United States Patent

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[54] **DUAL POTENTIOMETER**
13 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **338/131,** 338/132, 338/173, 338/196
[51] **Int. Cl.** **H01c 9/00**
[50] **Field of Search** 338/128, 130, 131, 132, 133, 134, 172, 173, 196, 191, 178, 179, 200, 201

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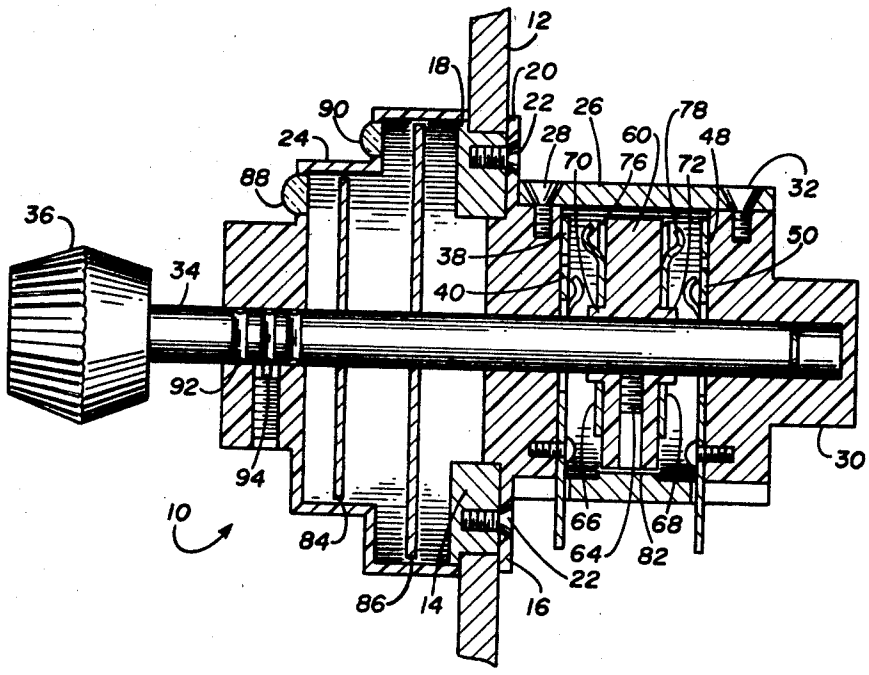
ABSTRACT: A dual potentiometer is operable by manipulation of a single shaft; two stationary resistive elements presenting annular tracks are axially spaced adjacent the shaft, and a contact hub is fixed on the shaft between the resistive elements with a pair of brushes for slidably contacting the elements; the shaft may be reciprocated to place a brush in contact with either of the elements, or to open circuit both potentiometers, and the shaft may be rotated to adjust the potentiometers; each of two indicator discs on the shaft is marked with appropriate calibrations for one of the potentiometers, and each is viewed through a lens having a focal length such that the disc is in focus when viewed through the lens when the shaft is in operating position for the potentiometer to which it relates.



