Jan. 1, 1963 G. J. E. JAYLE 3,071,040

EYE TESTING PERIMETER

Filed Aug. 22, 1957

Fig. 1.

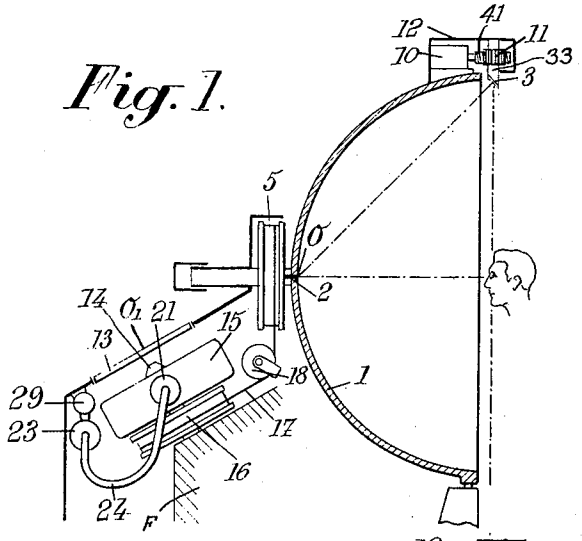
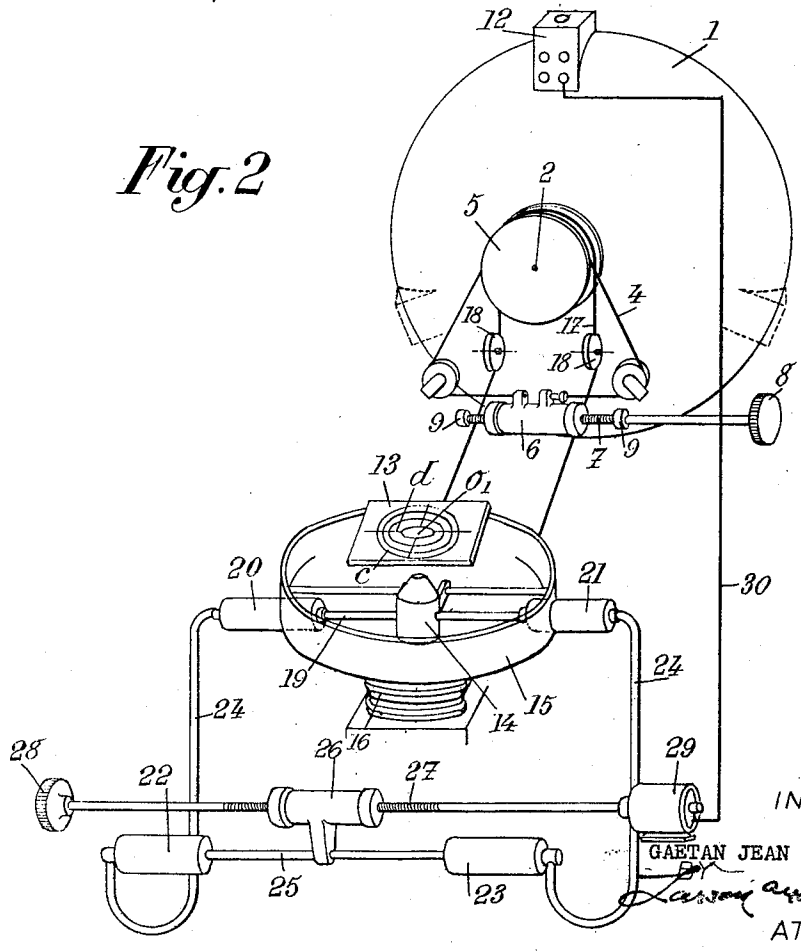


Fig. 2



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EYE TESTING PERIMETERS

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The present invention relates to ophthalmological apparatus for checking up the vision of a patient and in particular to perimeters, such apparatus comprising a bowl having an at least approximately part-spherical inner surface, the patient's eye being located at the center of said surface and light projecting means capable of forming a luminous spot at any desired point on said surface.

The object of my invention is to provide an apparatus of this kind which is better adapted to meet the requirements of practice than those used up to this time.

