diameter and an optical axis; and
- (c) a housing having provisions for holding said plate and said adapter lens at said forward end of said at least one objective lens so that said optical axis of said lens is coaxial and in correspondence with said optical axis of said aperture, said housing having means for engaging said entrance portion so that said adapter lens and said aperture are in close proximity with said objective lens.

13. The optical instrument according to claim 12, wherein said adapter lens has an optical power of +0.25 and said aperture has a diameter in the range from 5 mm to 7 mm so that focus of said optical instrument is alterable from an optical infinity exceeding twenty (20) feet to be within a range of seven (7) feet with a depth of field spanning from 5 to 15 feet when said adapter lens and said aperture are placed in close proximity to said objective lens.

14. The optical instrument according to claim 12 further comprising a split-retainer ring having an ear at each opposite end and said housing further having means to accept said ears so that said adapter lens is fixed in position in said housing.

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15. The optical instrument according to claim 12, wherein said plate is integral with said housing.

16. The optical instrument according to claim 12, wherein said housing has an optical axis and wherein said provisions include means for holding said plate and said adapter lens so that said optical axis of said adapter lens is coaxial and in correspondence with the optical axis of each of said aperture and said housing.

17. An adapter for varying the focus and depth of field of an optical instrument having at least one objective lens having forward and aft ends with the forward end facing an object to be focused by said optical instrument, said adapter comprising:

- (a) an adapter lens having a predetermined optical power and an optical axis;
- (b) a plate having a centrally located aperture with a predetermined diameter and an optical axis; and
- (c) a housing having provisions for holding said plate and said adapter lens at said forward end of said at least one objective lens so that said optical axis of said lens is coaxial and in correspondence with said optical axis of said aperture, said housing having means so that said adapter lens and said aperture are placed in close proximity with said objective lens of said optical instrument;

wherein said adapter lens is a +0.25 lens and said aperture has a diameter in the range from 5 mm to 7 mm so that focus of said optical instrument is alterable from an optical infinity exceeding 20 feet to be within a range of seven (7) feet with a depth of field spanning from 5 to 15 feet when said adapter lens and said aperture are placed in close proximity to said objective lens; and

wherein said housing has an optical axis and wherein said provisions include means for holding said plate and said lens so that said optical axis of said adapter lens is coaxial and in correspondence with the optical axis of each of said aperture and said housing.

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