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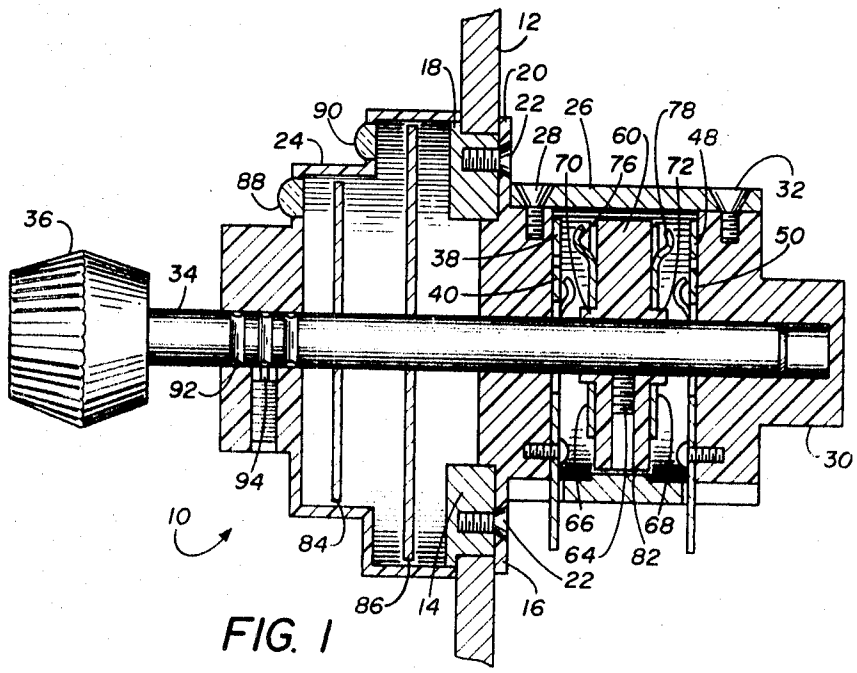

