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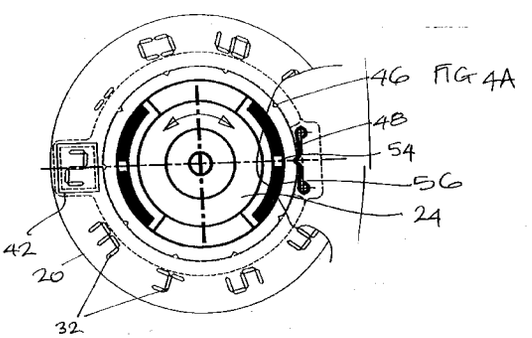
(54) Indicators for electrical apparatus.

(57) An indicator comprises a shutter 20 having apertures 32 arranged to denote settings of the control passing over a light diffuser 34. The shutter 20 is coupled to an actuator 24 of the control by a lost motion mechanism comprising springs 56 arranged in peripheral grooves 52 of the actuator between the ends of the grooves and side walls of lugs 54 of the shutter 20. The shutter is held in a desired setting position by a detent spring 48, but as the actuator 24 is rotated, springs 56a, 56b are loaded until they overcome the detent force, so as to flick the shutter to the next setting position under spring force.



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The present invention relates to indicators for apparatus, particularly electrical apparatus, having rotary control members and in particular, but not exclusively, to indicators showing a power level set by a rotary control for electrical heating appliances such as cooker hot plates, hobs, grills and ovens.

In an attempt to improve the appearance of electric cookers and hobs, manufacturers have sought to devise new ways in which to indicate to a user the power setting of a heating element, for example. In particular, it has been proposed to include a display means providing a variable illuminated region the extent and/or pattern of which is indicative of the power setting. This form of display means may be provided instead of or in addition to a printed numerical scale which is traditionally associated with the or each control knob of the device. Recent proposals have included arrays of light emitting diodes or neon bulbs, arranged in a linear manner. These are controlled electronically in response to turning of a control knob of the element in question to illuminate more of the neons or l.e.d.'s as the power setting is increased. Other proposals have included arrays of neon bulbs arranged in a 'bar-eight' configuration in which by illuminating selected combinations of the bulbs, the numerals 0 to 9 may be displayed. Again, this type of array is controlled electronically in response to turning of the control knob.

These arrangements are, however, expensive. The present invention seeks to provide an alternative mechanical system which avoids the need for large numbers of neons or l.e.d.'s and a multiple electrical switch means or electronic encoders and decoders for electronic controls.

Viewed from one aspect the invention provides a level indicator associated with a rotary control in or for an electrical or other apparatus, comprising a display means which provides a visible illuminated region whose extent and/or pattern is indicative of the level set by the control, wherein the visible illuminated region of the display means is varied by a shutter means which is coupled to a rotary actuating member of the control.

A modern illuminated type of display may therefore be provided without the need to provide a large number of individual electronically controlled indicator bulbs.

In this regard the term 'level' will be understood to mean the magnitude of a parameter set by the control. For example, in the context of electrical cooking apparatus the level may be the power supplied to a heating element.

The display means may be illuminated, for example from the front, but preferably it is illuminated from behind and comprises light transmission means whereby the light from a light source (which may, for example, comprise one or more neon bulbs) may be transmitted to an observer. The light transmission means may take several forms, for example one or more apertures, transparent or translucent areas, which are selectively covered and uncovered by the shutter means. The shutter means may be placed either between the light source and the display means or between the display means and the observer. Preferably, however, the shutter means is arranged in front of the display means.

The illuminated region provided by the display means may take a variety of forms. In one embodiment, for example, the display means may provide a "bar-eight" array of elements, which are selectively covered or uncovered by the shutter means in a desired combination to form the digits 0 to 9. The shutter means may comprise separate shutters for each element, coupled to the actuating member of the control by a suitable mechanism so that upon turning from the 'off' position to the fully 'on' position the digits 0 to 9 say, are sequentially displayed.

In the presently preferred embodiments, however, the display means provides an illuminated scale, wherein a larger or smaller portion of the scale is exposed or illuminated as the actuating member is rotated, to represent the setting of the control.

The scale may be formed, in one embodiment, as an arc extending around the actuating member of the control. Preferably, however, the display means provides a substantially linear scale.

The scale may comprise a series of discrete, aligned areas, in the form of apertures, transparent or translucent regions, through which light may be transmitted and which are selectively covered or uncovered by the shutter means. This arrangement is particularly preferred since it imitates the effect obtained using a plurality of individually controllable discrete neon bulbs or l.e.d's.

The effect of a digital or electronic display may be further enhanced by configuring the shutter means so as to change the display between settings in a step-wise manner. This will be discussed further below.

In another embodiment, the scale may be a single elongate area, again defined by an aperture or transparent or translucent window. To indicate increasing power settings of the control, the width and/or length of the illuminated area may be increased by movement of the shutter means therealong.

The shutter means may comprise a rotary mask adapted to rotate with the actuating member by, for example, being directly mounted to the actuating member.

In one embodiment, a cam-like profile of varying radius may be formed on an outer periphery of the mask, whereby the outer edge of the mask will selectively cover or expose areas of the display means as it rotates.

