# United States Patent

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## [54] TONOMETER MOUNTING DEVICE


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[51] **Int. Cl.** ..... **A61b 3/16**

[58] **Field of Search** ..... 73/80; 128/2 T, 17, 341



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[57] **ABSTRACT**

A device which is to be used with a tonometer for facilitating the operation thereof. The device includes a pair of retractors for respectively retracting the upper and lower eyelids of an eye which is to be examined. A holding unit holds and carries the pair of retractors in a position where they conveniently pull the eyelids apart from each other with a regulated force. A supporting device is provided for supporting a tonometer in a convenient position of operation while the eyelids are held back by the retractors.


**10 Claims, 5 Drawing Figures**

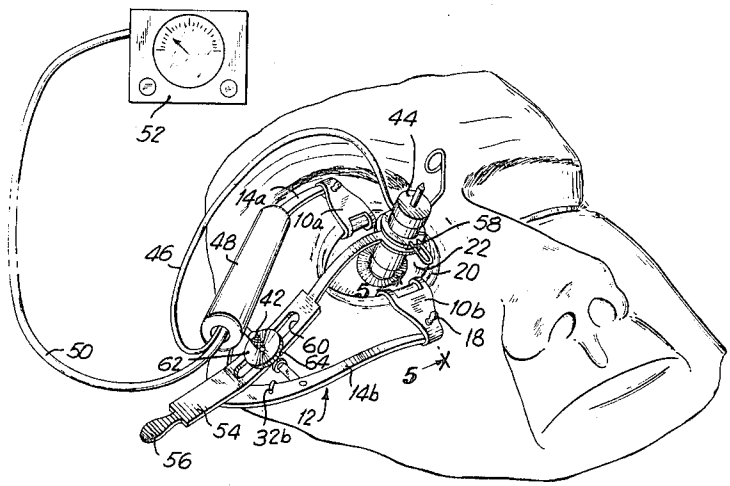


FIG. 1

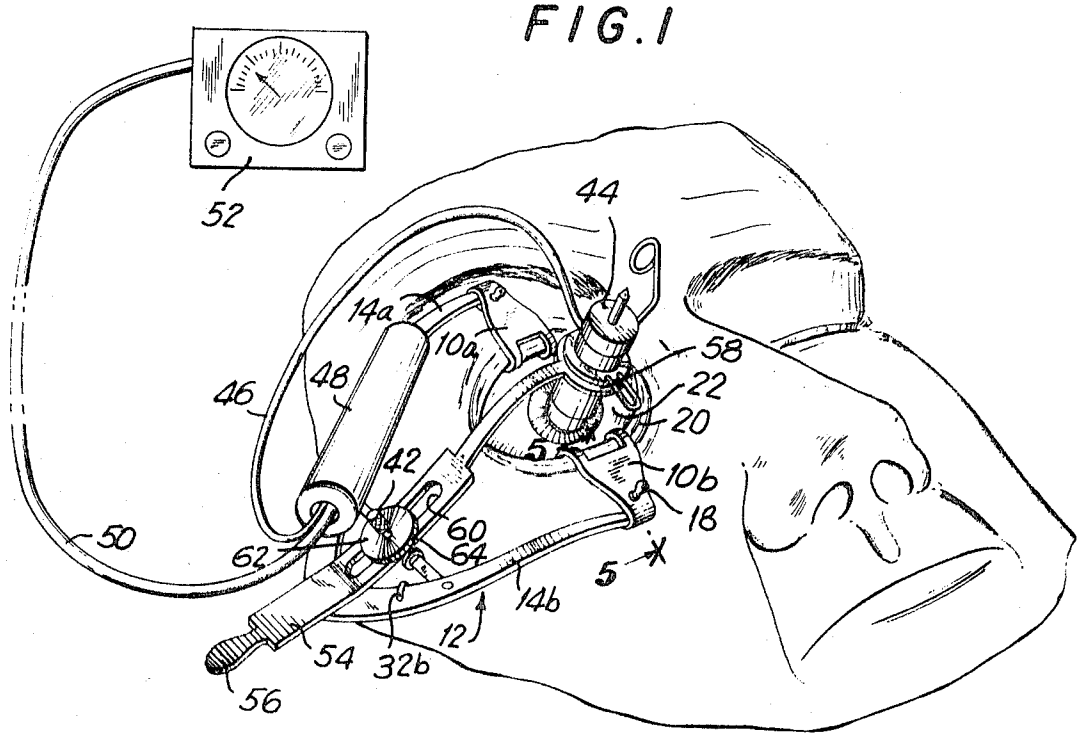
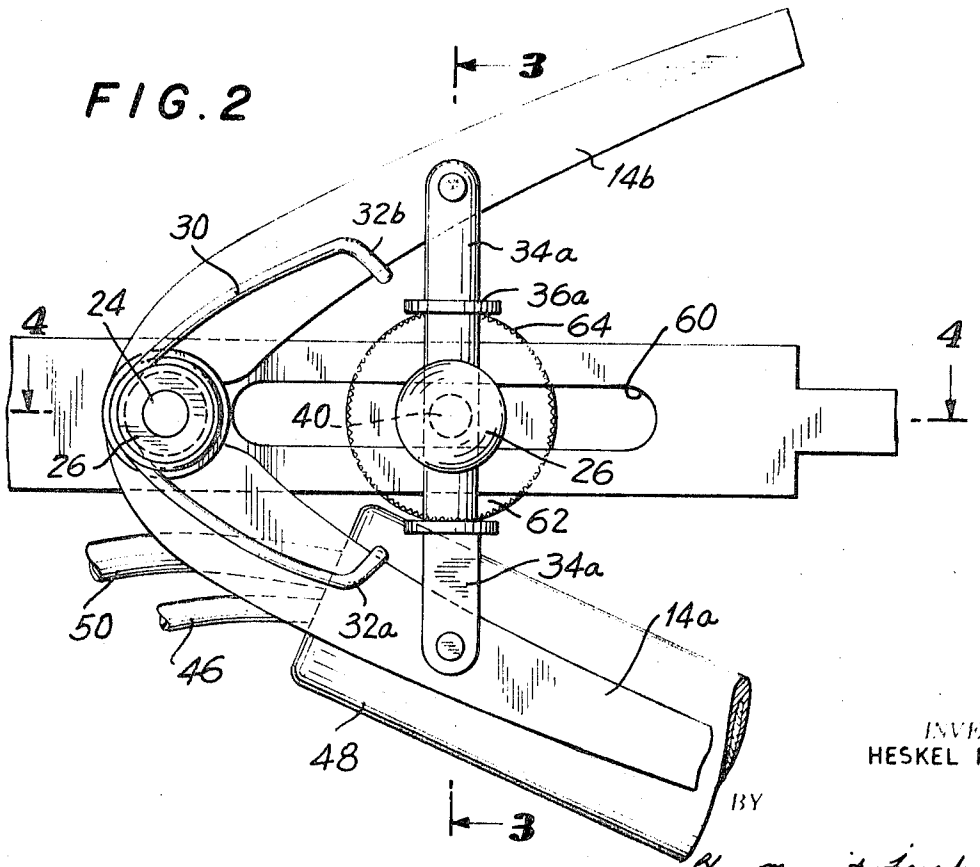



