United States Patent [19]

Chester

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[54] **SURGICAL HEADLAMP**

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[73] Assignee: **Edward Weck & Company,** Long Island City, N.Y.

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[21] Appl. No.: **291,446**

[52] **U.S. Cl.** **128/23,** 240/59

[51] **Int. Cl.** **A61b 1/06**

[58] **Field of Search** ..... 128/22, 23; 240/52, 59, 240/60, 73 BJ, 81 BE

[56] **References Cited**

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Attorney, Agent, or Firm—Lawrence S. Levinson; Merle J. Smith; John J. Archer

[57] **ABSTRACT**

A surgical headlamp is provided which permits several degrees of freedom of movement of a high intensity headlight with respect to a headband worn by a user. The light is connected to the headband via two rotation joints which are connected by a pivot member which permits planar rotation of the headlight about the headband. The pivot member also permits the adjustment of the distance between the joint members to provide for the various types of instruments worn by surgeons about the eyes. A swivel member is connected to the headband and one of the joints to permit rotation of the headlight in a plane perpendicular to the plane of rotation permitted by the joint means.

20 Claims, 5 Drawing Figures

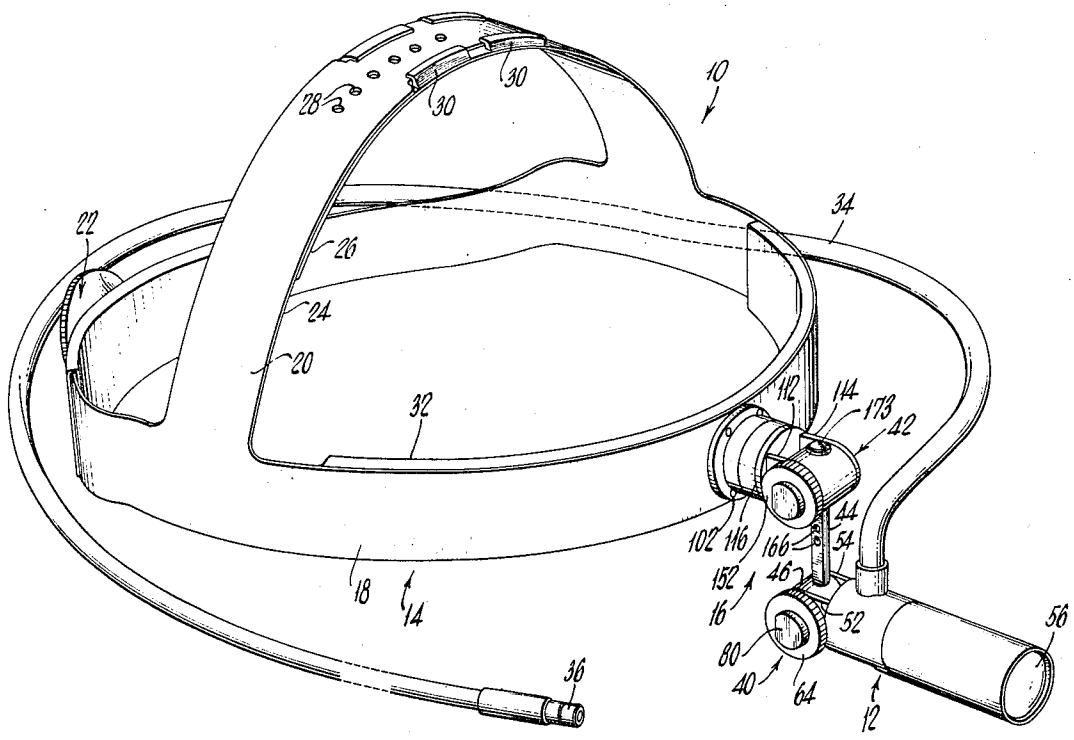


Fig. 1.

