

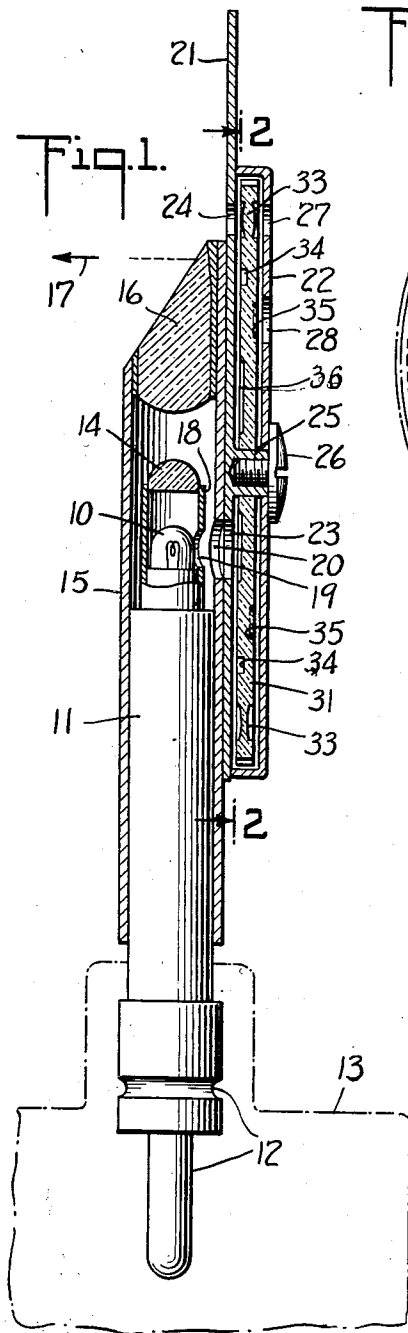
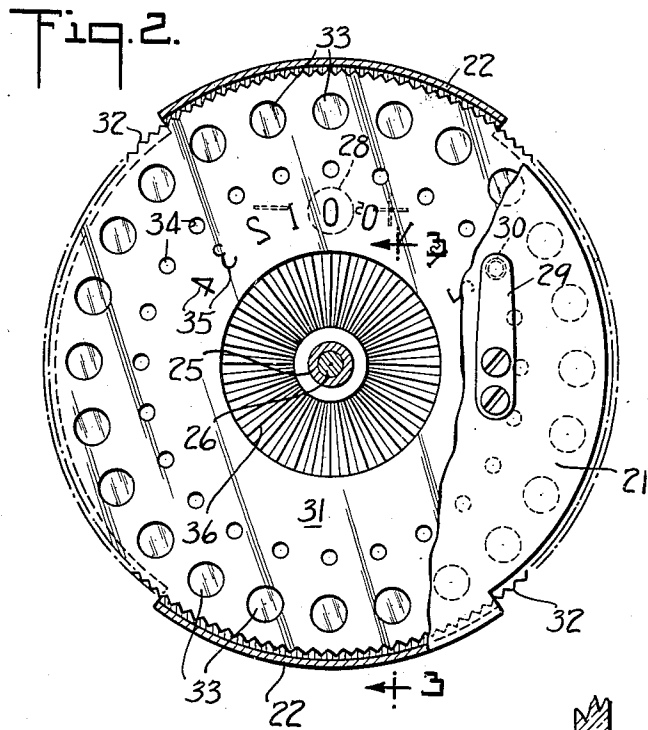
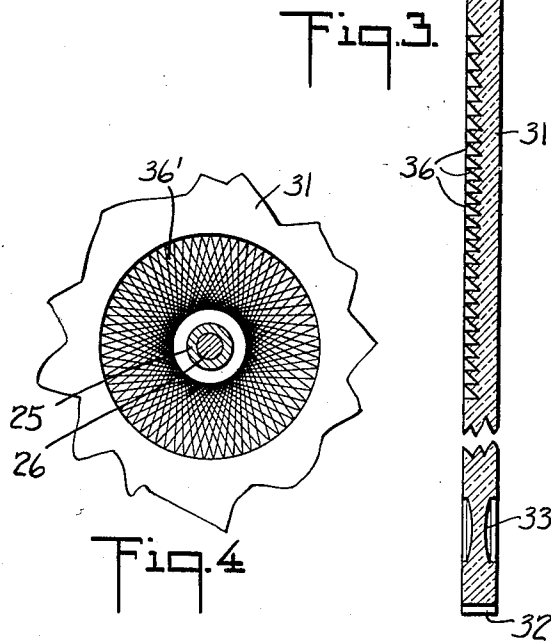
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OPHTHALMOSCOPE AND LENS DISK THEREFOR

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OPHTHALMOSCOPE AND LENS DISK
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My present invention relates generally to optical instruments, and has particular reference to ophthalmoscopes.