FIG. 2




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FIG. 3

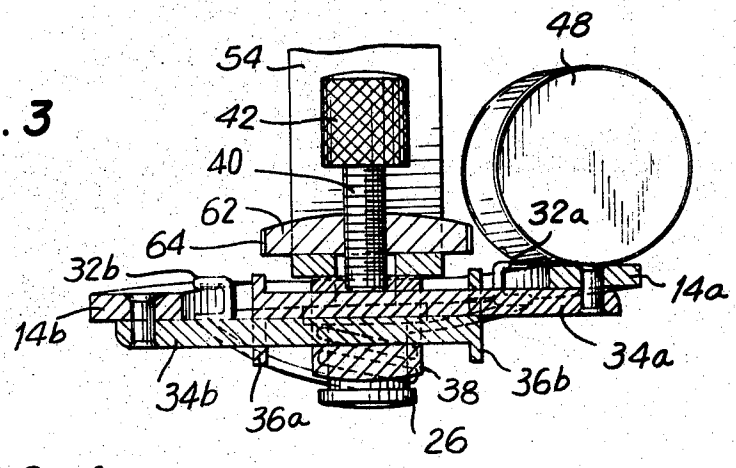



FIG. 4

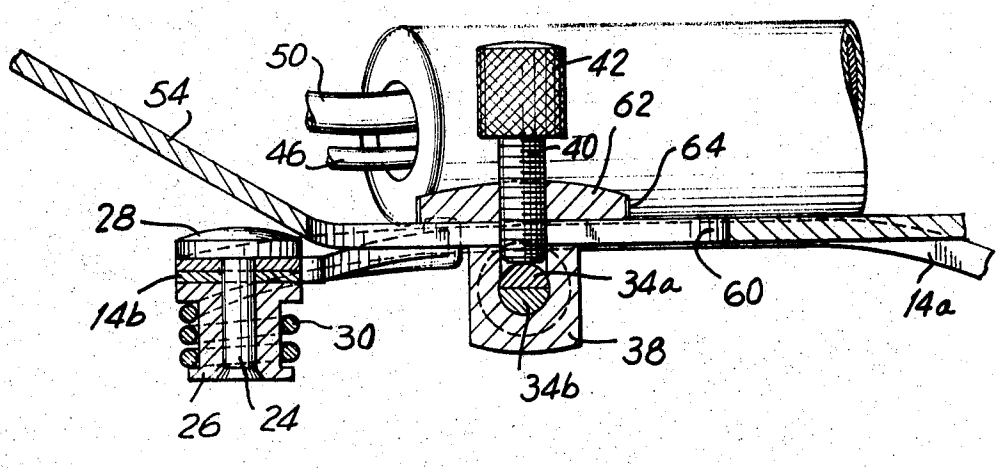
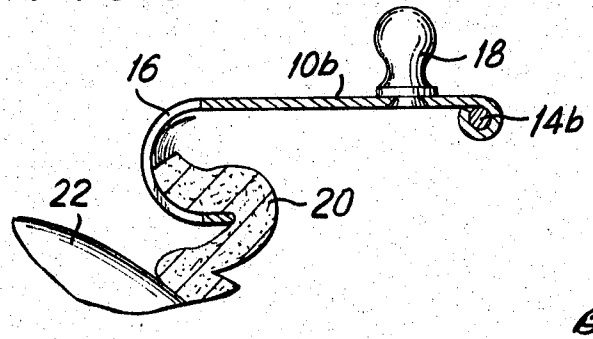



FIG. 5




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# TONOMETER MOUNTING DEVICE

## BACKGROUND OF THE INVENTION

The present invention relates to the examination of eyes of human beings and in particular to devices which are to be used with tonometers when the latter are operated to examine an eye.

As is well known, individuals are extremely sensitive at the region of their eyes. It is extremely difficult to have a person in a relaxed condition which will facilitate a comfortable safe examination of the eye. This is particularly the case when using a tonometer. It is essential to place the tonometer against the eyeball in order to measure the tension thereof, and due to the sensitivity of most individuals, the process is an extremely delicate one which must be carried out with extreme care.

## SUMMARY OF THE INVENTION

It is accordingly a primary object of the present invention to provide for use with a tonometer a device which will greatly facilitate the ease and precision with which the tonometer is operated.

In particular, it is an object of the invention to provide a device capable of holding an eye in a condition which will make it possible to use a tonometer comfortably, safely and far more accurately than has hitherto been possible.

Furthermore, it is an object of the invention to provide a device which can bring about this result without causing any appreciable discomfort to the individual whose eye is examined.

Also, it is an object of the invention to provide a device which can easily be adjusted to the requirements of different individuals.

In addition it is an object of the invention to provide a device of this type which is relatively simple and inexpensive and which can readily be used without difficulty even by individuals who do not have a great deal of training.

According to the invention a pair of retractors are provided for respectively retracting the upper and lower eyelids of an eye apart from each other, so as to expose the eyeball for easy convenient examination by a tonometer. A holding means carries the pair of retractors and holds them in a position where they pull the eyelids apart from each other to an extent sufficient to reliably uncover the eyeball to the desired extent. An adjusting means coacts with the holding means to adjust the latter to provide the desired extent of pulling the eyelids apart from each other. A support means is provided for supporting the tonometer in a position where it can conveniently be used while the eyelids are pulled apart by the retractors.

## BRIEF DESCRIPTION OF DRAWINGS

The invention is illustrated by way of example in the accompanying drawings which form part of this application and in which:

FIG. 1 is a perspective illustration of one embodiment of a device of the invention shown in FIG. 1 during use thereof;

FIG. 2 is a fragmentary view, on an enlarged scale, as compared to FIG. 1, of the device of FIG. 1 as it appears when looking at the device from the underside thereof;

FIG. 3 is a transverse section taken along line 3—3 of FIG. 2 in the direction of the arrows;

FIG. 4 is a longitudinal section taken along line 4—4 of FIG. 2 in the direction of the arrows; and

FIG. 5 is a transverse section taken along line 5—5 of FIG. 1 in the direction of the arrows and showing a retractor at an enlarged scale as compared to FIG. 1, FIG. 5 particularly showing how the retractor acts on an eyelid.

## DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to the drawings, FIG. 1 shows a pair of retractors **10***a* and **10***b* which are both carried by a holding means **12** described in greater detail below. This holding means **12** includes a pair of elongated levers **14***a* and **14***b*.



