(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 054 336**
A1

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **81201365.4**

(51) Int. Cl.³: **G 09 F 9/37**

(22) Date of filing: **11.12.81**

(30) Priority: **11.12.80 US 215321**
11.12.80 US 215359
11.12.80 US 215358

(43) Date of publication of application:
23.06.82 Bulletin 82/25

(84) Designated Contracting States:
AT BE CH DE FR GB IT LI NL SE

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(54) **Matrix display.**

(57) A movable display assembly (36) adapted for use in a spatial arrangement that includes a plurality of individually controlled assemblies comprising an upright frame surrounding an open window, a disk assembly pivotally mounted to said frame about a transverse axis (20), said disk assembly including a thin disk (25) having visually contrasting outer surfaces at opposite sides thereof and magnetic means on said disk assembly and said frame for selectively positioning said disk assembly about said axis in one of three angular positions relative to the shell (10) wherein (a) the disk assumes a first upright position exposing a first of its outer surfaces to one side of said shell, or (b) the disk assumes a second upright position exposing the second of its outer surface to said one side of said shell or (c) the disk assumes an intermediate position between such upright positions.

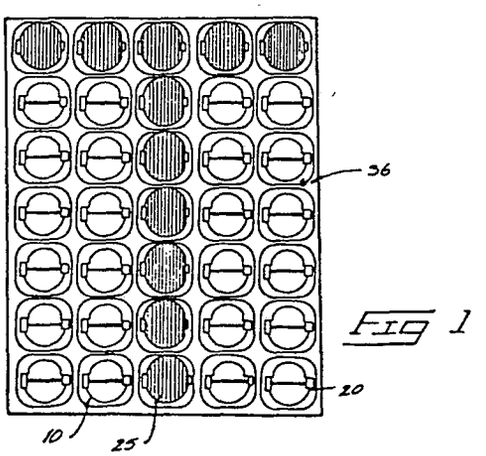

Fig 1

EP 0 054 336 A1

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This relates generally to changeable displays used for portraying visual or written information by a plurality of pivotable disks movable between contrasting conditions for day or night viewing conditions. The movable display assembly itself can be used in any desired spatial arrangement. This includes pre-arranged positions where the display assemblies might be alternately used to indicate one or two or more limited words or messages. More commonly, the display assembly will be used in a rectangular or geometric matrix. In such a matrix, the individual display assemblies will be typically arranged in multiple vertical columns and horizontal rows so as to be generally usable in portraying unlimited combinations of pictorial or written information.

A typical element used today in such a display matrix is a lighted lamp. Lighted lamps are used in both daylight and darkened environments to provide a visual contrast with a dark backgroudn panel. While very effective as a visual display, large matrix displays of this type requi substantial amounts of energy for operation and also generate substantial amounts of heat, most of which is

typically wasted to the environment.

The present display was developed in an effort to provide an economic alternative to a lighted lamp bank or lamp matrix display. To provide visual contrast under darkened or night conditions, a backlighted panel was desired However, bakclighting does not normally provide adequate contrast in such a display when viewed under bright daylight conditions. For these reasons, a reflective daylight display was desired as well.

The present apparatus provides two modes of operation. For daylight usage or for display under relatively bright environmental lighting conditions, a reflective or fluorescent contrasting display is available in combination with the background of the panel. For nighttime use or display under darkened environmental conditions, a backlight contrasting display is used. This versatility in display application required development of controls for moving the individual disks between three positions, each of which must be a stable rest position which can be maintained without continuous energization.

The present apparatus pivots a thin disk from a sealed background position to an opposed reflective or fluorescent position or to an intermediate light-transmitting position. In each of these alternate stable positions, the disk and its supporting elements are movable by magnetic forces to the alternate positions. This assures certainty in the disk movement and removes visual hesitancy that might otherwise affect the visual impact of an instantly changeable display. The resulting mechanical apparatus has a visual impact under all environmental lighting conditions similar to that achieved by instantly turning a multitude of lamps on or off to change a lamp bank matrix.