The principal object of the present invention is to provide an ophthalmoscope having certain structural improvements, particularly in connection with the so-called "lens disk," whereby the manufacture of the ophthalmoscope is simplified and rendered less expensive, and whereby the use of the ophthalmoscope is greatly facilitated.

An ophthalmoscope of conventional character consists essentially of a lamp, an optical system for directing a beam of illumination into the eye of the patient, a supporting element having a sight opening or aperture in alignment with such beam to permit the operator to look directly into the patient's eye, and a lens disk provided with a series of lenses of differing dioptric characteristics, the lenses being adapted to be successively brought into registry with the sight opening.

Usually, the lens disk also carries a series of indicia relating to the different lenses; and the supporting element is provided with a second aperture through which these indicia are successively visible, so that the operator knows exactly which lens he is bringing into registry with the sight opening.

Heretofore, the manufacture of the lens disk has entailed considerable expense and labor, because of the necessity for separately grinding an entire series of lenses of different dioptric characteristics, and thereupon separately mounting these lenses into suitably prepared apertures in the lens disk.

This cumbersome, time-consuming, and expensive manufacturing procedure is obviated by the present invention, which is predicated upon the discovery that it is possible and commercially feasible to construct the entire lens disk, including the lens portions thereof, of an integral element of transparent material.

Heretofore, also, various attempts have been made to illuminate the indicia which relate to the different lenses. It is another object of my present invention to provide an improved and simplified means for effecting this purpose.

A lens disk constructed in accordance with the present invention is composed of an integral element of transparent material, having the form of a relatively thin, flat disk, having an opening adapted to accommodate a pivot so that the disk may be rotated about the pivot, and having a series of arcuately arranged, specially configured portions which define a series of individual lenses

of different dioptric characteristics. These lens portions are arranged concentric with respect to the opening for the pivot. The present disk is also provided, where desired, with a series of shallow, arcuately arranged depressions adapted to engage successively with a spring-pressed detent.

The present disk is also provided with a series of indicia, which are either printed, engraved, or otherwise impressed onto the disk, these indicia being arranged so as to correspond, respectively, with the different lenses.

In a preferred form of the invention, the disk is further provided with a serrated or roughened portion which is adapted, when it receives light, to transmit the light by internal reflection through the lens disk, thereby imparting a novel type of illumination to the indicia, which need not necessarily be in direct alignment with the source of light.

I achieve the foregoing objects, and such other objects as may hereinafter appear or be pointed out, in the manner illustratively exemplified in the accompanying drawing, wherein—

Figure 1 is an enlarged cross-sectional view through the essential portions of an ophthalmoscope constructed in accordance with the present invention;

Figure 2 is a view taken substantially along the line 2—2 of Figure 1, with certain parts broken away for the sake of clearness;

Figure 3 is an enlarged cross-sectional view taken substantially along the line 3—3 of Figure 2; and

Figure 4 is a view similar to the middle portion of Figure 2, showing a modification.

In the ophthalmoscope which I have herein illustrated, an electric lamp 10 is mounted in a suitable socket at the upper end of a lamp carrier 11, the lower portion 12 of which is adapted to serve as an electric terminal or terminals for engagement with a suitable battery or the like (indicated by the dot-and-dash lines 13), so as to furnish the electric energy for illuminating the lamp 10. Above the lamp a condensing lens 14 is customarily provided. This entire lamp unit is mounted in a tube 15 at the upper end of which there is a prism 16 adapted to receive the illumination from the lamp 10 and ultimately direct the beam in the direction of the arrow 17.

For a purpose hereinafter to be described, the sleeve 18 carrying the condensing lens 14 is provided with the aperture 19 directly alongside of the lamp 10; and the tube 15 is similarly provided with an aperture 20 in substantial alignment with the aperture 19.

This entire assembly is secured, in any suitable or desired manner, to a supporting element which consists of the back plate 21 and the cover plate 22. The back plate is provided with an opening 23 aligned with the aperture 20; and is also provided with the sight opening or aperture 24 directly above the tip of the prism 15. The plate 21 is also provided with the pivot portion 25 adapted to accommodate a stud 26, the latter serving to hold in position the cover 22.

