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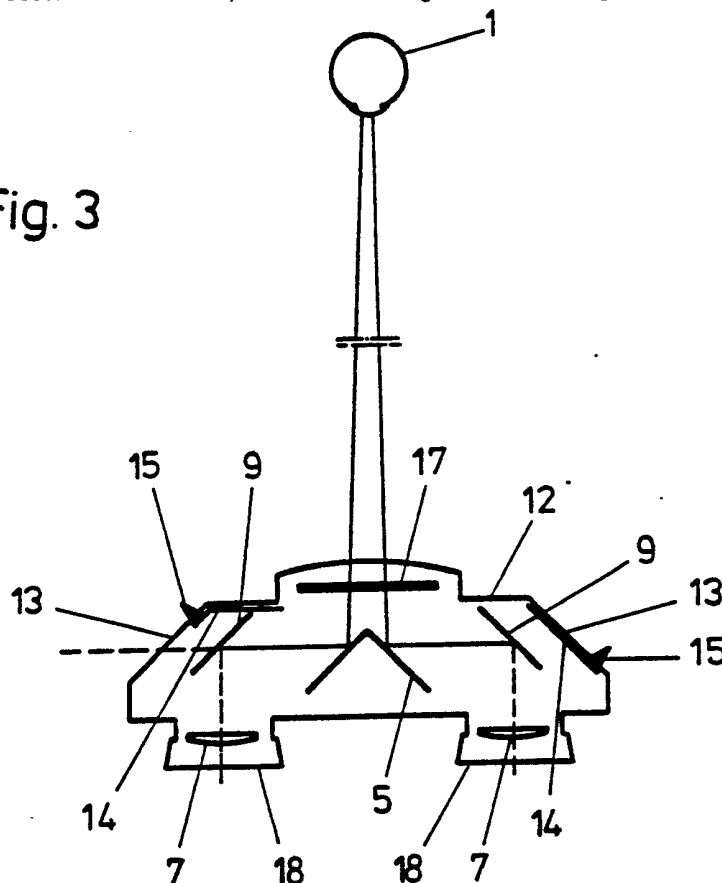
(56) Documents cited  
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EP 0048181 A2**

(58) Field of search  
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INT CL<sup>5</sup> **A61B, G02B**

(54) **Binocular ophthalmoscope**

(57) A binocular ophthalmoscope has two inner and two outer reflecting means which deflect the light from a patient's eye to the eyes of an observer. In order to permit co-observation by a third person and in order to avoid the disadvantages of conventional co-observer attachments, the outer reflecting means are designed as beam splitters.