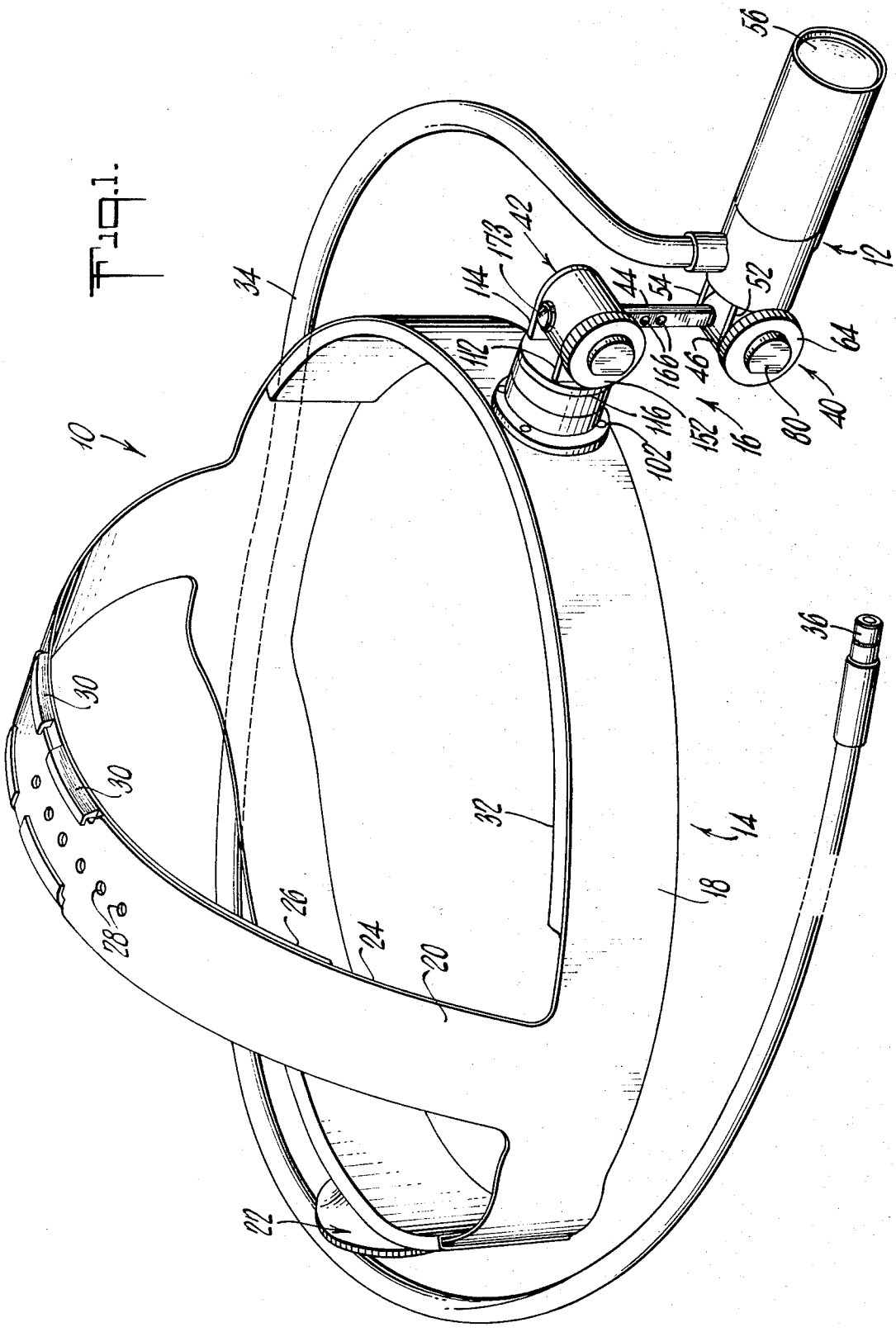

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Fig. 3.