The cover 22 has an aperture or sight opening 27 in alignment with the opening 24, and it is also provided with a second aperture 28 whose purpose will be presently described.

While not visible in Figure 1, it will be observed from the right-hand portion of Figure 2 that the back plate 21 is also provided with the leaf spring 29 whose free end bears against a detent 30 in the form of a small ball, this ball being snugly accommodated within an opening in the plate 21 provided for that specific purpose.

The present improved ophthalmoscope is completed by the lens disk 31 which, in accordance with my present invention, is composed of an integral element of suitable transparent material. In the illustrated embodiment, the disk is substantially circular, having the serrated edge 32 permitting the operator more readily to engage this edge and thereby rotate the disk around the pivot 25. To permit the disk to be mounted on the pivot 25, there is provided an opening adapted to fit slidably over the pivot 25. In the illustrated embodiment, this opening and the pivotal mounting are at the exact center of the circular lens disk.

Arranged in an arcuate circumferential manner are the lens portions 33, positioned so that they may be successively brought into registry with the sight openings 24 and 27. It is a characterizing and novel feature of the present invention that the lens portions 33 are integral portions of the disk or element 31. Preferably, each lens portion lies in its entirety within the confines of the disk 31, i. e., between the plane, parallel, front and rear faces of the disk 31.

The lens portions 33 are of different dioptric characteristics. For example, the uppermost lens portion of Figure 1 is convex on both sides; whereas the lowermost lens portion in Figure 1, and also the lens portion shown in Figure 3, are concave on both sides. Whatever the particular convexity or concavity of the lens portion may be, it will be noted that the resultant lens lies, preferably, in its entirety, within the confines of the disk 31.

The disk is also provided with a series of arcuately arranged, shallow depressions 34 which are so positioned that they come successively into engagement with the detent 30, thereby yieldably locking the lens disk in position every time one of the lens portions 33 comes into registry with the sight opening 27.

The present lens disk is also provided with a series of arcuately arranged indicia 35, only certain of which have been shown in Figure 2 for illustrative purposes. These indicia relate to the lenses 33, respectively, and are adapted to come successively into registry with the aperture 28, thereby enabling the operator to position any selected lens 33 in registry with the opening 27.

In the illustrated embodiment, the rear surface of the disk 31 is provided with the serrated, annular light diffusing portion 36, the serrations of Figure 2 being radial while the serrations of Figure 4 are not quite radial and intersect with one

another. In Figure 4, the annular portion is designated by the reference numeral 36', but the other features of the disk 31 are the same as in Figure 2 and, therefore, the same reference numerals are applied thereto.

The annular portion 36 is so positioned that one region thereof is always in alignment with the openings 19, 20, and 23. As a result, a portion of the illumination from the lamp 19 passes through the openings 19, 20, and 23, and impinges upon a portion of the serrations 36. This light is deflected by these serrations so that it travels by internal reflection through the body of the disk 31 and thereby imparts a novel and highly efficient type of illumination to the indicia 35, notwithstanding the fact that the aperture 28, through which these indicia are visible, is not in alignment with the openings 19, 20, and 23. As a result, the opening or aperture 28 may be positioned at any convenient point, even close to the sight opening 27. Moreover, the illuminated indicia that shows through the aperture 28 at any given time is not of a glaring character, but is, nevertheless, clearly visible even in a dark room.

From certain aspects, it makes no difference what the material is which enters into the construction of the lens disk 31. Preferably, however, the material is one which has the properties of being not only transparent, but colorless, of good light stability, of low specific gravity, and of a moldable character permitting the disk 31 to be formed by a molding procedure. By way of illustration, the disk 31 may be composed of the acrylic resin known on the market today as "Plexiglas" or the material known on the market as "Lucite." The latter is a thermoplastic acrylic resin, more particularly, meta-methylacrylate. This material is typical of those which may be used for the present purposes, and is admirably adapted for the present use. It is not only characterized by its thermoplastic and moldable qualities, but it is also of colorless transparency, of good light stability, of low specific gravity, of high impact strength, and it has good resistance to wear, and is easy to form and machine.

Moreover, a material of this character has excellent refractive powers which enhance the transmission of light through the interior by internal reflection.

The construction of the lens disk in an integral piece may be carried out in any suitable manner, depending upon the material used. Preferably, a mold is made in which all the apertures and lens portions are accurately formed, the material being then subjected to the mold in plastic or moldable form and being ultimately pressed into conformity with the accurate mold. This procedure obviously eliminates the necessity for separate manufacture of lenses, with all the ensuing inaccuracies that may result; and it obviates the necessity for thereupon individually mounting these lenses into separate and individual association with the usual metal lens-carrying disk.