**Fig. 3**



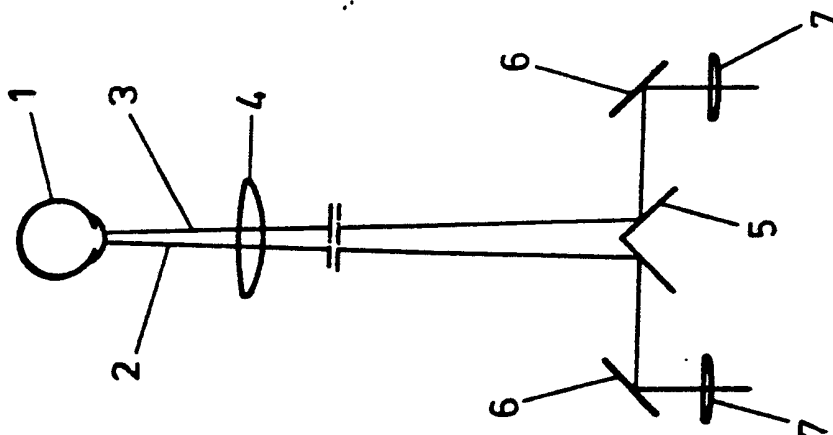


Fig. 1

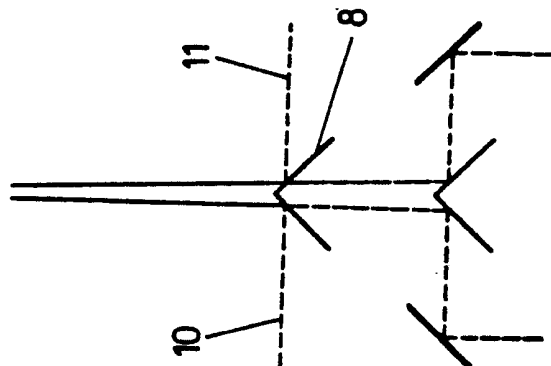


Fig. 2



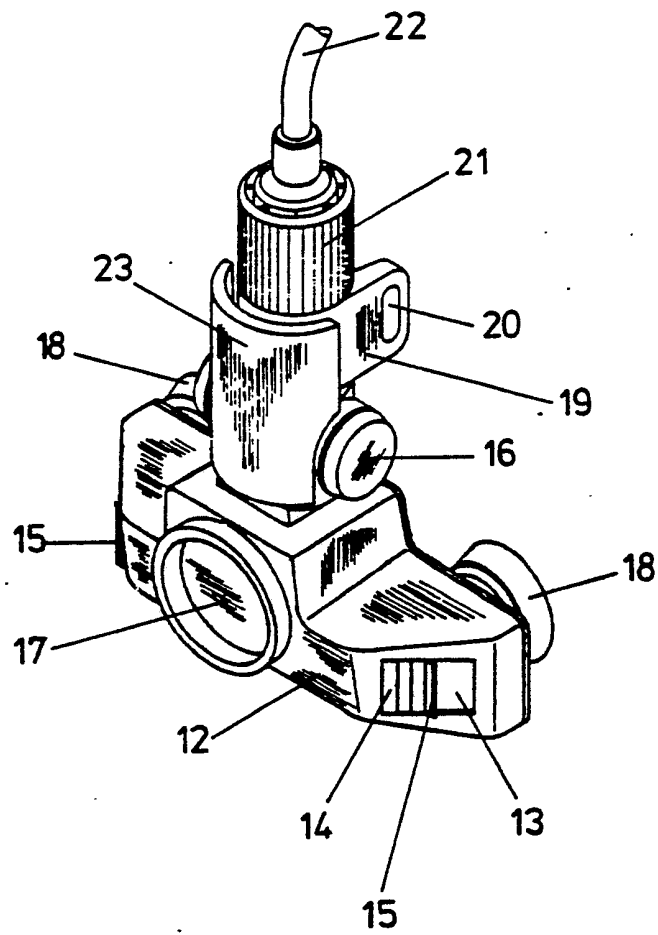


Fig. 4

Binocular ophthalmoscope

This invention relates to a binocular ophthalmoscope of the kind including two inner reflecting means and two outer reflecting means which deflect the light from a patient's eye to the eyes of an observer.

Binocular ophthalmoscopes are used for indirect ophthalmoscopy in which a patient's eye is viewed by a physician with the aid of an ophthalmoscope and a hand held ophthalmoscopy magnifier. The ophthalmoscope is either hand held or secured on the head of the physician by means of a headband or spectacles.

One known ophthalmoscope of the kind referred to is described in DE-OS 3627251 and has several mirrors for deflecting several times the light beams from the patient's eye.

Another known ophthalmoscope of the kind referred to is described in US-PS 4,684,227 and is shown schematically in Figure 1 of the accompanying drawings. This known ophthalmoscope is equipped with two inner mirrors 5 and two outer mirrors 6, which "spread" outwards the light beams 2 and 3 emanating from the patient's eye 1, after passage through the ophthalmoscope lens 4, and direct them through the ocular lenses 7 to the eyes (not shown) of the observer.

In the clinical field and in teaching it is often necessary to provide means for co-observation. For this purpose so-called co-observer attachments are known, for example from GB-PS 318,487 or the brochures from the company Zeiss, Oberkochen, "Ophthalmoskopierbesteck" [Ophthalmoscopy Instruments], brochure no. W 30-131-d (1976) and "Stereo-Mitarbeitertubus" [Stereoscopic Second-observer Tube], brochure no. W 30-047-d (1974). Such attachments are secured on the housing of the binocular ophthalmoscope and

Figure 2 shows schematically how the known ophthalmoscope shown in Figure 1 can be provided with such a second-observer attachment. In particular the second-observer attachment shown comprises two beam splitters 8, which  
5 direct part of the light received from the patient's eye 1 to the inner mirrors 5 of the binocular ophthalmoscope and direct part of the received light outwards (beam paths 10 and 11). Thus, as in the ophthalmoscope shown in Figure 1, the examiner receives a stereoscopic binocular image, while  
10 the same image, albeit monocular, is afforded to the co-observers.

