This invention relates in general to bi-optical loupes, and in particular to a bi-optical loup which may be readily adapted to the user and by the user to different magnifications.

An object of this invention is to provide a superior bi-optical loup which may be worn with less eye strain for longer periods of time.

Another object of this invention is to provide a bi-optical loup which may be more easily and smoothly adjusted to accommodate a particular wearer using the loup under varying conditions as for different angles of convergence at different focal lengths.

Yet another object of this invention is to provide a bi-optical loup which may be adjusted to converge to the varying distances between the pupils of the eyes of different users and which also may be adjusted for convergence as an object is viewed under different magnifications with the resulting different distances from the eyes of the object viewed.

A further object of this invention is to provide a pupilary distance and convergence adjustment for a bi-optical loup that may be simultaneously manipulated by means of a single adjusting element.

A still further object of this invention is to provide a bi-optical loup wherein a single locking element may be manipulated to lock a pupilary distance and a convergence adjustment.

Additional objects, advantages, and features of invention reside in the construction, combination, and arrangement of parts involved in the embodiment of the invention and its practice otherwise as will be understood from the following description and accompanying drawings wherein:

FIG. 1 is a plan view of a bi-optical loup embodying my invention;

FIG. 2 is a front elevation of the same;

FIG. 3 is a section taken on line 3—3 in FIG. 1;

FIG. 4 is an enlarged section taken on line 4—4 in FIG. 2;

FIG. 5 is a section taken on line 5—5 in FIG. 1;

FIG. 6 is a front view of the ring element removed from the adjusting assembly of the bi-optical loup with the pivotally attached operating rods partly broken away; and

FIG. 7 is a section taken on line 7—7 in FIG. 1 with the center portion of the bi-optical loup broken away.

Referring to the drawings in detail, FIG. 1 shows the eye loupe eye pieces 10 which are the upper and lower inclined sections 14. Each eye loupe 10 may be focused by sliding the barrel portion 14 in or out about the eye piece 12 in any conventional manner. Each eye loupe 10 is secured to one of the slidable mounted members 16 and 17 by means of one of the rotatably mounted vertical support members 18. The slidable mounted members 16 and 17 are secured to the frame member 20 by means of the slides 22. The temple pieces 24 are fixed by means of the small hinges 26 to the laterally adjustable members 28 which are held in the ways 30 by means of the locking screws 32. Secured to the center portion of the frame member 20 by means of the nose pad support wires 36 are the nose pads 34.

FIG. 2 shows the offsets 13 and 15 in the slidable mounted members 16 and 17. The horizontal extensions of these offsets 13 and 15 terminate in the sections of rack gear 21 and 23 which engage the spur gear 38 as shown in FIG. 7. If the spur gear 38 is rotated in a clockwise direction, it will move both sections of rack gear 21 and 23 outward which will move the attached slidable mounted members 16 and 17 outwards to move the eye loupes 10 further apart. In a like manner, if the spur gear 38 is rotated in a counter-clockwise direction, it will move the eye loupes 10 closer together.

It is also obvious that other mechanical modifications of the motion of spur gear 38 and racks 21 and 23 may be employed. For example, the spur gear 38 could be a bevel gear engaging a pair of bevel gears mounted on shafts positioned in bearings in the slides 22 and having threaded portions engaged by the support members 18. The threads on such shafts would both be of the same hand since they would be oppositely rotating for any single direction of rotation of the bevel gear replacing the spur gear 38. With such a structure the supports 18 would then be moved toward and away from each other as in the structure herein shown.

The details of the adjusting mechanism mounted in the center of the frame member 20 are shown in FIG. 4. Attached to and extending forward from the frame member 20 is the shaft 40. Rotatably disposed about the shaft 40 is the cylindrical hub 42 which has the spur gear 38 formed as an integral part of it. The cylindrical hub 42 contains the longitudinal keyway 43 and is retained on the shaft 40 by means of the nut 41. Disposed about the cylindrical hub 42 is the flanged collar 44 which has the annular flange 46 integrally formed at one end thereof and an aperture disposed in its body portion to receive the pin 45 which extends into the longitudinal keyway 43 in the cylindrical hub 42. The ring 48 is disposed about the flanged collar 44 adjacent to the flange 46. Also disposed about the flanged collar 44 is the knurled locking element 50 which has an internal threaded portion 59 cooperatively engaged with an external threaded portion 57 formed on the outer surface of the flanged collar 44. An extension 47 of this locking element 50 extends towards the flange 46 and the ring element 48 to pass over the pin 45 to secure it within the aperture in the body portion of the flanged element 44. The end of the flanged collar 44 opposite the flange 46 has the knurled adjusting knob 52 secured about it by means of the set screw 49.

Referring to FIGS. 1, 2 and 6, the ring 48 has the operating rods 54 pivoted secured to it by means of the lugs 9 which extend in pairs on either side of the ring 48. The ends of the operating rods 54 are slidably disposed within the operating tubes 51 which, in turn, are rigidly fixed to the rotatably mounted vertical support members 18. The collar 44 may rotate within the ring 48, but the ring 48 is secured against longitudinal movement with respect to collar 44 by the flange 46 and the end of extension 47. It is obvious that this flange 46 could be omitted and the ring 48 retained in an annular groove in collar 44 or by a snap ring.