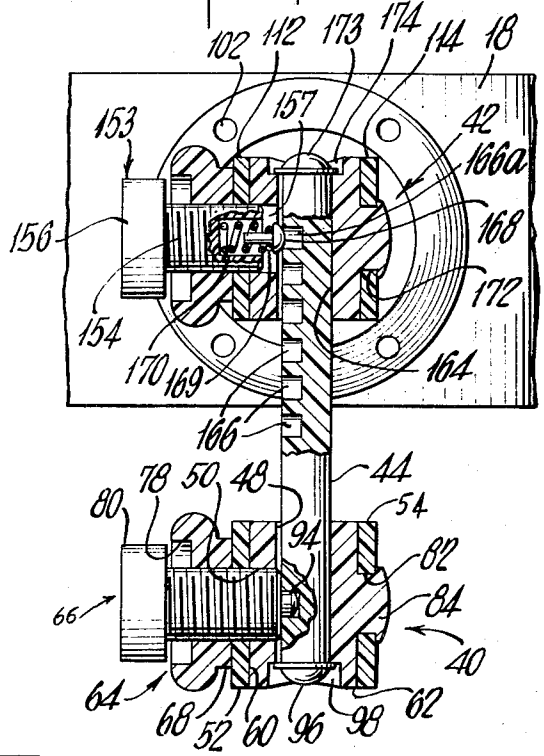


Fig. 4.

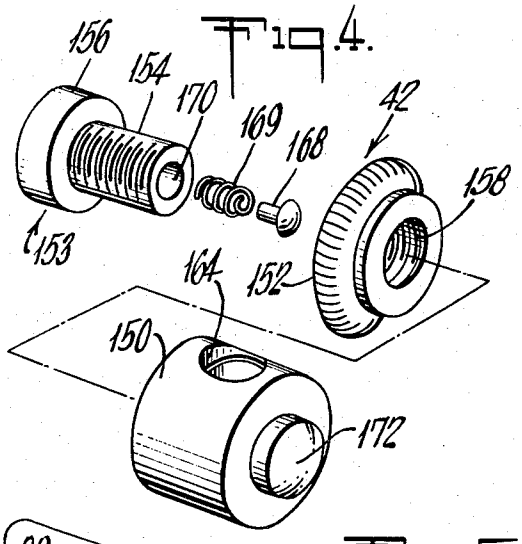


Fig. 5.

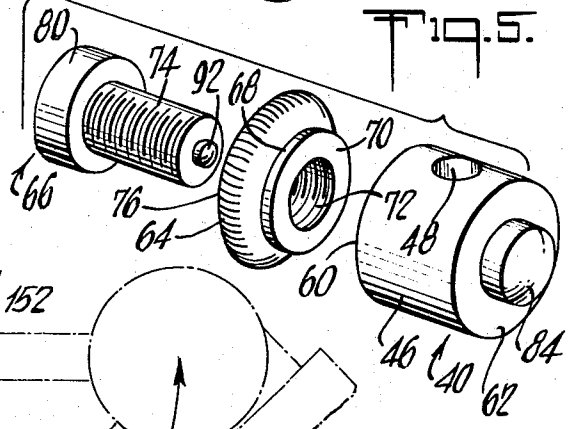


Fig. 2

SURGICAL HEADLAMP

BACKGROUND

The present invention relates to a surgical headlamp in which the light is adjustable to virtually any desirable working position.

The device is worn on the head of a user, more particularly a surgeon, for carrying out procedures that require the highest degree of precision in closely confined areas. The headlight, so as to reduce the carriage weight, is divorced from the illumination source, and only the connecting leads need be borne by the user.

Prior art embodiments include light sources which are separated from the headlamp to reduce the weight carried by the user. It is quite important, however, that the headlight be capable of positioning in virtually any desirable orientation as determined by the particular needs of the user. Specifically, the light should be rotatable in planes perpendicular to, and coplanar with, the general sight plane of a user. These degrees of freedom of movement permit essentially universal movement of headlight for the various needs of the surgeon.