In an alternative embodiment, however, the mask

may have a window formed in it, and the cam-like profile formed on a radially inwardly facing edge of the window.

The cam-like profile may be smooth, for example in the form of a smooth spiral. In this way, the area of a display means exposed or covered can be changed in a continuously varying manner. Alternatively, the profile may be formed from a series of discontinuous, for example linear, sections.

In a particularly advantageous embodiment, the discrete sections are joined by steps, preferably radially aligned with the axis of rotation of the mask. This arrangement gives a sharp transition between the display for successive settings. Preferably the sections are formed as arcs of successively increasing radii from the centre of rotation of the mask.

A particularly effective arrangement is obtained when the display means comprises a series of discrete illuminated areas as described above, when the effect obtained is one of individual bulbs lighting almost instantaneously. Then, each section of the profile may be arranged as an arc having a radius which lies between the outer radius of the illuminated area which it is intended to cover, and the inner radius of the next illuminated area. As the mask rotates, therefore the arc will cover its illuminated area, but will not encroach upon the next area. That area will be covered by the step between that arc and the next, radially more outward, arc upon sufficient rotation of the mask.

Of course, if the arrangement of the illuminated areas is such as to permit, the sections need not be formed as arcs of constant radius. Rather they can be linear or some other form, so long as the profile between successive steps does not encroach on the next illuminated area during rotation of the mask.

In such arrangements, the illuminated areas are preferably aligned on a radius extending from the axis of rotation of the mask. This allows a constant spacing between successive illuminated areas to be easily achieved. The arcs of the profile may then be formed on radii lying, for example, halfway between each successive illuminated area.

The visual contrast between the mask and the area surrounding the illuminated areas may be minimal to render the sections of the profile lying between the illuminated areas substantially invisible to a user.

As stated above, it is a preferred feature of the invention that the display means changes from one setting to another in a step-wise manner, in order to simulate an electronic control.

From a further aspect therefore, the invention provides a display for a rotary control comprising a rotary actuating member settable in a number of discrete positions representing different settings of the control, and a display modification member coupled to said actuating member for changing said display as said actuating member is rotated, wherein said display modification member is coupled to said actuating member such that said display is changed in a step-wise manner as said actuating member is rotated.

Preferably the member for changing the display is resiliently loaded to effect this movement, the loading being facilitated by a lost motion mechanism between that member and the actuating member of the control. In one embodiment, the display modification member, or shutter, is retained in discrete positions by detent means, initial movement of the actuating member acting to pre-load spring means or other resilient means while the modification member remains in its initial position by virtue of the detent means, the pre-loading of the spring means eventually overcoming the retention force of the detent means to allow the modification member to move quickly to its next setting under the spring load.

In a simple embodiment, the display modification means is merely a rotary member having symbols representing the settings of the control arranged circumferentially thereabout. Preferably however the modification means comprises a shutter having sets of apertures arranged in different configurations to simulate the digits of a 'bar-eight' display. This is particularly preferred since it gives the impression of a neon display in which the settings change instantaneously.

In practice, the display means may be mounted behind a fascia panel of an appliance such as an electrical appliance.

From a further aspect therefore, the invention, provides an appliance comprising an indicator in accordance with the invention. Preferably the display means of said indicator is arranged in or behind a fascia panel of the appliance, and a rotary control for said appliance is arranged behind said fascia panel, the actuating member of the control of the appliance extending through said panel for manipulation by a user, and being coupled to the shutter means of said indicator.

Preferably the appliance is an electric cooker and the control an energy regulator for supplying electrical energy to an element of the cooker.

Preferably, the control itself comprises illumination means which are arranged behind the display means of the indicator, to obviate the need for additional, separate, illumination means.

Preferably the panel has a window through which the display means may be viewed. The window may have a lens to assist a user of the appliance in viewing the display means. A translucent lens is preferred since it enables the display to be viewed from different angles and not just face on.

Some preferred embodiments of the invention will now be described by way of example, with reference to the accompanying drawings in which:

Fig. 1 is a schematic view of part of an electrical

appliance incorporating the invention;

Fig. 2 is a schematic view of the appliance of Fig. 1 with its fascia panel removed to expose details of the indicator; and

Fig. 3 is a scrap view showing an alternative form of display means.

Fig. 4A shows schematically a second embodiment of the invention in one setting position;

Fig. 4B shows schematically the embodiment of Fig. 4A mid-way between setting positions;

Fig. 4C shows schematically the embodiment of Fig. 4C in its next setting position.

Fig. 5 is a side sectional view of Fig. 4A.

Fig. 6B is a vertically exploded view of Fig. 5; and

Fig. 7A shows a view along arrow 7A in Fig. 6; A to 6.

Fig. 7B shows a sectional view along the line 7B-7B in Fig. 6; and

Fig. 7C shows a view along arrow 7C in Fig. 6.

With reference now to Fig. 1, there is shown a section of a fascia panel 1 of an electric cooker. The electrical supply to an element of the cooker is controlled by an energy regulator 2, the actuating member 3 (Fig. 2) of which extends through the panel 1, and on the end of which is mounted a control knob 4.