FIG. 1

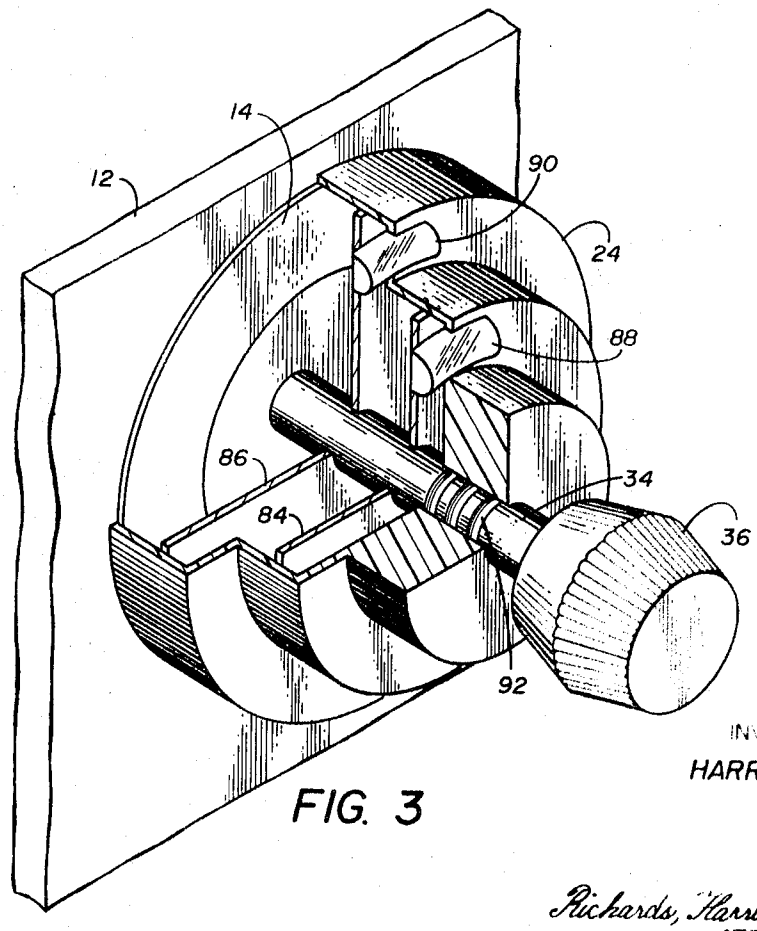

FIG. 3

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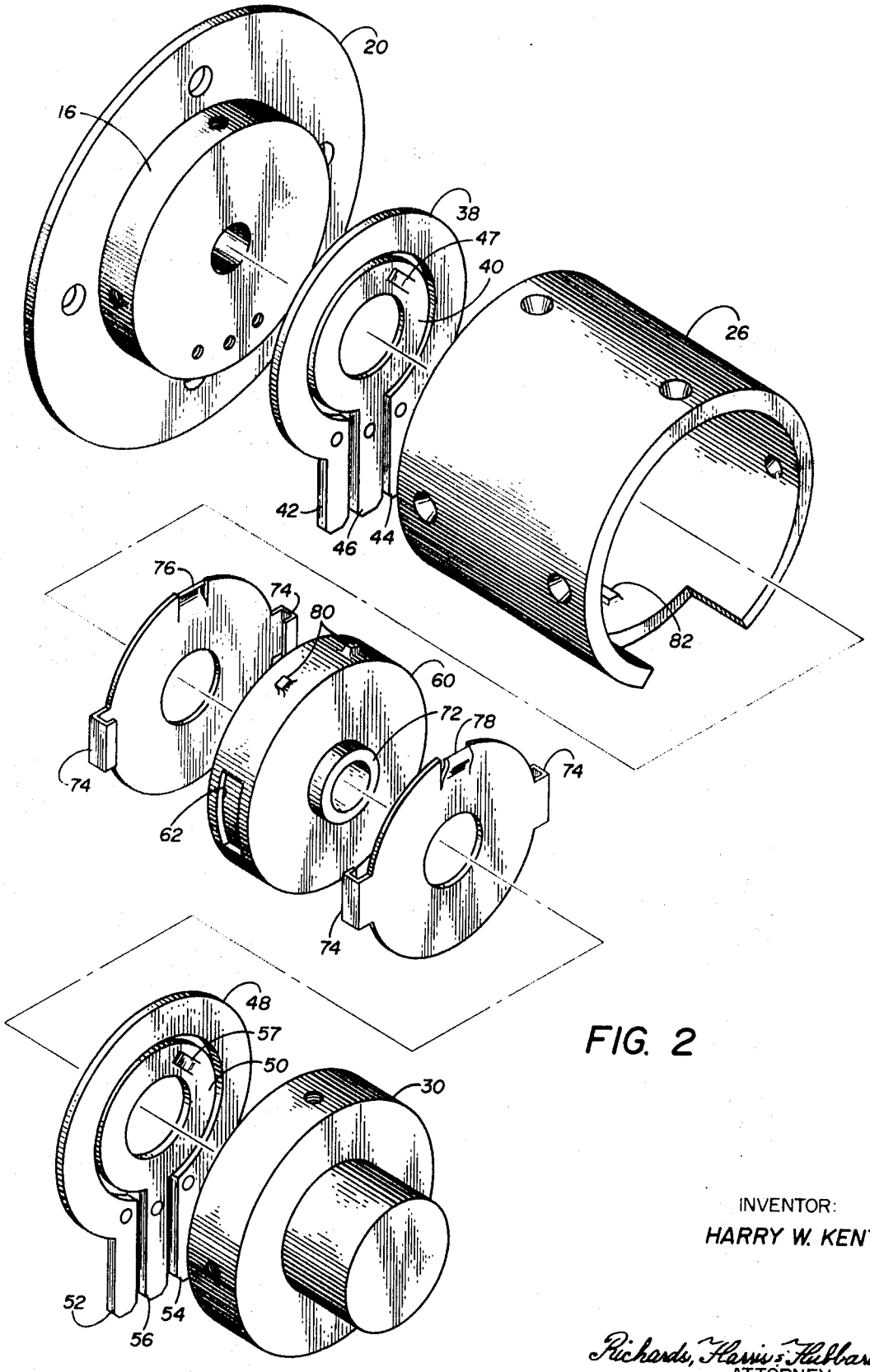

FIG. 2

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DUAL POTENTIOMETER

This invention relates to potentiometers and, more particularly, to a dual potentiometric device incorporating two potentiometers which may be used alternatively or switched off altogether, and having correspondingly alternative displays of the potentiometer settings.