Figure 1 is a front view of an assembled matrix showing display of a letter;

Figure 2 is a front view of a single display assembly in the reflective condition;

Figure 3 is a rear view of the display assembly in the reflective condition;

Figure 4 is a side view of the display assembly;

Figure 5 is a front view of a single display assembly in the closed or background condition;

Figure 6 is a front view of a single display assembly in the backlighted condition;

Figure 7 is a fragmentary sectional view taken along line 7-7 in Figure 3;

Figure 8 is a front elevation of a disk assembly;

Figure 9 is a front elevation of a disk;

Figuge 10 is a front elevation of an armature;

Figure 11 is a sectional view taken along line 11-11 in Figure 8;

Figure 12 is a vertical sectional view taken along line 12-12 in Figure 2;

Figure 13 is a vertical sectional view taken along line 13-13 in Figure 5;

Figure 14 is a vertical sectional view taken along line 14-14 in Figure 6;

Figure 15 is a schematic view of the display assembly in the reflective condition;

Figure 16 is a schematic view of the display assembly in the closed condition; and

Figure 17 is a schematic view of the display assembly in the backlighted condition.

The drawings illustrate a specific form of the invention, which is an individual movable display assembly. It is adapted to be arranged in a spatial display arrangement forming discrete informational patterns or in a matrix having multiple vertical columns and horizontal rows for display of general pictorial or written information.

Each assembly is individually controlled and movable between three different positions. In one position, the assembly displays a surface that contrasts with the background of the matrix. In the second position, it displays a surface having a color common to the background.

In the third position, it transmits light from behind the assembly in a backlighted display mode. The first and second positions are designed for use in a reflective mode the second and third for use in a backlighted mode.

The assembly basically comprises a shell 10 that supports the assembly components; an armature 20 and disk 25 that pivot relative to the shell as a unit; and a magnetic operator, shown as a permanent magnet 26 on the armature 20 and a pair of driving magnets 27 and 28 at the back of shell 10. By selectively reversing magnets 27 and 28, disk 25 can be instantly positioned in one of the three above-described positions. The three operational positions of the assembly are shown in sectional views 12, 13 and 14. Schematic views illustrating operation of the assembly in the three positions are shown in Figs. 15,16 and 17.

As shown in the drawings, shell 10 is molded of plastic resin or other suitable structural material as an integral member. Shell 10 can be integral with a supporting panel or frame for the display or can be a separably formed component as shown. It includes a surrou ing rim 11 having a front surface 12 and anoppositely facing back surface 13. The surfaces 12 and 13 are bounded by an outer peripheral edge 14 and an inner peripheral edge 15. The edge 15 surrounds a centrally open window through the shell 10.

Bearing means for the armature 20 are provided integrally in the molded shell 10 and are designated in th drawings specifically at 17. The bearings 17 are shown as inwardly open apertures aligned along a transverse pivot axis X-X.

Armature 20 comprises a transverse axle 22 havin offset support stubs 21 complementary in both size and location to the bearings 17. Stubs 21 are adapted to be inserted into the opposed bearing apertures to pivotally mount armature 20 about axis X-X. The offset between axle 22 and stubs 21 facilitates flexure of the armature

for insertion of the stubs 21 into the bearing apertures at each side of shell 10. It also facilitates overlapping of the enlarged reflective or fluorescent area of disk 25 in front of shell 10 when in the position shown in Figs. 2,3 and 12.

The resulting forward projection of disk 25 significantly increases the visibility of the reflective or fluorescent area on disk 25 in contrast to the more recessed position assumed in the closed disk condition. It brings disk 25 forward to minimize overlap of adjacent shell surfaces which might otherwise obscure viewing of the disk.

Armature 20 is provided with a pair of opposed slotted tabs 23 and 24 aligned across one of its sides and partially overlapping axle 22. The tabs 23 grip the side edges of disk 25, which is provided with complementary notches 38 and 39 formed inwardly from its side edges (Fig.9). As shown, notch 38 is complementary to tab 23 and notch 39 is complementary to tab 24. The tabs and notches are of differing width so that the interfit between them automatically indexes and locates the flap 25 properly across the armature 20.

Armature 20 also supports a cylindrical permanent magnet 26 having opposed magnetic poles located about its periphery along a plane that intersects axis X-X and is perpendicular to it. The angular position of armature 20 is controlled by switchable magnets 27 and 28 fixed to shell 10 within an integral magnet housing 30 protruding from the rear shell surface 13 (see Fig.7). The magnets 27 and 28 have inwardly facing permanent magnet poles located adjacent to the periphery of the cylindrical magnet 26. Magnets 27 and 28 are electrically switchable by electronic controls (not shown) which reverse their polarity. A substantial amount of such polarity remains as residual magnetism without the requirement for continuous electrical current.