A translucent lens 5 is provided in the panel 1 for viewing the display means 6 of a power setting indicator 7 (Fig. 2) arranged behind the panel 1.

With reference to Fig. 2, the indicator is shown in further detail. A rotary mask 8 is hinged onto the actuating member 3 of the energy regulator 2 which is arranged behind a further panel 9 of the appliance, so as to rotate with the actuating member. The mask 8 is formed with a window 10 having on a radially inwardly facing edge thereof, a cam-like profile 11 comprising ten discrete portions 12.

The display means 6 provides an illuminated scale comprising a series of ten equispaced apertures 13 arranged in a line on a radius extending from the axis of rotation A of the actuating member 3 and mask 8. Typically the apertures may be 2mm in diameter, and they may be spaced apart by 0.5mm.

The energy regulator 2 has a neon bulb arranged in an extension portion 14 so as to lie behind the display means 6, so as to illuminate it. If required, a diffuser (not shown) may be arranged between the neon bulb and the apertures 13 to distribute light thereto.

It will be apparent that as the actuating member 3 is turned by the knob 4, the mask 8 will rotate such that the window 10 exposes a greater or lesser number of the apertures 13. The arrangement of the mask 8 is such that when the energy regulator is switched off, none of the apertures 13 is exposed, and that as the setting is steadily increased, more and more illuminated apertures 13 appear.

It will be noted that the discrete sections 12 of the profile 11 are each formed on an arc of a constant radius from the axis A, and joined by radially extending steps 15. The radius of any particular section is chosen such that it lies between adjacent apertures 13 on the display means. This arrangement ensures that the apertures 13 become exposed or covered by the steps 15 over a very small arc of rotation of the knob 4, so giving the impression of a bulb being switched on.

In the power setting shown in Figs. 1 and 2, seven out of ten of the illuminated apertures 13 are exposed, indicating a nominal power setting of '7'. The mask 8 obscures the remaining three apertures 13. To enhance the visual appeal of the indicator, the visual contrast between the mask 8 and the area of the display surrounding the apertures 13 may be minimal and/or the lens 5 be such that the edge sections 12 of the mask will not be easily visible to an observer.

The panel 9 may be formed with a slot (not shown) into which different display means 6 may be inserted. Fig. 3 shows an alternative display means in the form of a scale 20 formed as an inverted triangular section window 21. As the actuating member 3 is rotated to a higher setting, the length and width of the scale 20 exposed increases.

Of course the above embodiments are merely exemplary of the invention, and many variations will be apparent to the skilled person. For example, the apertures 13 could be replaced by transparent or translucent windows or lenses, which may be coloured. Also, the scale need not be linear nor need it be aligned with the axis of rotation of the actuating member. Furthermore, if, for example, a scale was required which indicated an increased setting from the top down rather than from the bottom up as in the illustrated embodiments, the mask profile could be provided on the outer edge of the mask rather than on a window formed therein.

A further embodiment of the invention will now be described with reference to Figs. 4A to 7.

With reference to Figs. 4 and 5, a shutter member 20 is arranged behind the fascia panel 22 of a cooking appliance. The shutter member is coupled to a central actuating member 24 via a lost motion mechanism, as will be described below. The actuating member 24 is keyed to the shaft 26 of a control 28 to rotate therewith upon rotation of a control knob 30.

The shutter 20 is an opaque moulded plastics member and is formed around its circumference with groups of apertures 32 arranged to simulate the digits 0 to 9 of a 'bar-eight' display and representing settings of the control 28. The digits 32 pass over, and are illuminated by, a diffuser 34 arranged in a housing 36, which also mounts the shutter 20. The housing 36 has a depending portion 38 which acts to guide light from a light source 40 to the diffuser 34. The fascia panel 22 has a window 42 to allow viewing of the digit 32 above the diffuser 34.

The shutter 20 is received in a bore 44 of the housing 36, and has a plurality of notches 46 formed

in its lower circumference. A bow-shaped detent spring 48 is mounted on pegs 50 the housing 36 and engages in the notches 46 to retain the shutter in a number of predetermined positions in which digits 32 will appear through the window 42. The assembly sits on a chassis member 62.

As mentioned above, the shutter member 20 and the actuating member 24 are coupled by a lost motion mechanism. The actuating member 24 has two arcuate peripheral grooves 52 which slidably receives opposed lugs 54 provided on the inner periphery of the shutter member 20. The shutter member fits onto the actuating member 24 from below, the lugs 54 passing through cut outs 60 on the periphery of the member 24. Four partially pre-loaded coil springs 56 of substantially the same spring force are also arranged in the grooves 52 extending between the end walls 58 of the grooves and the opposed side faces 60 of the lugs 54.

Operation of the display will now be described with reference to Figs. 4A to 4C. Fig. 4A shows the display in a first condition in which setting "2" is illuminated. The display is retained in this position by the detent spring 48 engaging in an opposed notch 46 of the shutter. As shown in Fig. 4B, as the actuating member 24 is turned anticlockwise, with a view to reducing the control setting to "1", the actuating member 24 moves relative to the shutter 22, this movement being accommodated by the grooves 52. As the actuating member 24 is rotated, however, opposed springs 56a, 56b are compressed between the ends 58 of the grooves 52 and the sides 60 of the lugs 54. The movement of the actuator 24 will continue to the point where the combined load exerted by the springs on the lugs 54 exceeds the retention force of the detent spring 48, at which point the shutter 20 will flick forward under the force of the springs 56a, 56b to its next position, as shown in Fig. 4C, where it will again be held by the detent spring 48. This gives the impression of an instantaneous change from one setting to another.