Several of the prior art devices satisfy the freedom of movement criteria discussed above. One such device utilizes ball and socket joints. However, one further degree of freedom of movement is highly desirable. In many surgical applications the surgeon will wear optical devices and the like which may be required by the particular operation being performed. These devices vary in size and shape and a completely utilitarian headlight should be adaptable for use with most if not all these optical devices. To satisfy this requirement it is necessary that the means which connects the headlight to the headband permit the selective adjustment of the distance between the headlight and headband. In other words, for some optical devices there need be a relatively large distance between the headlight and headband, and for other optical devices a relatively small distance is necessary. The present invention not only provides for relative universal movement, but also permits the adjustment of the relative headlight-headband distance. Additionally, the prescribed movements are accomplished with a very simple and inexpensive connecting means which means is easily manipulated by the user.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a headlamp of superior construction which conveniently permits adjustment of the headlight to preferred orientations.

Another object of the present invention is the provision of a headlamp which allows adjustment of the distance between the headlight and headband.

Still another object of the present invention is the provision of a headlamp which is light in weight, reliable of performance and characterized by dependable interaction of the moving parts.

In accordance with the above designs a surgical headlamp comprises an adjustable headband and a headlight attached thereto. The headlight is attached by means of movable joints which permit several rotational movements as well as a translational movement.

A first joint means is pivotally connected to a second, turret mounted joint means. The first joint means is

connected to the headlight and permits the headlight to rotate thereabout.

A pivot member connects the two joint means and also permits the adjustment of the distance therebetween. Spaced openings formed in the pivot member cooperate with a spring loaded stop member housed in the second joint means. The spring is received in the openings to releasably secure the pivot member in a particular position. The position chosen depends on the type of surgical devices the surgeon must wear. The pivot member in permitting adjustment of the distance between the two joint means permits a wide variety of surgical devices to be accomodated by the headlamp.

The second joint means is turret mounted to the headband, in other words, it is capable of rotational movement in pairs of perpendicular planes. A base part is rotatably mounted to the headband which permits rotation in a generally vertical plane (assuming the user is in an upright position). In addition, the second joint member permits the pivot member to rotate thereabout in planes perpendicular to the plane of rotation of the base part. Additionally, both joint means include means to lock the joints at a particular orientation.

The above and other objects of the present invention will be apparent from the following description when read in conjunction with the drawings.

DESCRIPTION OF THE DRAWINGS

FIG. **1**, is a perspective view of the entire surgical headlamp embodying the present invention;

FIG. **2**, is a side elevational view of the means to connect the headlight to the headband phantomly shown in various positions;

FIG. **3**, is a view partially in section taken along the line 3—3 of FIG. 2;

FIG. **4**, is an exploded perspective view of the component parts of the second joint means; and

FIG. **5**, is an exploded perspective view of the component parts of the first joint means.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. **1**, the entire headlamp assembly **10** is shown in perspective. A fiber optic lens assembly **12** is movably connected to the headband **14** by the joint means assembly **16**. The headband **14** is similar to prior art types and basically consists of the band **18** which encircles the physician's head and the cross-band **20** which spans the skull and maintains the entire headband **14** in place. The band **18** is adjustable for various head sizes and utilizes a friction locking means **22** to maintain a specific head size. Also, the cross-band **20** is adjustable in that its two ends **24** and **26** overlap, there being spaced holes **28** in end **24** and a detent on end **26** which is received in the various holes **28** to maintain a specific setting. The flanges **30** serve to prevent the ends **24, 26** from pivoting with respect of each other. For the comfort of the surgeon, a band of spongy material **32** is situated on the forward interior part of the band **18** for direct contact with a physician's forehead. The conduit **34** contains the bundle of fiber optic strands, is connected to the headband **14**, and conducts the light from a remote source (not shown) by way of jack **36** to the fiber optic lens assembly **12**.