These levers taper as they approach the pair of retractors, and they terminate in free end portions which are directly engaged by the retractors. As is apparent from FIG. **5** where the free end portion of the lever **14***b* is shown in section, at its part which is engaged by a retractor each lever is of substantially circular cross section.

As is apparent from FIGS. **1** and **5**, the retractors respectively have hooked portions **16** in the form of a pair of hook-shaped tabs at the free end of each retractor where it engages an eyelid. At the region of the levers **14***a* and **14***b* each of the retractors **10***a* and **10***b* carries a knob **18** by which the retractor can conveniently be swung about the free end portion of the lever which carries the retractor. Thus, as is apparent from FIG. **5** it is a simple matter for the operator to engage the knob **18** and swing the retractor **10***b* around the rod **14***b* so as to engage the hooked portions **16** behind the eyelid **20** as shown in FIG. **5** so as to place the eyelid **20** in the condition illustrated in FIG. **5** where it is retracted with a selected carefully regulated force away from the eyeball **22**. The other retractor **10***a* coacts with the upper eyelid in precisely the same way that the retractor **10***b* coacts with the lower eyelid **20**.

The levers **14***a* and **14***b* of the holding means **12** have free end portions overlapping each other distant from the retractors **14***a* and **14***b*. These overlapping end portions of the levers **14***a* and **14***b* are formed with openings through which a pivot pin **24** extends as shown most clearly in FIG. **4**. This pivot pin **24** is carried by a sleeve **26** on which the pivoted end portion of the lever **14***b* rests, this end portion as well as the corresponding end portion of the lever **14***a* being of a reduced thickness at their overlapping portions through which the pivot **24** extends. This pivot **24** has a bottom riveted end engaging the lower end of the sleeve **26** and an upper head end **28** beneath which the overlapping pivoted ends of the levers **14***a* and **14***b* are located.

A spring **30** is coiled about an elongated portion of sleeve **26** which is of reduced diameter. This spring **30** terminates in a pair of free ends **32***a* and **32***b* which are hooked around the inner edges of the levers **14***a* and **14***b* so as to urge these levers apart from each other at their ends which carry the retractors. An adjusting means is provided for adjusting the force with which the levers **14***a* and **14***b* urge the retractors apart from each other under the force of the spring means **30**. This adjusting means includes a pair of elongated adjusting rods **34***a* and **34***b* respectively pivoted to the levers **14***a* and **14***b* at the undersides thereof. These adjusting rods **34***a* and **34***b* extend from the levers **14***a* and **14***b* to the space therebetween where the adjusting rods are provided with flat surfaces slidably engaging each other at the longitudinal portions of the rods which overlap each other. The rod **34***b* terminates distant from the lever **14***b* in a flanged plate portion **36***b* formed with an opening through which the rod **34***b* slidably extends with a freedom to move longitudinally through the opening of the flange **36***b*. In the same way the rod **34***a* terminates distant from the lever **14***a* in a flat flanged end portion **36***a* formed with an opening through which the rod **34***b* slidably extends. The openings of the flanges **36***a* and **36***b* may be of a semicircular configuration to conform to the cross sections of the rods **34***a* and **34***b* as shown most clearly in FIG. **4**.

The adjusting means further includes a nut **38** formed with a transverse bore through which the rods slidably extend. This transverse bore of the nut **38** extends perpendicularly to a threaded bore thereof which receives the threaded shank of a screw **40** provided at its top end with a knurled head **42** conveniently accessible to the operator. Of course, when the parts are assembled one of the rods will first have its elongated portion passed through the transverse bore of the nut **38** and then the other rod will be passed through the transverse bore and then through the semicircular opening of the flanged portion of the first rod with the flanged portion of the second rod then having its opening receiving the first rod. After the rods are assembled in this way with each other and with the nut **38** they are riveted to the levers **14***a* and **14***b* through the pivots illustrated in FIG. **3** to provide the pivotal connection between the rods and the levers.

It is thus apparent that with the structure as thus far described it is possible to tighten the screw **40** in the nut **38** so as to fix the rods to each other and prevent movement of the levers **14***a* and **14***b* apart from each other by the spring **30**. With the levers **14***a* and **14***b* at a convenient position apart from each other the retractors can be placed in engagement with a pair of eyelids and the screw **40** can be loosened just enough to permit the spring to pull the retractors and the eyelids apart from each other to the desired extent after which the screw **40** can be tightened to hold the parts in the adjusted position.