Operation

Referring to FIG. 4, the adjusting knob 52 may be rotated clockwise or counter-clockwise by the fingers of the user. Rotation of the adjusting knob 52 turns flanged element 44 on which it is mounted and thus cylindrical hub 42 by means of key pin 45 extending into the longitudinal keyway 43. This rotation turns spur gear 38 to move eye loupes 10 together or apart.

As the adjusting element 52 is turned, it may be pulled out or pushed in so that the flanged collar 44 slides longitudinally along the cylindrical hub 42 while the pin 45 moves along the longitudinal keyway 43. As the flanged element 44 is moved in or out, it moves the ring element 48 in or out with it. As can be seen in FIG. 1, while the ring element moves out away from the frame member...
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3. the operating rods 54 withdraw slightly from the operating tubes 51 but urge their inwardly disposed ends away from the frame member 20. The operating tubes 51 thus pivot the vertical support members 18 and the eye loupes 10 outward. In a like manner, as the adjusting member 52 is moved inwardly, the eye loupe 10 will pivot inwards for further convergence. In a modification (not shown), the operating rod 54 may be pivotally attached to the tube 10 at its other end in the manner illustrated for the attachment of its one end to ring 48 (FIG. 6).

When it is desired to lock the adjusted bi-optical loupe, the locking element 50, as shown in FIG. 4, is turned towards the base 45 on the flanged cylinder 44 about the cooperating threaded portions 37 and 39. The extension 47 of the locking element 50 then clamps the ring 48 between itself and the flange 46. As shown in FIG. 6, the ring 48 has the operating rods 54 pivotally secured between the lugs 9 so that the operating rods 54 prevent any rotation of the ring 48. Therefore, as the ring 48 is clamped to the flanged collar 44, it prevents any rotation of the flanged collar 44 and thereby prevents the spur gear 38 from turning, thus locking the eye loupes 10 in a fixed position.

Referring now to FIG. 5, as the extension 47 of the locking element 50 is turned to clamp the ring element 48, that portion of the extension 47 that is cut in the cam surface 53 to force the pin 45 inward against the bottom of the longitudinal keyway 43. Thus the pin 45 locks the flanged element 44 so that it cannot slide longitudinally in relation to the cylindrical hub 42. The extension 47 contains the dwell portion 56 as an extension of the cam surface 53 so that, after the pin 45 is forced downward into a locking position, the dwell portion will continue to hold the pin downward in the locking position if the extension 47 must be turned further to clamp the ring element 48 as has been described. To assure the locking action of the pin 45, the bottom of the longitudinal slot 43 may have positioned in it a thin strip of rubber or other resilient material (not shown). Therefore, it can be seen from the foregoing description that a slight angular turn of the locking element 50 locks the convergence and the pupillary distance adjustment of the bi-optical loupe. It should be noted that the profile of the cam might be longitudinal to extension 47 rather than circumferential as shown since extension 47 moves along both sectors of motion when element 50 is rotated.

In using the device, the bi-optical loupe is adjusted to rest before the eyes of a user with the nose pads 34 engaging the bridge of a user’s nose. The lens-glassing piece 37 may be adjusted to comfortably span the head of the wearer by loosening the locking screws 32 so that the laterally adjustable members 28 may be moved inwardly or outwardly in the ways 30. FIG. 3 shows how the slot 31 extends along the laterally adjustable member 28 so that it can be secured in position by tightening the locking screw 32.

If an object is then to be viewed under high magnification, the barrel portion 14 is slid outward about the eye piece 12 to focus each eye loupe 10 and move its focal point closer. Since each eye loupe 10 should encompass the same visual area, the eye loupes 10 would have to be adjusted to converge accordingly. If a wider field of vision is desired under less magnification, the barrel portion 14 may be slid inwards about the eye piece 12 to move the focal point outward. In this case the eye loupes 10 would be adjusted to converge less. If it is considered desirable, the eye pieces 12 may be fitted with suitable prisms to lessen convergence of the eyes of the user. Such prisms are well known and deflect the line of sight from each eye loupe 10.

While I have disclosed my invention with particularity in the best forms known to me, it will nevertheless be understood that these are purely exemplary and that modifications in the construction, arrangement, and combination of parts, substitution of materials and substitution of equivalents mechanically and otherwise, may be made without departing from the spirit of the invention, except as it may be more particularly limited in the appended claims wherein I claim:

1. A bi-optical loupe frame for the support of two eye loupes comprising, in combination, a horizontally disposed frame member adapted to span the eyes, supporting means to secure said frame member to the head, mounting means slideable along said frame and pivotally supporting said eye loupes, a shaft extending from and attached to said frame member, adjusting means rotatably and slidably secured to said loupe and said adjusting means used to move said loupe and said slideable mounting means to vary the distance between said eye loupes, two telescoping links extending outward from said adjusting means to be fixed to said eye loupes so that said telescoping links will pivot said eye loupes to vary their convergence during said sliding movement of said adjusting means along said shaft.