A means to movably connect the headlight to the headband **16** is capable of several different movements

to satisfy the demands of various surgical procedures. It is necessary that it be possible to rotate the lens assembly **12** about an axis generally coincident with the line of sight of the surgeon. Additionally, it is most helpful if the lens assembly **12** is pivotable about the same axis; the aforementioned two movements resembling the action of a turret-type assembly. During the course of many surgical procedures a surgeon is called upon to wear various instruments about the eyes, such as magnifiers and the like, for work in extremely close or delicate areas. In such instances yet another movement is advantageous; that being the ability to selectively adjust the distance between the lens assembly **12** and the headband **14.** These movements permit utilization by the surgeon of a wide variety of surgical devices worn about the eyes.

The means **16** basically comprises first and second joint means **40** and **42** respectively as best shown in FIGS. **1** and **2.** The first joint means **40** serves to movably connect the lens assembly **12** to a pivot member **44** and the second joint means **42** movably connects the first joint means **40** and pivot member **44** to the headband **14.**

Specifically the first joint means **40** permits rotation of the lens assembly **12** about the joint means central or longitudinal axis. That means **40** is characterized as having a midsection member **46** which is substantially cylindrical. The midsection member **46** has a radial hole **48** which can extend completely therethrough and an axial hole **50** which extends partially therethrough and registers with the axial hole **48.**

As seen in FIGS. **1** and **2,** the lens assembly **12** includes parallel brackets **52, 54** which extend longitudinally outwardly on the side opposite the lens **56.** The brackets **52, 54** have curvilinear end portions and have axial holes formed therethrough. The brackets **52, 54** are designed to fit about the bases **60, 62** of midsection member **46.** The brackets **52, 54** are forced to bear against the bases **60, 62** by means of a frictional locking member **64** and the end cap **66.** The frictional locking member comprises an integral raised front ring portion **68** having the flat friction surface **70** and the center hole **72.** The friction locking member **64** and the midsection member **46** sandwich bracket **52** between surfaces **60** and **70.** The end cap **66** is then threadedly received in both holes **72** and **50.** As will be hereinafter described, end cap **66** is received into midsection member **46** a specific distance and friction locking member **64** is adapted to fit therebetween and also is permitted limited travel along the threaded section **74** of end cap **66.** The friction locking member has a knurled outer surface **76** to facilitate grasping and has a recess **78** on the side opposite the ring **68.** The end cap **66** has a head **80** which is received in the recess **78** but need not make contact with the walls thereof. Upon assembly of the various components just described, the lens assembly **12** can be locked in a specific orientation by rotation of the friction locking member **64** until the surface **70** and **60** frictionally lock bracket **52** in place. As this occurs the bracket **54** is similarly locked between surface **62** on midsection member **46** and another friction surface **82** on the cap **84.** When it is desired to change the orientation of the lens assembly **12,** one merely rotates the friction locking member **64** so as to release the brackets **52, 54** from the friction lock, the lens assembly **12** is appropriately adjusted, and then the friction locking member is turned so as to lock it in place.

The lens assembly **12** and the first joint means **40** are connected to the second joint means **42** by way of the pivot member **44.** The pivot member **44** is received in the radial hole **48** and is fixedly secured to the first joint means **40** by means of the detent **92** formed on the forward end of the threaded section **74** of the end cap **66,** which detent is received in the opening **94** in the pivot member **44.** The pivot member **44** is also held in place by means of a cap **96** which is received in a recess **98** in the midsection member **46.**

Referring to FIGS. **1** and **2** it is seen that the second joint means **42** is rotatably connected to the headband **14.** To accomplish such connection the second joint member **42** is provided with a base **100** which is connected to the headband **14** by means of the screws **102** which are threadedly received in corresponding openings **104** in the headband **14.** The base **100** also comprises the cylindrical flanges **106, 108** which are at right angles to each other, and which define the generally cylindrical opening **110.** The second joint means **42** comprises the brackets **112, 114** which are fixed to a base member **116.** Member **116** has a shaft **118** and a flange **120** both of which are received in the opening **110.** A generally cylindrical spring member **122** is received between the flanges **108, 120** and urges the respective base members **100, 116** toward continuous engagement. The second joint means **42,** therefore, is permitted to rotate about the headband **12** in a plane generally perpendicular to the band **18.**