Typical of the materials that may be employed for the manufacture of the integral lens disk are the acrylic resins hereinbefore mentioned and the condensation products of urea formaldehyde and of phenol formaldehyde, these products being available in transparent form and embodying the other characteristics hereinbefore mentioned. Also, pyroxylin, Celluloid, cellulose acetate, and similar plastic moldable materials, in pure transparent form, are suitable.

It will be understood that the broader phases of my invention do not require that the lens disk embody any indicia, nor any illumination of the same. However, the characteristics of a transparent material are admirably suited to provide for an illumination of the indicia, as hereinbefore described. However, the exact means of illuminating the indicia may, obviously, be varied to suit differing requirements.

In general, it will be understood that changes in the details, herein described and illustrated for the purpose of explaining the nature of my invention, may be made by those skilled in the art without departing from the spirit and scope of the invention as expressed in the appended claims. It is, therefore, intended that these details be interpreted as illustrative, and not in a limiting sense.

Having thus described my invention, and illustrated its use, what I claim as new and desire to secure by Letters Patent is—

1. In an ophthalmoscope, a supporting element having spaced apertures and provided with a pivot, a disk rotatably mounted on said pivot and composed of transparent material, a series of lens portions of differing dioptric characteristics integrally formed in the disk of one-piece therewith and arranged in an arc concentric with the pivot so as to register successively with one of said apertures when the disk is rotated, a series of indicia on the disk corresponding respectively to said lens portions and arranged in another concentric arc so as to register successively with the other aperture when the corresponding lens portions are in registry with the first-mentioned aperture, a source of light at the back of the supporting element, means for directing a beam of illumination from said light source into a direction aligned with the first-mentioned aperture, and means for directing some of the illumination into and through said disk to such portions thereof as to illuminate the indicia in registry with said second-mentioned aperture.

2. In an ophthalmoscope, a supporting element having spaced apertures and provided with a pivot, a disk rotatably mounted on said pivot and composed of transparent material, a series of lens portions of differing dioptric characteristics integrally formed in the disk of one-piece therewith and arranged in an arc concentric with the pivot so as to register successively with one of said apertures when the disk is rotated, a series of indicia directly on the disk corresponding respectively to said lens portions and arranged in another concentric arc so as to register successively with the other aperture, a source of light offset from the second-mentioned aperture, means for directing a beam of illumination into a direction aligned with the first-mentioned aper-

ture, and means formed in the disk for directing some of the illumination into and through said disk to the indicia so as to illuminate the indicia in registry with said second-mentioned aperture.

3. In an ophthalmoscope, the combination with the elements set forth in claim 1, of a spring-pressed detent mounted in said supporting element, and a series of detent-engaging portions formed in said disk and arranged in a concentric arc so as to register successively with said detent and thereby yieldably retain a lens portion and a corresponding indicia in registry with said apertures respectively.

4. In an ophthalmoscope, a supporting structure having spaced apertures and provided with a pivot, a disk rotatably mounted on the pivot and composed of transparent material, a series of lens portions of differing dioptric characteristics forming a one-piece structure with the disk and arranged in an arc concentric with the pivot so as to register successively with one of said apertures when the disk is rotated, a series of indicia directly on the disk on imperforate portions thereof and corresponding respectively to said lens portions and arranged in another concentric arc so as to register successively with the other aperture, a source of light offset from the first-mentioned aperture, means for directing a beam of illumination from said light source into a direction approximately aligned with the first-mentioned aperture, said disk having light diffusing means formed therein in a path of light from said source for directing some of the illumination into and through the disk to the indicia so as to illuminate the indicia in registry with the second-mentioned aperture.

5. In an ophthalmoscope, a supporting element having spaced apertures and provided with a pivot, a disk rotatably mounted on said pivot and composed of transparent material, a series of lens portions of differing dioptric characteristics integrally formed in the disk of one-piece therewith and arranged in an arc concentric with the pivot so as to register successively with one of said apertures when the disk is rotated, a series of indicia on the disk corresponding respectively to said lens portions and arranged in another concentric arc so as to register successively with the other aperture when the corresponding lens portions are in registry with the first-mentioned aperture, a source of light at the back of the supporting element, means for directing a beam of illumination from said light source into a direction aligned with the first-mentioned aperture, and means for directing some of the illumination to the indicia in registry with said second-mentioned aperture so as to illuminate the same from behind the disk.

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