The shell 10 also includes complementary angular extensions 31 and 32 which limit one angular position of

disk 25. The lower extension 31 projects forwardly from the front shell surface 12 about a first window section 40 located beneath axis X-X. The upper extension 32 projects rearwardly from the rear shell surface 13 about a second window section 41 located above axis X-X. Extension 31 terminates along an outer edge 33 which converges outward from axis X-X when viewed from the side. A similar outer edge 34 is formed about extension 32. As seen from the side the two extensions 31 and 32 terminate along substantially coplanar outer edges 31 and 32, these edges being offset only by an amount equivalent to the thickness of the flap 25 which selectively contacts them.

The assembly including shell 10, armature 20, disk 25, and the magnets mounted to them, is releasably mounted to an upright support panel shown at 36, which might be in a matrix configuration and include vertical columns and horizontal rows of aligned apertures having a shape suitable to provide clearance for the moving disks 25 and for the projecting extension 32 and magnet housing 30. Pane 36 might further include printed circuitry (not shown) for connection to the terminals of magnets 27 and 28 in each assembly. Mounting projections 35 at the top and botto of the rear shell surface 13 are engageable through complementary apertures in the panel 36 to releasably fix the she 10 and its components to the matrix panel 36. Shell 10 and its components are removable from panel 36 as a unit for repair or replacement purposes.

As shown, the disk 25 is not symmetrical about the axis X-X. It is operationally divided into a first disk end 42 and a second flap end 43 extending oppositely from armature 20 and pivot axis X-X. The disk ends 42 and 43 are bounded on their sides by substantially parallel convex edges 44 and 45 which diminish in width outwardly from axis X-X. They intersect convex end edges 46 and 47 which are symmetrical across the width of disk 25.

It is to be noted that the first disk end 42 has

a cross-sectional configuration complementary to and capable of passing through the first window section 40 on shell 10 when pivoted about axis X-X. Also, the cross-sectional configuration of the first disk end 42 is greater in both length and width than that of the second window section 41 of shell 10. The second disk end 43 has a cross-sectional configuration greater than that of the first disk end. Its length is such as to extend outwardly to the peripheral edge 14 of shell 10 when in the reflective or fluorescent position shown in Figs.1 and 2.

The operational positions of disk 25 are best understood from Fig.12, which shows the reflective disk position, Fig.13, which shows the background or closed disk position and Fig.14 which shows the light transmitting disk position. During normal use of the sign under daylight conditions or where external lighting is adequate to provide substantial contrast to the flat surfaces, only the reflective or fluorescent position (Fig.2) and the background position (Fig.5) would be used. In darkened environments and in night conditions outdoors, only the background position (Fig.5) and the light transmitting position (Fig.6) would be used.

Disk 25 has visually contrasting outer surfaces 48 and 50 at opposite sides thereof. Surface 48 shall be termed a "reflective" surface and surface 50 shell be termed a "background" surface. Surface 48 can be covered or coated with any material or coloring that visually contrasts with the background color of shell 10 and panel 36. Fluorescent coatings have been preferred for maximum visibility under both natural and artificial lighting conditions. Normally surface 50 and armature 20 will be painted or colored identically to the finish of shell 10 and the exposed portions of panel 36 so as to fade into the background of the display when viewed from the front. This background color is preferably black, but other colors can be utilized where desired. Surface 50 is over-

lapped by armature 20, but since they are identically colored, this is not visually objectionable.

It is noted that surface 48 faces outwardly opposite to the armature 20. Since it overlaps armature 20 it is unobstructed other than by the small area overlapped at each of its sides by the inwardly projecting mounting tabs 23 and 24.

Figs.15, 16 and 17 illustrate the alignment of the magnetic poles on permanent magnet 26 with respect to the plane of disk 25. The magnets 27 and 28 continuously maintain disk 25 in each of its three alternate preset positions until they are reactivated to move it to another position. No mechanical latches or dampeners are included in the assembly.