Yet another movement is desirable, and that is the ability for the first joint means **40** to pivot about the second joint means **42.** Such a capability is provided by an assembly similar to joint means **40.** Specifically, as indicated in FIG. **4,** there is a midsection member **150** which is similar to midsection member **46.** Additionally, the second joint means **42** includes a friction locking member **152** which is similar to friction locking member **64.** Also, end cap **153** comprising a threaded section **154** and head section **156** is threadedly received in opening **158** in friction locking member **152** and is also received in an opening **157** formed in midsection member **150.** The brackets **112** and **114** have central openings (not shown) and are frictionally and releasably held in place in the same manner as the brackets **52, 54.** The pivot member **44** which connects first joint means **40** and second means **42** also permits the adjustment of the relative distance between the two means **40, 42.** For such a purpose, the pivot member **44** is received in the axial hole **164** in midsection member **150** and includes a series of spaced openings **166** which are so located so as to register, one at a time, with the axial hole **164** in that midsection member. The pivot member **44** is releasably secured in any desired position so as to permit a relatively simple adjustment by the surgeon. This is accomplished by providing a stop member **168** which is spring **169** loaded and which is releasably received in the openings **166.** The stop member **168** and spring **169** are both received in the axial hole **170** which is formed partially through threaded section **154** of the end cap **153.** The cap **173** is received in the recess **174** formed in midsection member **150** and prevents the pivot member **44** from any movement below the upper most opening **166a.**

The means **16** thus far described permits at least four separate movements. There is rotational movement permitted about both midsection members **46** and **150,** the entire means **16** is permitted to rotate about band

18 (in a plane generally perpendicular to the plane of that band), and a translational movement which permits the adjustment of the relative distance between joint means **40** and **42,** by way of the pivot member **44** arrangement. This last mentioned movement permits the use by the surgeon of various instruments which are generally worn about the eyes. Several of these movements are illustrated in FIG. **2** which phantomly indicates various positions of the lens assembly **12.** Specifically, the lens assembly is shown in orientations of maximum and minimum distance between the joint means **40** and **42,** as well as various orientations which require adjustment about the midsection members **46, 150.**

It should be indicated at this time that it is possible to eliminate joint means **40** without severely restricting the use of the lens assembly **12.** In other words, the lens assembly **12** could be directly connected to the pivot member **44** all the remaining structure being identical to that herein described and the permissible movements would be adequate for most applications. In addition, various changes may be made in the details which fall within the spirit and scope of the appended claims and are intended to be embraced therewithin.

What is claimed is:

1. In combination with a surgical headlamp for use in carrying out surgical procedures comprising a headlight and a headband for the attachment of the headlight to the head of the user; means to movably connect the headlight to the headband comprising:

a. first joint means connected to said headlight;

b. second joint means pivotally connected to said first joint means and freely rotatably connected to said headband, said second joint means adapted for rotation in a multiplicity of pairs of perpendicular planes; and

c. a pivot member connecting said first and second joint means, said pivot member having means cooperating with means on said second joint means to permit selected adjustment of the distance between said first and second joint means.

2. The combination of claim **1** wherein said pivot member moves relative to said second joint means and is fixedly secured to said first joint means.

3. The combination of claim **1** wherein said means on said pivot member comprises a plurality of spaced openings and said cooperating means comprises a biased stop member, which member is generally received in said openings to releasably maintain said pivot member in a selected position.

4. The combination of claim **1** wherein said headlight includes bracket means adapted to rotatably connect said headlight to said first joint means.

5. The combination of claim **4** wherein said first joint means comprises means to frictionally and releasably engage said bracket means, thereby to releasably maintain said headlight at a selected orientation.

6. In the combination of claim **1** said second joint means comprising bracket means adapted to rotatably connect said headband to said second joint means.

7. The combination of claim **6** wherein said second joint means comprises means to frictionally and releasably engage said bracket means, thereby to releasably maintain said headlight at a selected orientation.