The potentiometer, also known as a variable resistor or voltage divider, often plays an important role in adjustable electronic circuitry. The function of the potentiometer is to provide an electrical resistance in a circuit which may be selectively varied by the operator or by electrical or electromechanical control devices.

Various combinations of potentiometers are frequently used in electrical systems, linked together and into the system in any number of ways and employing a variety of modes of operation. Such a system may require that two potentiometers be used in the alternative, and that the capability be present of switching both potentiometers out of the system's circuit.

An important objective in such systems is to minimize the physical manipulations involved in making required control adjustments. It is also important to reduce the number of individual control knobs, switches, levers and the like, to facilitate the carrying out of control functions. It is therefore highly desirable to render a number of related but distinct control functions exercisable through a single control element.

While it is important to minimize the physical manipulations necessary to perform control functions by reducing the complexity of interface control elements, it is equally important to provide readily comprehensible optical displays representing various parameters of the system and subparts thereof. The value of reducing the number of control elements is lessened if clarity in the necessary displays is lost.

It is therefore an object of this invention to provide a device incorporating two potentiometers which permits alternative switching between two potentiometers by a single control element which can also be manipulated to vary the setting of the potentiometers.

A further object of the invention is the provision of a device having such a control element which may be moved to a position wherein both potentiometers are disabled.

Yet another object of the invention is to provide such a dual potentiometer with indicator means for each potentiometer which will present a readable display of the resistance values of its corresponding potentiometer only when the potentiometer is in operation, or at other selected times.

A further object of the invention is the provision of a device having the foregoing characteristics which is lightweight, compact, simple and relatively inexpensive to manufacture.

In accordance with this invention, there may be provided a dual potentiometer having a rotatable and reciprocatable shaft mounted adjacent first and second resistive means. Contact means carried by the shaft may be moved into sliding contact with either of the resistive means by reciprocation of the shaft, or may be moved to a position in which it contacts neither of the resistive means.

In a further aspect of the invention, indicator means carried by the shaft provide a display of the resistance setting of the potentiometer which is in service. The indicator means corresponding to each potentiometer is discernible when that potentiometer is in service, but is not discernible in other positions of the device.

This invention contemplates a device incorporating two potentiometers which is controllable by a single control element. The control element may be reciprocated to place either potentiometer in service, or to disable both potentiometers, and it may be rotated to vary the resistance setting of the potentiometers.

For a more complete understanding of the present invention and for further objects and advantages thereof, reference may now be had to the following description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a cross-sectional view of a dual potentiometer which embodies the present invention;

FIG. 2 is an exploded isometric view of a portion of the device shown in FIG. 1; and

Fig. 3 is a partially cutaway isometric view of a portion of the device shown in FIG 1.

Referring now to the drawings, a dual potentiometer generally indicated by the reference numeral **10** is shown mounted in a control panel **12** by means of mounting plates **14** and **16**. Flanges **18** and **20** on mounting plates **14** and **16**, respectively, are provided to hold the device securely in place in panel **12** when the mounting plates **14** and **16** are secured together by appropriate means, such as screws **22**.

An indicator housing **24** is positioned on mounting plate **14** in front of the panel **12**. Housing **24** may be secured to mounting plate **14** about flange **18** by acrylic cementing. A rear housing **26** is secured to mounting plate **16** to the rear of panel **12** by means of screws **28**.

The housing **26** is closed by rear plate **30**, held in place by screws **32**. A central shaft **34** extends through the device, riding in apertures in indicator housing **24**, mounting plate **16** and rear plate **30**. The shaft **34** is journaled slidably in those members, so that it may be rotated and reciprocated. A control knob **36** is secured to the outer end of shaft **34**.

A resistance ring **38** is secured to the rear face of mounting plate **16**, and a referencing ring **40** is mounted concentrically therewith on plate **16**. The resistance ring **38** has ends extending through housing **26** to present exterior electrical terminals **42** and **44**. Similarly, referencing ring **40** has an external tap **46** extending through housing **26**. Referencing ring **40** is provided with raised contact **47**.