Of course such a spring loaded arrangement could equally well be applied to the embodiment of Figs. 1 and 2.

Furthermore, although preferred the shutter 20 need not have apertures 32 as described. It could for example merely have printed figures.

Claims

1. An indicator associated with a rotary control in or for particularly an electrical apparatus, comprising a display means which provides a visible illuminated region whose extent and/or pattern is indicative of the level set by the control, wherein the visible illuminated region of the display means is varied by a shutter means which is coupled to a rotary actuating member of the control.

2. An indicator as claimed in claim 1 wherein the display means provides an illuminated scale, wherein a larger or smaller portion of the scale is exposed or illuminated as the actuating member is rotated, to represent the setting of the control.

3. An indicator as claimed in claim 2 wherein said scale is linear.

4. An indicator as claimed in claim 3 wherein said scale comprises a series of discrete, aligned areas, in the form of apertures, transparent or translucent regions, through which light may be transmitted and which are selectively covered or uncovered by the shutter means.

5. An indicator as claimed in any preceding claim wherein said display means is configured and arranged to represent discrete settings of the control, and said shutter means is configured and arranged so as to change the display in a step-wise fashion.

6. An indicator as claimed in claims 4 and 5 wherein said shutter means comprises a rotary mask having a cam profile, the profile comprising discrete sections joined by steps.

7. An indicator as claimed in claim 6 wherein said discrete sections are formed as arcs of successively increasing radii, and said steps extend generally radially.

8. An indicator as claimed in any of claims 5 to 7 wherein said shutter means comprises a shutter member coupled to said actuating member of the control via spring means for moving said shutter means between settings in a step-wise manner.

9. An indicator as claimed in claim 8 comprising detent means for selectively retaining said shutter member in a number of discrete positions, corresponding to discrete settings of the control, said spring means being arranged between the actuating member of the control and the shutter member, such that as said actuating member is turned from one setting position to the next setting position, said actuating member initially moves relative to said shutter member, thereby loading the spring means to the point at which the spring load overcomes the retaining.force of the detent means whereupon said shutter member moves from said one to said next setting position under the force of said spring means.

10. An indicator as claimed in claim 9 wherein said

spring means comprises springs which may be loaded by motion of said actuating member in either rotary direction.

11. An indicator as claimed in claim 9 or 10 wherein said spring means is arranged symmetrically about the axis of rotation of said control.

12. An indicator as claimed in any of claims 8 to 11 wherein said shutter means comprises a mask having symbols passing in front of said illuminated region and representing settings of the control.

13. An indicator as claimed in claim 12 wherein said symbols are digits formed by apertures in said mask.

14. A display for a rotary control comprising a rotary actuating member settable in a number of discrete positions representing different settings of the control, and a display modification member coupled to said actuating member for changing said display as said actuating member is rotated, wherein said display modification member is coupled to said actuating member such that said display is changed in a step-wise manner.

15. A display for a rotary control as claimed in claim 14 wherein said modification member is resiliently biased to effect its movement.

16. A display for a rotary control for an electrical apparatus as claimed in claim 14 or 15 wherein said modification member is selectively retainable in a number of discrete positions by detent means, and is coupled to said actuating member via a lost motion mechanism comprising spring means which is pre-loaded by an initial rotary movement of said actuating member, and which moves said modification member to an adjacent setting when the pre-loading force exceeds the retaining force of the detent means.

17. A display for a rotary control for an electrical apparatus as claimed in claims 14, 15 or 16 wherein said modification member comprises a shutter having groups of apertures representing control settings arranged circumferentially thereabout.

18. Cooking appliance comprising a display as claimed in any preceding claim.

19. An appliance as claimed in claim 17, the display means of said indicator is arranged in or behind a fascia panel of the appliance, and a rotary control for said appliance is arranged behind said fascia panel, the actuating member of the control of the appliance extending through said panel for manipulation by a user, and being coupled to the shutter means of said indicator.

20. An appliance as claimed in claim 9 wherein the appliance is an electric cooker and the control an energy regulator for supplying electrical energy to an element of the cooker.