2. The combination according to claim 1 further characterized by locking means on said adjusting means to arrest the motion thereof upon said shaft to secure said eye loupes in an adjusted position.

3. A bi-optical loupe frame for the support of two eye loupes comprising, in combination, a horizontally disposed frame member adapted to rest on the nose and span the eyes, means to secure said frame member to the head, a pair of mounting means slidably secured along said frame member, said eye loupes being pivotally mounted each on one of said pair of mounting means, a shaft extending forward from and attached to the central portion of said frame member, a cylindrical element rotatably disposed about said shaft and engaging said mounting means to impart sliding movement along said frame member upon rotation of said cylindrical element, a collar slidably mounted on said cylindrical element, means to prevent the rotation of said collar about said cylindrical element, means for manually rotating said collar and said cylindrical element thereon about said shaft to slide said mounting means along said frame member to vary the distance between said eye loupes, a ring member rotatable on and longitudinally secured to said collar, and a telescoping link pivotally connected to said ring member and fixed to each of said eye loupes so that said collar may be rotated to turn said cylindrical element to vary the distance between said eye loupes and said collar slid relative to said cylindrical element to move said eye-loupe temple pieces and said telescoping links and thereby said eye loupes to vary their convergence.

4. The combination according to claim 3 wherein said means to prevent the rotation of said collar comprises a key on said collar and extending into a keyway formed in said cylindrical element.

5. The combination according to claim 3 wherein said collar is provided with a flange to engage said member rotatably mounted thereon to limit longitudinal movement of said member along said collar.

6. A bi-optical loupe frame for the support of two eye loupes comprising, in combination, a horizontally disposed frame member adapted to be secured to the head and to span the eyes, slide means slidably and pivotally supporting said eye loupes on said frame member, a shaft extending forward from and attached to the central portion of said frame member, a cylindrical element rotatably disposed about said shaft, a flanged element having a flange disposed on said cylindrical element and adapted to be secured to the head and said flanged element being pivotally mounted about said cylindrical element, a pin disposed through an aperture in said flanged element and extending into a longitudinal slot formed in said cylindrical element to prevent said flanged element from rotating about said cylindrical element, an adjusting element fixed on the outwardly disposed end of said flanged element to be manipulated by the fingers to cause the
rotation of said cylindrical element about said shaft, said cylindrical element being interconnected to said slide means upon rotation to the distance therebetween, a ring member disposed about said flanged element adjacent to the flange, a locking nut screwed about a thread portion of said flanged element and having a cam portion to jammingly engage both said pin and said ring member upon rotation of said locking member about said flanged element, and two telescoping links pivotally connected to said ring member and fixed to said eye loupes so that said adjusting element may be rotated to turn said flanged element and said cylindrical element to vary the distance between said eye loupes as said adjusting element and said flanged element are said relative to said cylindrical element to move said ring member to pivot said telescoping links and thereby said eye loupes to vary their convergence until said locking nut is screwed into jamming engagement with said ring member and said pin to prevent said flanged member and thereby said cylindrical member from turning at the same time as the cam surface in said locking member forces said pin into the longitudinal slot in said cylindrical member to prevent said flanged member from sliding relative to said cylindrical member.

7. The combination according to claim 6 wherein said means to vary the distance between slide means comprises a spur gear mounted on said cylindrical element and two sections of rack gear to engage the top and bottom of said spur gear and attached, respectively, to each of said slide means so that the rotation of said cylindrical member causes said spur gear to move said sections of rack gear to vary the distance between said slide means supporting said eye loupes.

8. A bi-optical loupe frame for the support of two eye loupes comprising, in combination, a horizontally disposed frame member adapted to span the eyes, supporting means to secure said frame member to the head, mounting means slidable along said frame and pivoting supporting said eye loupes, adjusting means rotatably and slidably mounted to said frame member and coupled to said slidable means so that said adjusting means may be rotated to move said loupes and said slidable mounting means to vary the distance between said eye loupes, two telescoping links extending outward from said adjusting means to be fixed to said eye loupes so that said telescoping links will pivot said eye loupes to vary their convergence during the sliding movement of said adjusting means.

9. A bi-optical loupe frame for the support of two eye loupes comprising, in combination, a horizontally disposed frame member adapted to span the eyes, supporting means to secure said frame member to the head, mounting means slidable along said frame and pivoting supporting said eye loupes, an elongated member mounted to extend from said frame member and rotatable about its own axis, a device axially movable along said elongated member and adapted to engage said elongated member to selectively rotate said elongated member, said elongated member being coupled to said slidable means so that said device may be selectively rotated to rotate said elongated member to move said slidable means thereby to vary the distance between said eye loupes supported thereon, two telescoping links engaged from said device to be fixed to said eye loupes so that said telescoping links will pivot said eye loupes to vary their convergence when said device is moved axially along said elongated member.

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