Second-observer attachments of this type are awkward to handle, they are susceptible to breakage, scratching, gathering dust and smudging of the glass surfaces, and they  
15 must be replaced frequently. In addition, stray light reflected from outer light sources onto the glass surfaces disturbs the examiner.

The present invention is based on the object of providing a binocular ophthalmoscope which makes second-observer  
20 attachments of the type described superfluous.

This object is achieved according to the present invention with an ophthalmoscope of the kind referred to by virtue of the fact that the two outer reflecting means are designed as beam splitters.

25 In the ophthalmoscope according to the invention, co-observation is possible by means of openings provided in the housing of the ophthalmoscope, which openings can be designed as closeable windows.

In the binocular ophthalmoscope according to the invention,  
30 tion, cost, weight and physical size are reduced by the omission of two optical components and their carriers and their securing means. The other disadvantages of second-observer attachments are also avoided.

An exemplary embodiment of the binocular ophthalmoscope according to the invention is illustrated below with reference to the accompanying drawings, in which

5       Figure 1 shows schematically the structure and beam path of a known binocular ophthalmoscope of the kind shown in US-PS 4684227,

Figure 2 shows, schematically, the ophthalmoscope of Figure 1 provided with a second-observer attachment,

10       Figure 3 shows schematically a binocular ophthalmoscope according to the invention, and

Figure 4 shows a perspective view of a binocular ophthalmoscope according to the invention.

As shown in Figure 3, the inner mirrors 5 and ocular lenses 7 are placed in a housing 12 in a similar arrangement as that shown in Figure 1. The basic difference is  
15       that the outer mirrors 6 of the ophthalmoscope shown in Figure 1 are replaced by beam splitters 9. The housing 12 has a pair of glass windows mounted in openings in the housing which windows are closeable by slatted blinds 14.  
20       The blinds 14 are slidably movable in guides (not shown) in the housing 12. A nose or grip 15 enables the fingers of a user to open and close the windows 13. In Figure 3 the left-hand window 13 is shown open and the right-hand window 13 is shown closed.

25       With the binocular ophthalmoscope shown in Figure 3 the light from the patient's eye passes, in a manner similar to the arrangement shown in Figure 1, through a protecting window 17 in front of the ophthalmoscope onto mirrors 5 from where it is reflected to the beam splitters 9. The  
30       beam splitters 9, in a manner similar to the mirrors 6 in Figure 1, direct the light through the ocular lenses 7 in

the oculars 18 to the eyes (not shown) of the user. In addition, however, light passes through the beam splitters 9 and, when open, through the window(s) 13 so that a co-observer will see a monocular image which is presented to the observer binocular.

Figure 4 shows in a perspective view a binocular ophthalmoscope wherein similar parts are designated with the same reference numerals as in Figure 3. The window 13 visible in Figure 4 is shown half open. At the upper side of the housing 12 a lampholder 21 is fixed by means of a pivot 16. The lampholder is connected to an external power source (not shown) by a cable 22. The lampholder 21 is surrounded by a clamp 19 having an opening 20 therein for fixing the whole arrangement on a conventional head-band (not shown). A heat protective shield 23 is provided in front of the lampholder.

When the external power source is switched on, light from the lamp (not shown) is directed into the housing 12 and, in the usual way, onto a reflecting mirror which directs the light from the lamp through the protective window 17 and onto the patient's eye. From the patient's eye the light is directed to the eyes of the observer and any co- or second-observer(s) in the manner better shown in Figure 3 and described with reference thereto.



CLAIMS

1. A binocular ophthalmoscope including two inner reflecting means and two outer reflecting means which deflect light from a patient's eye to the eyes of an observer, wherein the outer reflecting means are designed as beam splitters.

2. A binocular ophthalmoscope according to claim 1, comprising a housing having at least one opening therein for passage therethrough of light split by at least one of said beam splitters for enabling monocular co-observation.

3. A binocular ophthalmoscope according to claim 2, in which said at least one opening is closeable by at least one blind.

4. A binocular ophthalmoscope constructed and arranged substantially as herein described with reference to, and as illustrated in, Figures 3 and 4 of the accompanying drawings.