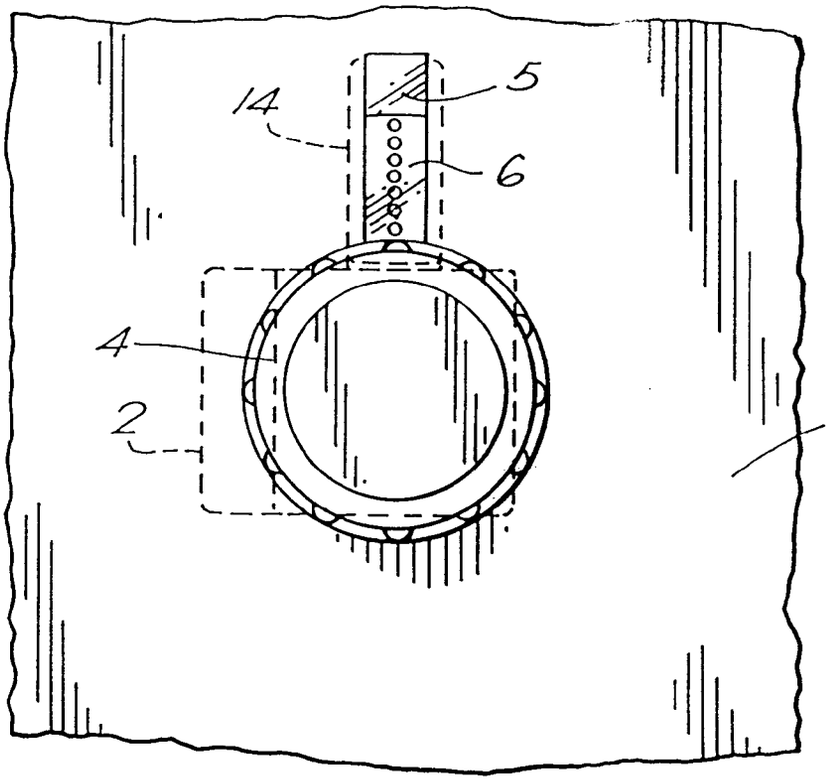
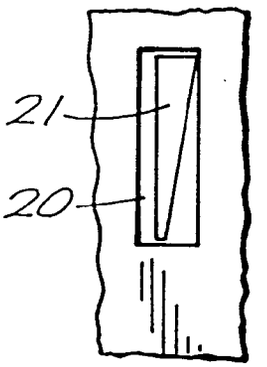


FIG.1.

FIG.3.



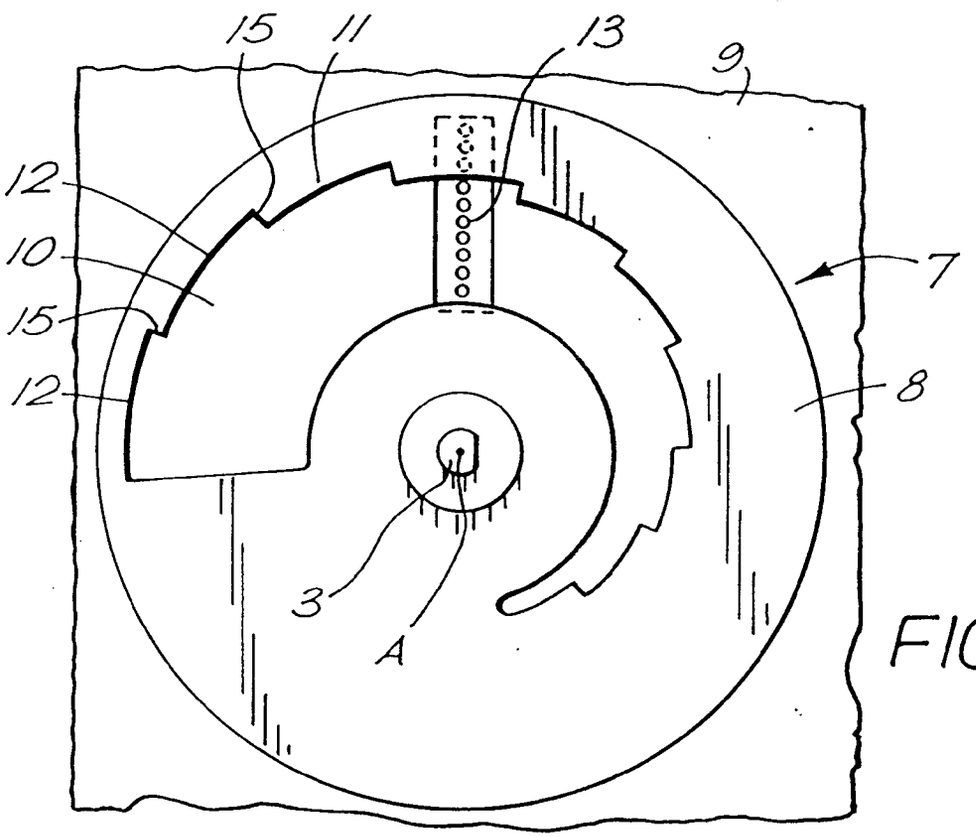


FIG.2.