8. The combination of claim **5** wherein said first joint means further comprises a midsection member having a center hole and a radial hole formed therethrough, said pivot member being received in said radial hole, and end cap received in said center hole which cap frictionally engages said bracket means, said pivot member having an opening which registers with said center hole and said end cap having a detent which is received in said opening to fixedly secure said pivot member in said first joint means.

9. In the combination of claim **7** said second joint means further comprising a midsection member having a center hole and a radial hole formed therethrough, said pivot member being received in said radial hole, and end cap received in said center hole which frictionally engages said bracket means, said pivot member having a plurality of spaced openings which selectively register with said radial hole and a biased stop member within an opening in said end cap, which stop member is generally received in said openings to releasably maintain said pivot member in a selected position.

10. The combination of claim **1** wherein said second joint means comprises a base part rotatably connected to said headband.

11. The combination of claim **10** wherein said base part includes a first member fixed to said headband, said member having an opening therein and a second member rotatably secured within said opening.

12. The combination of claim **11** including a cylindrical flange on said first member, a generally registering flange on said second member and a resilient member disposed between said flanges to rotatably secure said second member within said first member.

13. In the combination of claim **1**:

a. first bracket means adapted to rotatably connect said headlight to said first joint means;

b. second bracket means adapted to rotatably connect said headband to said second joint means;

c. said first joint means comprising a first midsection member with threaded center hole and radial hole formed therethrough;

d. said second joint means comprising a second midsection member with threaded center hole and radial hole formed therethrough;

e. a pivot member connecting said first and second joint members which pivot member is received in the respective center holes of said midsection members;

f. a biased stop member in said second joint means which cooperates with a multiplicity of spaced openings in said pivot member to releasably secure said pivot member in a selected position and to permit the selected adjustment of the distance between said first and second joint means.

14. The combination of claim **13** further comprising an end cap received in the first midsection member center hole, which cap frictionally engages said first bracket means, said pivot member having an opening which registers with said center hole and said end cap having a detent which is received in said hole, to fixedly secure said pivot member in said first joint means.

15. In the combination of claim **13** an end cap received in said second midsection member center hole which cap frictionally engages said second bracket means, and said biased stop member received in an opening in said end cap.

16. In combination with a surgical headlamp for use in carrying out surgical procedures comprising a headlight and a headband for the attachment of the headlight to the head of the user; means to movably connect the headlight to the headband comprising joint means

pivotally connecting said headlight to said headband, said joint means freely rotatably connected to said headband, and adapted for rotation in a multiplicity of pairs of perpendicular planes, a pivot member connecting said headlight and said joint means, said pivot member having means cooperating with means on said joint means to permit selected adjustment of the distance between said headlight and said joint means.

17. The combination of claim **16** wherein the means on said pivot member comprises spaced openings and the cooperating means on said joint means comprises a biased stop member which is generally received in said openings to releasably maintain said pivot member in a selected position.

18. The combination of claim **16** said joint means comprising bracket means adapted to movably connect said headband to said joint means.

19. The combination of claim **18** wherein said joint means comprises means to frictionally and releasably engage said bracket means, thereby to releasably maintain said headlight at a selected orientation.

20. In the combination of claim **19** said joint means further comprising a midsection member having a center hole and a radial hole formed therethrough, said pivot member being received in said radial hole, an end cap received in said center hole which frictionally engages said bracket means, said pivot member having a plurality of spaced openings which selectively register with said radial hole and a biased stop member within an opening in said end cap, which stop member is generally received in said openings to releasably maintain said pivot member in a selected position.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,830,230 Dated August 20, 1974

Inventor(s) John E. Chester

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the title page, the name of the assignee should be --Edward Weck & Company, Inc.--.

Column 3, line 58, "surface" should read --surfaces--.

Column 6, line 1, "and" should read --an--.

Column 6, line 11, "and" should read --an--.

Signed and sealed this 12th day of November 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

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