For this purpose, according to my invention, said bowl is journalled about the central axis of said surface and may be rotated through suitable means about said axis, and the light projecting means are movably carried by said bowl and actuated through suitable means to displace said luminous spot on a given great circle of said spherical surface located in a plane passing through said central axis.

Other features of my invention will become apparent in the course of the following detailed description of an embodiment thereof, with reference to the appended drawing, given merely by way of example and in which:

FIG. 1 is an elevational view partly in vertical section of a perimeter made according to my invention.

FIG. 2 is the corresponding perspective view.

The apparatus illustrated by the drawing comprises the following elements:

On the one hand, a bowl **1**, for instance having a hemispherical inner surface, at the center of which is placed the patient's eye, said bowl being journalled in the apparatus frame F about an axis **2** passing through the central point O of said surface;

And on the other hand, a light projecting device carried by bowl **1** and capable of forming on the inner surface thereof a luminous spot, said light projecting device including movable elements arranged in such manner that the luminous spot can be displaced on a given great circle of the spherical surface thereof located in a plane passing through said central point O.

For instance, as shown, this light projecting means comprises a tube **33** having a light source therein, the tube having an end face **3** mounted at 45° from the vertical on the lower end of the tube. The axis of the tube **33** passes through the center of spherical bowl **1** and the tube is mounted so as to be pivotable in casing **12** about said axis. The tube **33** is rigid with a worm wheel **11** surrounding it and the worm wheel meshes with a worm **41** fixed on the shaft of motor **10**. A light source within tube **33** sends a light beam to form the luminous spot on the inner surface of bowl **1**. The source is mounted in a fixed position with respect to bowl **1** so that, when motor **10** rotates tube **33**, the luminous spot formed by the beam from the tube **33** travels along the horizontal meridian circle shown in dotted lines in FIG. 1.

It will thus be possible, by combining the movements of bowl **1** about its axis **2** and those of tube **33**, to produce a luminous spot at any desired point with respect to the patient's eye.

The movement of rotation of bowl **1** about axis **2** may be obtained through manually controlled means including for instance, as visible on FIG. 2, a cable **4** forming a loop wound on a grooved pulley **5** fixed with respect to bowl **1** and rotating about axis **2**, said cable being mounted

so that it cannot slip with respect to said pulley. Both of the ends of this cable are fixed to a nut **6** movable axially along a screw **7** on which it is screwed, said screw carrying an operating wheel **8** so as to be movable between two end positions limited by abutments **9** and corresponding to the maximum angular displacements of bowl **1** (for instance 180°).

This system is combined with an observation device enabling the operator to follow on a frosted glass table **13** the displacements of another light spot emitted from a light projector **14** adapted to be moved with respect to said table with two elementary motions, that is to say a radial motion and an angular motion.

The displacements of this second mentioned luminous spot are controlled in such manner as to correspond to those of the luminous spot formed on bowl **1**.

For this purpose, for every position of the great circle described by the first luminous spot on bowl **1**, there corresponds a straight line described by the second spot on table **13**, the different straight lines such as *d* which can thus be traced on said table **13** corresponding to the different positions of said great circle of the spherical inner surface of bowl **1**, when said bowl is rotated about its axis **2**.

The circles described by the first luminous spot when the light projecting device **3** remains fixed with respect to the bowl and said bowl is rotated about its axis **2** are represented on table **13** by concentric circles *c*.

Thus, the indications given by the second spot on table **13** give exactly the position of the first light spot formed on bowl **1** with respect to the patient's eye.

In order to control the displacements of the second light spot, formed on table **13**, in accordance with the displacements of the first spot, formed on bowl **1**, I may for instance use the arrangement shown by the drawing:

The light projector **14** is carried by an annular member **15** capable of rotating about an axis at right angles to table **13** and passing through the central point thereof. For this purpose, this annular member **15** is mounted on a pulley **16**.

The axis **2** of bowl **1** carries a pulley of the same diameter as pulley **16** (and which may be constituted by the above mentioned pulley **5**) and pulleys **16** and **5** are coupled together by means of a semi-rigid cable **17** passing around said pulleys in such manner as to be unable to slip with respect thereto. Cable **17** passes on rollers **18**, which permits its tension to be adjusted and to give table **13** the desired inclination.