The reflective position (Figs. 2 and 3) exposes most of the area about surface 48 to the front of the assembly to provide maximum visual contrast with the background elements about the matrix panel 36. In this positio disk 25 a-sumes an upright position exposing surface 48 to the front of the assembly. The first disk end 42 is locate within the first window section 40 of shell 10 and the second disk ends 43 overlaps the front surface 12 of shell 10 about the second section 41. The only portions of the reflective or fluorescent surface 48 not visible are those overlapped by the tabs 23 and 24. The maximum available area on disk 25 is exposed for visual impact in existing light.

In the second or background position (Fig.5), the disk 25 is rotated approximately 150^{o} from the first position and rests with its edges against the edges 33 and 34 of extensions 31 and 32 , respectively. This exposes the background surface 50 to the front of shell 10. The second disk end 43 overlaps and seals the outer edges 33 o the lower extension 31 about the first window section 40 o the shell 10. The first disk end 42 overlaps and seals the outer edges 34 of the upper extension 32 about the second window section 40. While less of the disk 25 is thereby

visible when viewed from the front, this is of no material consequence since the surface 50 is colored identically to the surfaces about shell 10 and the surrounding panel 36. Disk 25 becomes part of the matrix background in this position. When the display is backlighted, disk 25 substantially stops passage of light in this position.

Transmittal of light through shell 10 is accomplished by selectively moving disk 25 to an intermediate position (Fig.6) between the two above-described positions. In this position, disk 25 will normally be almost horizontal, although it is preferable that the forward edge of disk 25 be inclined downwardly where the display is elevated and is to be viewed from a somewhat lower location.

The assembly can be backlighted by incandescent or fluorescent tubes or by any other source of light located rearward of the assemblies as diagrammatically shown at 51 in Figs. 15-17. In this position, it is desirable that the thin disk 25 be viewed on edge so as to obscure as little of the transmitted light as possible. In addition, interior surfaces viewable behind the panel 36 might be colored so as to contrast with the background coloring of the panel 36 and shell 10 when disk 25 is in this intermediate position.

With the disk 25 substantially aligned parallel to the magnetic poles on permanent magnet 26, armature 20 is moved to the first position by driving the magnets to polarities opposed to the permanent magnet poles when disk 25 is upright. Movement of disk 25 to its background position is achieved by reversing the polarity of the magnets 27 and 28. The intermediate position of disk 25 is achieved in alternation with the background position by reversing the polarity of one magnet 27 or 28 only, using the other as a magnetic dampener to minimize fluttering of the disk 25 as it reaches the intermediate position.

The magnets 27 and 28 are arranged at approximately 45° orientations with respect to the upright position of disk 25 and the front and rear surfaces 12 and 13 of shell 10. They are also arranged at 45° from the horizontal and 90° from one another. Their magnetic axes converge and inter-

sect at axis X-X. The 45° orientation of magnets 27 and 28 assures substantially horizontal positioning of disk 25 when in its intermediate position. The actual position of disk 25 in any of its three positions is a resultant of the magnetic moments exerted on the armature 20.

The above display assembly provides maximum areal contrast between the reflective and background conditions for daylight or frontligted use and between the backlighted and background positions for nighttime use or in darkened environments. The operation of the display requires little energy, since the controlling magnets need only to be energized during resetting of individual disks 25. In many instances, no external lighting will be required during daylight hours. The backlighting necessary in darkened environments requires substantially less energy than is the case with conventional lamp banks used in prior matrix displays.

The assembly is designed for simplified replacemer of disks 25 to compensate for fading or aging of the reflective finish on its surface 48. Each disk 25 can be readily flexed inward toward its transverse center to release it from the armature tabs 23 and 24. Similarly, the entire armature assembly can also be released from shel 10 by flexing axle 22 and pulling stubs 21 from bearings 1 Replacement of a disk or armature is no more difficult thar replacement of a lamp bulb in a lighted lamp matrix.

Various modifications might be made with respect to the details of the assembly without deviating from the general features described above.