A second resistance ring **48** and referencing ring **50** are mounted concentrically on the rear plate **30**, in the same manner as rings **38** and **40**. Resistance ring **48** terminates in external taps **52** and **54**. Referencing ring **50** has an exterior terminal **56**, and a raised contact **57**.

Resistance rings **38** and **48** are formed so that the electrical resistance between circumferentially spaced pints thereon varies over a desired range in dependence upon the circumferential distance between the points. This may be achieved, for example, by forming the rings **38** and **48** from a material which will give resistance values varying over the desired range. For example, a sintered carbon might be used for rings **38** and **40**. Other ways of providing the variable resistance in rings **38** and **48** will be appreciated, such as by winding a long continuous wire about the rings. Discrete variations in resistance about the rings **38** and **40** might be provided by employing printed circuit boards on the faces of the rings, with the electrically connected material being arrayed in serpentine fashion along the annulus.

Between rings **38** and **48**, a contact mount **60** having mounting slots **62** on its sides is fixed to the shaft **34** by means of setscrew **64**. Contact rings **66** and **68** are mounted on the opposite faces of mount **60**, about hubs **70** and **72** provided on mount **60**. The contact rings **66** and **68** are secured to the mount **60** by means of tabs **74** on the contact rings, which tabs **74** are inserted in slots **62**. The contact rings **66** and **68** are provided with contact brushes **76** and **68**. The inner radius of contact rings **66** and **68** is smaller than the radial distance from the axis of the shaft to the raised contacts **47** and **57** on referencing rings **40** and **50**.

A pair of ears **80** are provided on the mount **60** for cooperation with a raised portion **82** on the inside of housing **26**. Cooperation of the ears **80** with the raised portion **82** limits the rotation of mount **60**, and thus contact rings **66** and **68**.

Indicator discs **84** and **86** are mounted on the shaft **34**, and are calibrated on their outer faces with markings corresponding to the possible resistances obtainable across terminals **44—46** and **54—56**, respectively. The discs **84** and **86** may be viewed through lenses **88** and **90**, respectively.

Three notches **92** are provided in the shaft adjacent housing **24**, for cooperation with detent means such as a spring plunger **94** shown mounted in housing **24**. The notches **92** define three

discrete axial positions of the shaft **34**. In FIG. **1**, the plunger **94** engages the center notch, which places the device **10** in its off condition. In this position, there is no contact between any portion of either contact rings **66** or **68** and either resistance rings **38** or **48**.

WHEn the left-hand notch is engaged with the plunger **94**, contact **78** on contact ring **68** slidingly engages the resistance ring **48**, and the contact **57** on referencing ring **56** also slidingly engages contact ring **68**. In the third position of the shaft **34**, in which plunger **94** engages the third notch, the brush **76** on contact ring **66** slidingly contacts resistance ring **38**, and the contact ring **66** is placed in sliding engagement with the contact **47** on referencing ring **40**. **88**.

The lenses **88** and **90** are selected so that viewing of the respective discs **84** and **86** is only possible at a selected position or positions of the shaft **34**. The lens **88** is provided so that its focal with the resistance ring **38**. In this position, however, disc **86** is not viewable through lens **90**. Disc **86** is discernible through lens **90** when brush **78** engages resistance ring **48**, but at such time the disc **84** is not readable through lens **88**.

The dual potentiometer **10** is operable by a simple manipulation of the knob **36** on shaft **34**. Resistances which increase with clockwise rotation of the shaft **34** are obtainable across terminals **44—46** and terminals **54—56**, when the shaft **34** is in the appropriate axial position. Conversely, decreasing resistances with clockwise rotation would be obtained across taps **42—46** and **52—56**.