A support means is provided for supporting a tonometer such as the tonometer **44** shown in FIG. **1**. This tonometer is conventional in every respect. It is connected through a suitable cable **46** and the electrical connecting unit **48** as well as the cable **50** to a meter **52** enabling the desired readings to take place. These components relate to the tonometer itself and are conventional so that they are not further described. The support means which is provided for supporting the tonometer **44** in a position for convenient use at the eyeball **22** includes an elongated strip **54** made of any suitable metal, for example, and having a handle **56** at one free end thereof which is accessible to the operator. This strip **54** terminates distant from the handle **56** in a ring portion **58** through which the tonometer **44** extends and on which the tonometer **44** is supported in any convenient manner. Between the ring **58** and the handle **56** the strip **54** of the support means is formed with an elongated slot **60** through which the threaded shank of the screw **40** extends. Thus, while the screw **40** can be manipulated for loosening and tightening the rods of the adjusting means, it is possible for the operator to move the strip **54** longitudinally with respect to the screw **40** and to swing the strip **44** around the screw **40** so that the tonometer **44** can be very conveniently positioned.

The screw **40** carries a lock nut **62** having a conveniently knurled periphery **64**. Thus, once the strip **54** has its position properly determined the operator can tighten the lock nut **62** so as to press the strip **54** against the top end of the nut **38** and hold the strip **54** in the required position.

It will be seen that with this construction it thus is possible to hold the tonometer **44** in an extremely steady manner due to the support means **54** while at the same time the eye itself is very stably held in a condition where the tonometer can very readily be used in a safe and accurate manner.

During use of the device the retractors **10***a* and **10***b* are first placed in position and the tonometer **44** is positioned at the best location, and then the structure simply is permitted to remain for a while in its adjusted position to permit the individual to become accustomed to the device. When a certain degree of comfort has been achieved, after a relatively short time, it is possible to manipulate the tonometer **44** in an extremely safe, convenient manner, which does not cause any possible discomfort or injury to the individual who is being examined.

Of course, the device is removed as readily as it is mounted simply by loosening the lock nut **62** so as to facilitate displacement of the tonometer **44** away from the eye, and then loosening the screw **40** so as to facilitate removal of the entire device together with the retractors **10***a* and **10***b* away from the eye.

What is claimed is:

**1**. For use with a tonometer, a pair of retractors for respectively retracting upper and lower eyelids apart from each other, holding means coacting with said pair of retractors for holding the latter in positions retracting a pair of eyelids apart from each other, and support means for supporting a tonometer in a position for convenient operation while the eyelids are retracted by said retractors.

**2**. The combination of claim **1** and wherein an adjusting means coacts with said holding means for adjusting the latter to control the extent to which the pair of retractors retract the eyelids apart from each other.

**3**. The combination of claim **1** and wherein each retractor has a hooked portion for engaging an eyelid and a free end portion distant from said hooked portion thereof and engaged by said holding means.

**4**. The combination of claim **3** and wherein each retractor is swingably carried by said holding means at the free end portion of each retractor engaged by said holding means.

**5**. The combination of claim **1** and wherein said holding means includes a pair of levers respectively having free ends engaging and carrying said retractors and respectively having distant from said free ends overlapping portions pivoted to each other.

**6**. The combination of claim **5** and wherein a spring means coacts with said levers for urging them to swing apart from each at their ends which respectively carry said retractors.

**7**. The combination of claim **6** and wherein an adjusting means is provided for adjusting the extent to which said retractors pull eyelids apart from each other, said adjusting means including a pair of elongated overlapping rods slidably engaging each other, respectively pivoted to said levers and extending therefrom to the space between said levers where said rods slidably engage each other, a nut formed with a threaded bore and with a transverse bore extending through said nut perpendicularly across said threaded bore thereof and through which said rods slidably extend, and a screw threaded into said threaded bore of said nut for releasably pressing against said rods to hold the latter in a selected position adjusting the force with which the retractors pull eyelids apart from each other.

**8**. The combination of claim **7** and wherein said support means for the tonometer includes an elongated strip formed with an elongated slot through which said screw extends.

**9**. The combination of claim **8** and wherein said screw threadedly carries a lock nut, said strip of said support means extending between said lock nut and said nut formed with said transverse bore through which said rods extend, so that said lock nut can releasably fix said strip in an adjusted position on the nut through which the adjusting rods extend.

**10**. The combination of claim **9** and wherein said levers of said holding means terminate at their overlapping portions which are pivoted to each other distant from said retractors, said adjusting rods being situated between the overlapping portions of said levers which are pivoted to each other and said retractors.

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