CLAIMS

1. A movable display assembly adapted for use in a spatial arrangement that includes a plurality of individually controlled assemblies characterized in

an upright fram surrounding an open window;

a disk assembly pivotally mounted to said frame about a transverse axis; said disk assembly including a thin disk having visually contrasting outer surfaces at opposite sides thereof;

and magnetic means on said disk assembly and said frame for selectively positioning said disk assembly about said axis in one of three angular positions relative to the shell wherein (a) the disk assumes a first upright position exposing a first of its outer surfaces to one side of said shell, or (b) the disk assumes a second upright position exposing the second of its outer surfaces to said one side of said shell or (c) the disk assumes an inter-

mediate position between such upright positions.

2. A movable display assembly as claimed in claim 1 characterized in that the magnetic means comprises a cylindrical permanent magnet fixed to said disk assembly coaxially along said transverse axis and a pair of switchable magnets fixed to said shell outwardly adjacent to the periphery of the permanent magnet.

3. A movable display assembly as claimed in claim 1 characterized in that the magnetic means comprises a cylindrical permanent magnet fixed to said disk assembly coaxially along said transverse axis and a pair of switchable magnets fixed to said shell outwardly adjacent to the periphery of the permanent magnet, said switchable magnets being aligned along two magnetic axes lying in a common plane perpendicular to said transverse axis of the disk assembly and converging toward one another at said transverse axis.

4. A movable display assembly as claimed in claim 1 characterized in that the magnetic means comprises a cylindrical permanent magnet fixed to said disk assembly coaxially along said transverse axis and a pair of switchable magnets fixed to said shell outwardly adjacent to the periphery of the permenant magnet, said switchable magnets being aligned along two magnetic axes lying in a common plane perpendicular to said transverse axis of the disk assembly and converging toward one another at said transverse axis, each magnetic axis being arranged approximately 45^{o} from the first upright position of said flap and 90^{o} apart from one another.

5. A movable display assembly as claimed in claim 1 furhter characterized in

bearing means transversely spanning the window on said frame said bearing means defining a transverse pivot axis dividing the window into first and second window sections;

said disk assembly being pivotally mounted on said frame by said bearing means for movement relative to the

frame about the pivot axis;

said disk having first and second disk ends extending oppositely from the armature, the first disk end having an areal crosssectional configuration that is complementary to and capable of passing through the first window section when pivoted relative to the frame about said pivot axis and is greater in area than that of the second window section of the shell, the second disk end having an areal cross-sectional configuration having a greater area than that of the first disk end.

6. A movable display assembly as set out in claim 5 characterized in that the disk ends have convex side edges substantially perpendicular to said pivot axis and intersecting convex end edges.

7. A movable display assembly as set out in claim 5 characterized in that the disk ends have convex side edges substantially perpendicular to said pivot axis and intersecting convex end edges, the separation of the side edges across the second disk end being greater than the separation of the side edges across the first disk end.

8. A movable display assembly as set out in claim 5 characterized in that the disk ends have convex side edges substantially perpendicular to said pivot axis and intersecting convex end edges, the separation of the side edges across the second disk end being greater than the separation of the side edges across the first disk end, and the separation between the pivot axis and end edge along the second disk end being greater than the separation between the pivot axis and end edge along the first disk end.

9. A movable display assembly as claimed in claim 1 characterized in that said disk assembly comprises:

an armature pivotally mounted by said bearing means for angular movement relative to said frame about the bearing axis;

a thin disk fixed to said armature, said disk having visually contrasting outer surfaces at opposite sides thereof;

said disk being removably mounted on said armature to one side of said armature axis.

10. A display assembly as set out in claim 9 characterized in that the armature further includes:

a pair of opposed slotted tabs releasably engaging opposite side edges of the disk.

11. A display assembly as set out in claim 9 characterized in that the armature further includes:

a pair of opposed slotted tabs releasably engaging opposite side edges of the disk, said tabs being in alignment with one another to one side of said armature axis.

12. A display assembly as set out in claim 9 characterized in that the armature further includes:

a pair of opposed slotted tabs releasably engaging opposite side edges of the disk, said tabs being in alignment with one another to one side of said armature axis;

one tab being wider than the other;

said disk having notches along opposed side edges thereof complementary in width to the respective tabs, whereby the disk is properly indexed on the armature by matching of the respective notches and tabs.

13. A movable display assembly as set out in claim 9 characterized in that the disk is releasably gripped at its opposite side edges by a pair of opposed slotted tabs aligned along one side of said armature, one of the outer surfaces of the disk being unobstructed by said armature.