Thus, when the operator rotates wheel **8** in one direction, he produces a rotation in a given direction of bowl **1** about its axis, which in turn produces, owing to the transmission constituted by pulleys **5** and **16** coupled together by cable **17**, a rotation in a given direction of annular member **15**. When the operator turns wheel **8** in the opposed direction, he produces a rotation in the opposed direction of member **15**.

Furthermore, projector **14** is mounted on a rod **19** extending along a diameter of annular member **15**, said projector being always maintained in such position with respect to said rod that the beam it supplies is at right angles to table **13**. Projector **14** is fixed to the central portion of rod **19** and the ends of said rod are provided with two pistons (not visible on the drawing) slidable in receiver cylinders **20** and **21** carried by annular member **15** at the ends of a diameter thereof. Said cylinders **20** and **21** are connected through conduit **24** with two power cylinders **22** and **23**, the whole of said cylinders and said conduit being filled with a liquid so that the displacements of pistons slidable in power cylinders **22** and **23** are transmitted to the pistons slidable in cylinders **20** and **21**.

The pistons slidable in cylinders **22** and **23** (which are

not visible on the drawing) are mounted at the ends of a rod **25** which carries at the middle point thereof a nut **26** screwed on the screw-threaded portion **27** of a shaft carrying a control wheel **28**.

Said shaft is rigid with the rotor of a transmitter **29** controlling, through an electrical conductor **30**, the motor **10** which controls the displacements of the light projecting device **3**.

Thus, when the operator turns control wheel **28** in one direction, he produces a displacement in a given direction of rod **25** and therefore a corresponding displacement of rod **19**, so that the spot formed on table **13** is moved along a straight line passing through the center O_1 of said table **13**. Simultaneously, this rotation of wheel **28** produces, through transmitter **29** and motor **10**, a corresponding displacement of the light projecting device **3**.

In a general manner, while I have, in the above description, disclosed what I deem to be a practical and efficient embodiment of my invention, it should be well understood that I do not wish to be limited thereto as there might be changes made in the arrangement, disposition and form of the parts without departing from the principle of the present invention as comprehended within the scope of the accompanying claims.

What I claim is:

1. An ophthalmological apparatus which comprises, in combination, a frame, a bowl having an at least approximately hemi-spherical inner surface, said bowl being journalled in said frame about the central axis of said surface, the patient's eye being located at the center of curvature of the hemi-spherical surface, means for rotating said bowl with respect to said frame about said central axis, first optical means including a light source movably carried by the edge of said bowl for projecting a luminous spot directly on the inner surface of said bowl at a point of a given great circle of said spherical surface located in a plane passing through said central axis, means carried by said bowl for actuating said first optical means to cause said luminous spot to be displaced on said circle, an observation table carried by said frame at a distance from said bowl, said table having a central point, second optical means movable with respect to said table for projecting a light spot on said table, first control means for moving said second optical means to displace said light spot on straight lines passing through said central point of said table, means for operatively connecting said control means with said means for actuating said first optical means, second control means for moving said second optical means to displace said light spot on circles having their common center at said central point of said table, and means for operatively connecting said second control means with said means for rotating said bowl about the central axis of its surface.

2. An ophthalmological apparatus which comprises, in combination, a frame, a bowl having an at least approximately hemi-spherical inner surface, said bowl being journalled in said frame about the central axis of said surface, the patient's eye being located at the center of curvature of the hemi-spherical surface, means for rotating said bowl with respect to said frame about said central axis, first optical means including a light source movably carried by the edge of said bowl for projecting a luminous spot directly on the inner surface of said bowl at a point of a given great circle of said spherical surface located in a plane passing through said central axis, means carried by said bowl for actuating said first optical means to cause said luminous spot to be displaced on said circle, an observation table carried by said frame at a distance from said bowl, said table having a central point, an annular member pivoted in said frame about an axis perpendicular to said table and passing through the central point thereof, a light projector for forming a light spot on said table, means carried by said annular member for supporting said light projector therein slidably along a diameter of said annular member, said means being capable of keeping said light projector constantly directed at right angles to said table, first control means for moving said projector along said diameter, first means for operatively connecting said control means with said means for actuating said optical means, second control means for rotating said annular member about its axis, and second means for operatively connecting said second control means with said means for rotating said bowl about the central axis of its surface.

3. An apparatus according to claim 1, in which said second operatively connecting means are cable and pulley means.

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