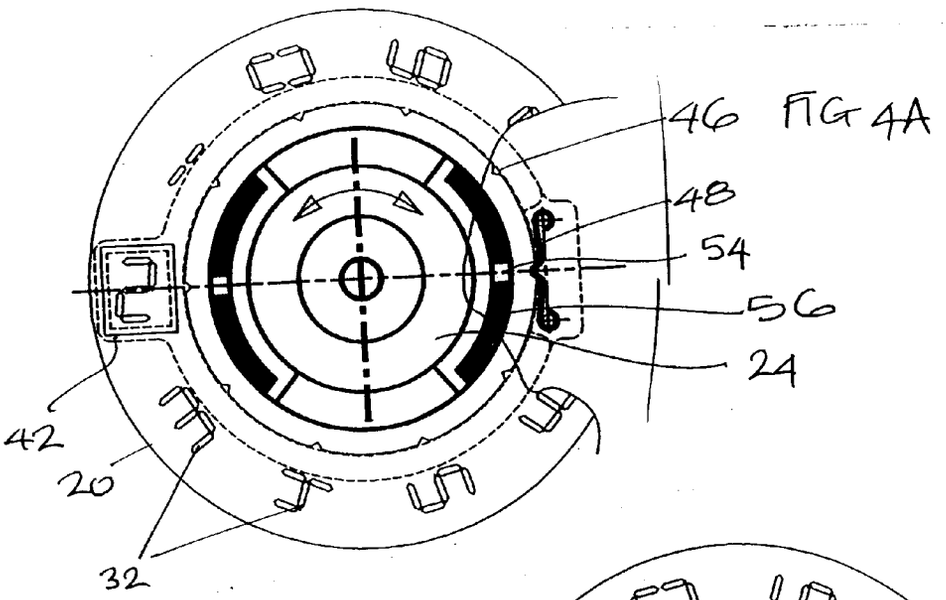


FIG 4A

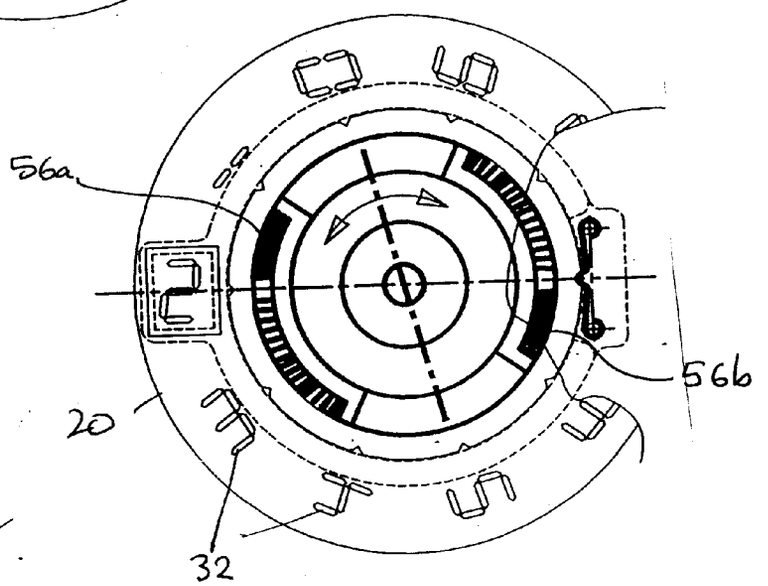


FIG 4B

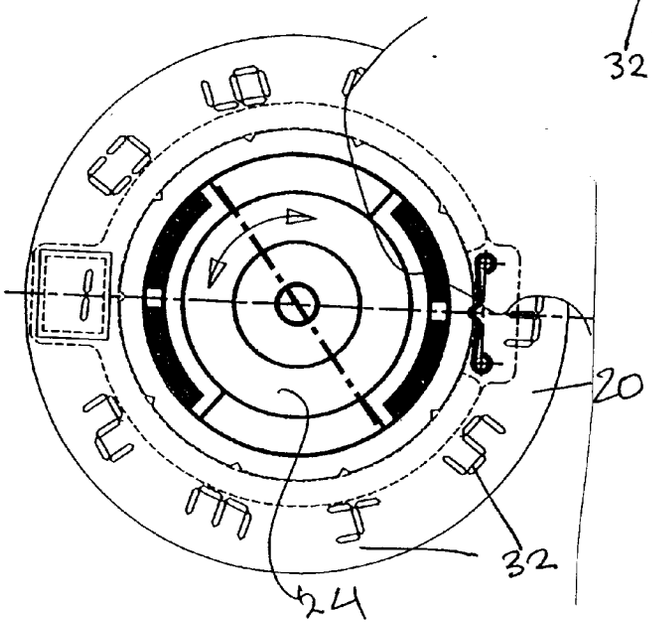
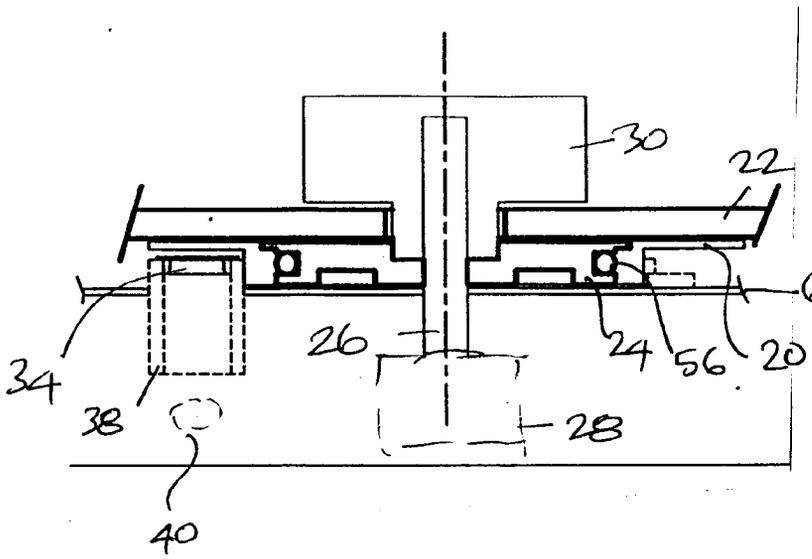