In the position shown in FIG. **1**, the device is in the "off" state, with both potentiometers disabled. There are open circuits across all terminals of the device in this position. To actuate either potentiometer, the knob **36** is either pushed or pulled to create the desired engagement of contact in resistance rings. The resistance value may be adjusted by rotation of the knob **36**. The value may be read from the indicator disc corresponding to the potentiometer which is engaged. Simplicity and readability of the display is provided by virtue of the fact that the indicator disc which is not in service is unreadable.

Having described the invention in connection with certain specific embodiments thereof, it is to be understood that further modifications may now suggest themselves to those skilled in the art and it is intended to cover such modifications as fall within the scope of the appended claims.

What I claim is:

1. A dual potentiometer comprising:
- a rotatable and reciprocatable shaft;
- first resistive means;
- second resistive means spaced from the first resistive means;
- contact means carried by the shaft for movement between sliding contact with the first resistive means and sliding contact with the second resistive means;
- first indicator means for indicating the position of the contact means with respect to the first resistive means, which first indicator means is discernible when the contact means is in contact with the first resistive means and is not discernible in at least one other position of the contact means; and
- second indicator means for indicating the position of the contact means with respect to the second resistive means, which second indicator means is discernible when the contact means is in contact with the second resistive means and is not discernible in at least one other position of the contact means.

2. The combination of claim **1**, wherein the means for rendering the indicator means discernible or not are:
- the mounting of the first and second indicator means on the shaft for movement with the shaft; and
- lens means fixedly positioned adjacent the indicator means for viewing the indicator means therethrough.

3. A dual potentiometer comprising first variable resistive means, second variable resistive means, contact means, and means responsive to manipulation of a single control to:
- switch the contact means between a first position in which it contacts the first variable resistive means and a second position in which it contacts the second variable resistive means;
- slide the contact means against the first variable resistive means; and
- slide the contact means against the second variable resistive means.

4. The combination of claim **3** wherein said means responsive to manipulation of a single control is operable to place the contact means in a position not contacting either variable resistive means.

5. The combination of claim **3** wherein said means responsive to the manipulation of a single control comprises a rotatable and reciprocatable shaft adjacent both said variable resistive means, and the mounting of said contact means on said shaft.

6. A dual potentiometer comprising:
- a rotatable and reciprocatable shaft;
- first resistive means;
- second resistive means;
- contact means rotatable with the shaft, and movable into sliding contact with the first resistive means by reciprocation of the shaft to a first axial position, and movable into sliding contact with the second resistive means by reciprocation of the shaft to a second axial position; and
- a pair of terminals associated with each resistive means such that the resistance across the pair is varied as the contact means slides against the resistive means with which the pair is associated.

7. The combination of claim **6**, wherein the shaft is reciprocatable to a third axial position in which the contact means contacts neither of the resistive means.

8. The combination of claim **6**, wherein one terminal in each pair of terminals is electrically connected to a referencing means mounted fixedly adjacent each resistive means whereby each referencing means engages the contact means when the contact means is in contact with the adjacent resistive means.

9. A control device comprising:
- a rotatable and reciprocatable shaft for controlling a plurality of variable functions, each function being variable by rotation of the shaft at one of a plurality of axially spaced positions of the shaft;
- indicator means corresponding to each controlled function;
- optic means for viewing each indicator means therethrough; and
- means for varying, as the shaft is reciprocated, the distance between each indicator means and the optic means through which it is viewable, whereby each indicator means is in focus when viewed through the optic means when the shaft is in at least one predetermined axial position of the shaft, but is not in such focus for all positions of the shaft.

10. The combination of claim **9**, wherein the means for varying the distance between the indicator means and the optic means is the mounting of the indicator means on the shaft.

11. The combination of claim **9** wherein each indicator means is in focus when viewed through the optic means when the shaft is in the position in which the function corresponding to the indicator means is variable by rotation of the shaft.

12. The combination of claim **11**, in which each indicator is in focus in at least one additional predetermined position of the shaft.

13. The combination of claim **9**, wherein the optic means comprises a plurality of lenses, each optically aligned with one of the indicator means.