FIG 4C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22
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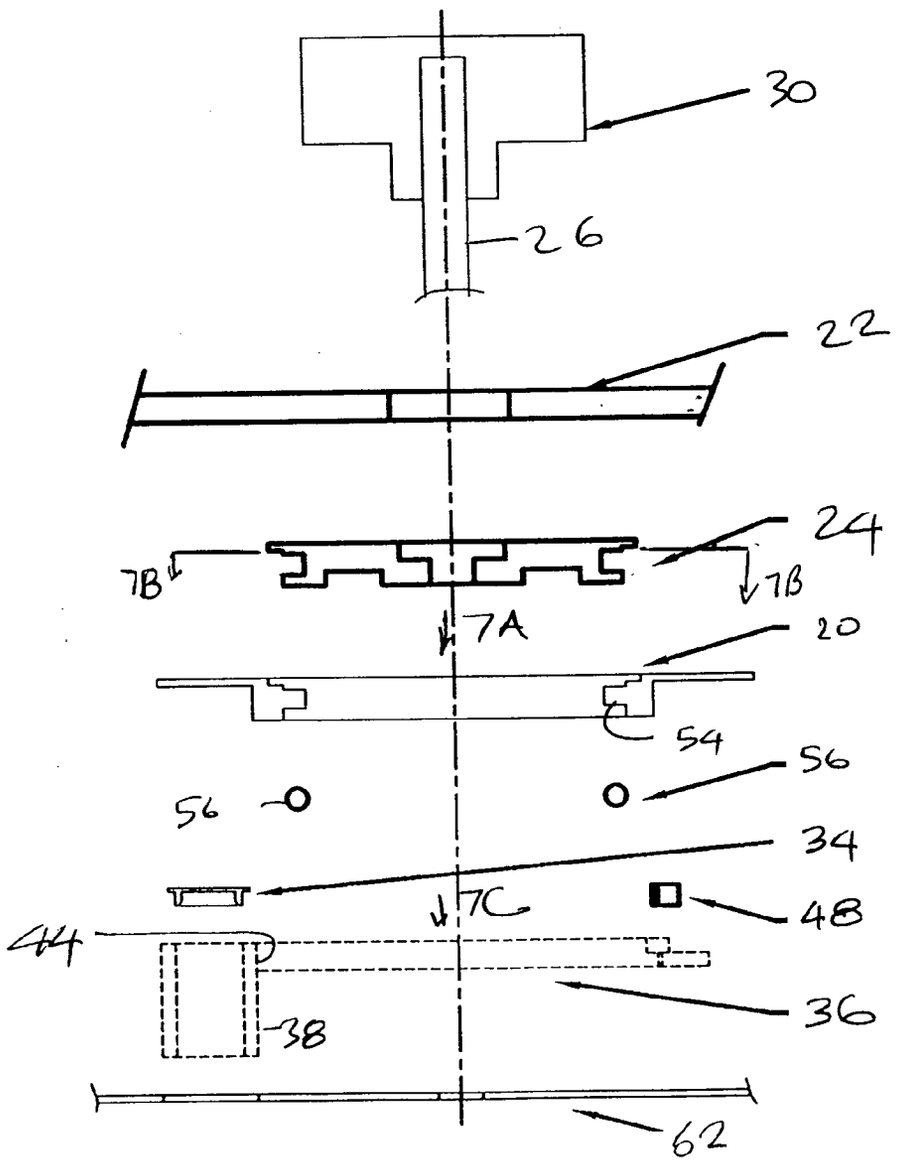
FIG5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26
22
24
7B
7B
7A
20
54
56
56
34
7C
48
44
38
36
62

FIG6

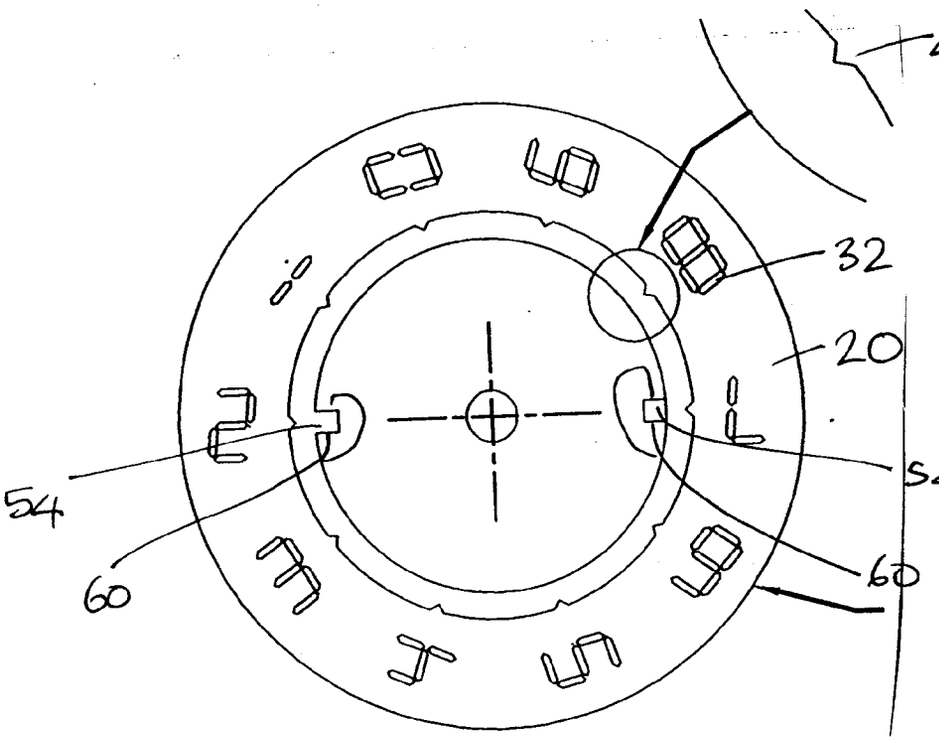

FIG 7A

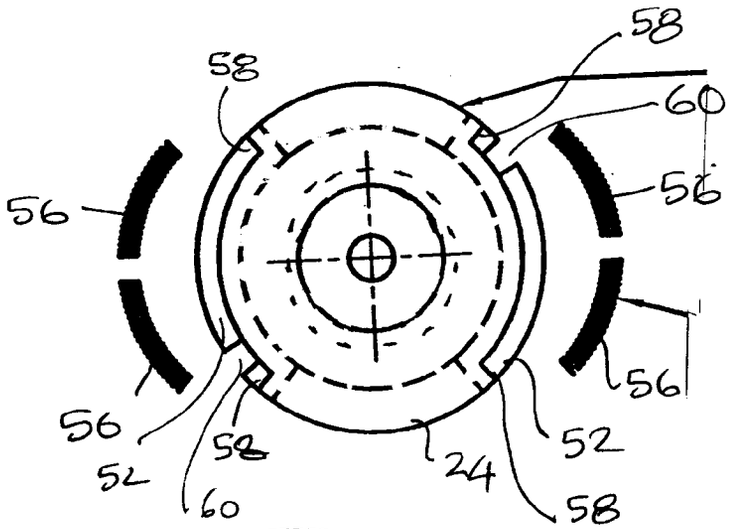

FIG 7B

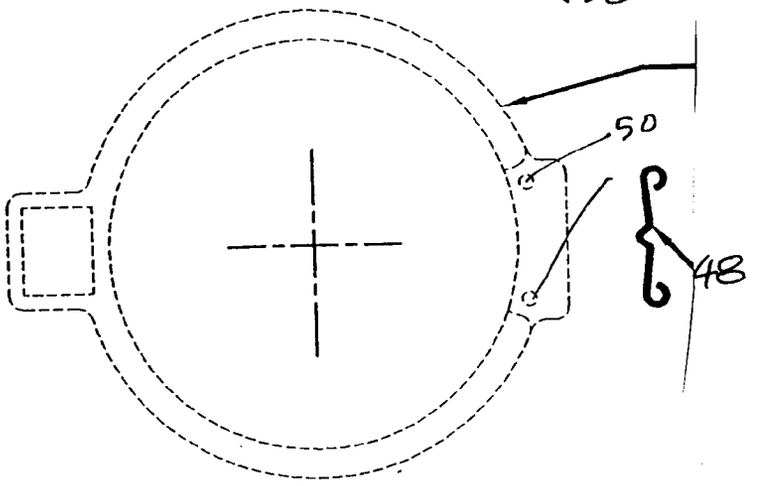

FIG 7C

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 30 0957

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	US-A-3 260 830 (E. E. ALBRIGHT) * column 2 - column 3; figures 2-7 *	1-3,14, 15,18,19	G09F9/40 F24C7/08
X	FR-A-2 239 730 (MATSUSHITA ELECTRIC INDUSTRIAL CO.) * claims 1-6 *	1-3, 14-17	
X	GB-A-772 713 (SIMPLEX ELECTRIC COMPAGNY LTD.) * page 3, line 41 - page 4, line 36; figures 1-3 *	1,2,14, 18	
X Y	US-A-2 197 759 (W. F. EWALD) * column 1, line 38 - column 2; figures 1,2 *	1-3 4-9,12, 13	
X Y	US-A-3 972 241 (A. A. VALDETTARO) * column 9, line 28 - column 10; figure 6 *	14-17 4-9,12, 13	
X	US-A-3 916 317 (R. D. GIBSON ET AL.) * column 3, line 18 - column 5, line 52; figure 1 *	1-3, 14-17	TECHNICAL FIELDS SEARCHED (Int.Cl.5) G09F H03J F24C
A	GB-A-1 115 442 (ASSOCIATED ELECTRICAL INDUSTRIES LIMITED) * claims 1-9; figures 1-3 *	1-3,14, 18-20	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	24 May 1994	Hulne, S

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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