14. A movable display assembly as set out in claim 9 characterized in that the disk is releasably gripped at its opposite side edges by a pair of opposed slotted tabs aligned along one side of said armature, one of the outer surfaces of the disk being unobstructed by said armature;

the remaining outer surface of the disk, as well as the armature and frame all having a common background color about their areal surfaces.

15. A movable display assembly as set out in claim 9 characterized in that the disk is releasably gripped at its opposite side edges by a pair of opposed slotted tabs

aligned along one side of said armature, one of the outer surfaces of the disk being unobstructed by said armature;

the remaining outer surface of the disk, as well as the armature and frame all having a common background color about their areal surfaces; and

light means spaced behind the frame for back-lighting the disk.

16. A movable display assembly adapted for use in a spatial arrangement that includes a plurality of individually controlled assemblies, characterized in that said display assembly comprises:

a centrally open shell;

means for fixing the shell in an upright position;

coaxial bearing means fixed to opposed transverse sides of said shell;

an armature pivotally mounted by said bearing means for movement relative to said shell about a transverse axis;

a thin disk fixed to said armature, said disk having visually contrasting outer surfaces at opposite sides thereof;

and magnetic means on said shell and armature for pivoting the armature and disk about said transverse axis between three alternate angular positions relative to the shell wherein (a) the disk assumes a first upright position exposing a first of its outer surfaces to one side of the shell, or (b) the disk assumes a second upright position exposing the second of its outer surface to said one side of the shell, or (c) the disk assumes an intermediate position between such upright positions.

17. A movable display assembly as claimed in claim 16 characterized in that said magnetic means comprises:

a cylindrical permanent magnet having magnetic poles at its periphery arranged in a plane through its cylindrical axis, said magnet being fixed coaxially to said armature at one transverse side of said disk;

and two individually controlled switchable magnets fixed to said shell with one magnetic pole of each switchable magnet being adjacent to the periphery of said

permanent magnet.

18. A movable display assembly as claimed in claim 16 characterized in that said magnetic means comprises:

a cylindrical permanent magnet having magnetic poles at its periphery arranged in a plane through its cylindrical axis, said magnet being fixed coaxially to said armature at one transverse side of said disk;

and two individually controlled switchable magnets fixed to said shell with one magnetic pole of each switchable magnet being adjacent to the periphery of said permanent magnet;

said switchable magnets being aligned along two magnetic axes lying in a common plane perpendicular to said transverse axis of the disk assembly and converging toward one another at said transverse axis.

19.A movable display assembly adapted for use in a spatial arrangement that includes a plurality of individually controlled assemblies characterized in

a shell having a rim with oppositely directed front and back surfaces located within an outer peripheral edge and extending to inner peripheral edges that define the boundaries of a centrally open window;

bearing means transversely spanning the window on said shell, said bearing means defining a transverse pivot axis dividing the window into first and second window sections, the areal cross-sectional configuration of the first window section being greater than that of the second window section;

an armature pivotally mounted by said bearing means for movement about said transverse pivot axis;

a thin disk mounted to said armature, said disk having first and second disk ends extending oppositely from the armature, each disk having visually contrasting outer surfaces at opposite sides thereof;

the first disk end having an areal cross-sectional configuration that is complementary to and capable of passing through the first window section when pivoted relative to the shell about said pivot axis, and is greater than that

of the second window section of the shell;

the second disk end having an areal cross-sectional configuration greater than that of the first disk end;

said shell having complementary angular extensions thereon projecting forward from its front surface about the first window section and projecting rearward from its back surface about the second window section, said extensions terminating along substantially coplanar outer edges;

and magnetic means on said shell and armature for pivoting the armature and disk about said pivot axis between three alternate angular positions relative to the shell wherein (a) the disk assumes a position exposing a first of its outer surfaces to the front of the shell with the first disk end located within the first window section of the shell and the second disk end overlapping the front surface of the shell about its second window section, or (b) the disk assumes a position exposing the second of its outer surfaces to the front of the shell with the second disk end overlapping and abutting the outer edges of the extension about the first window section of the shell and with the first disk end overlapping and abutting the outer edges of the extension about the second window section of the shell, or (c) the disk assumes an intermediateposition between such positions.

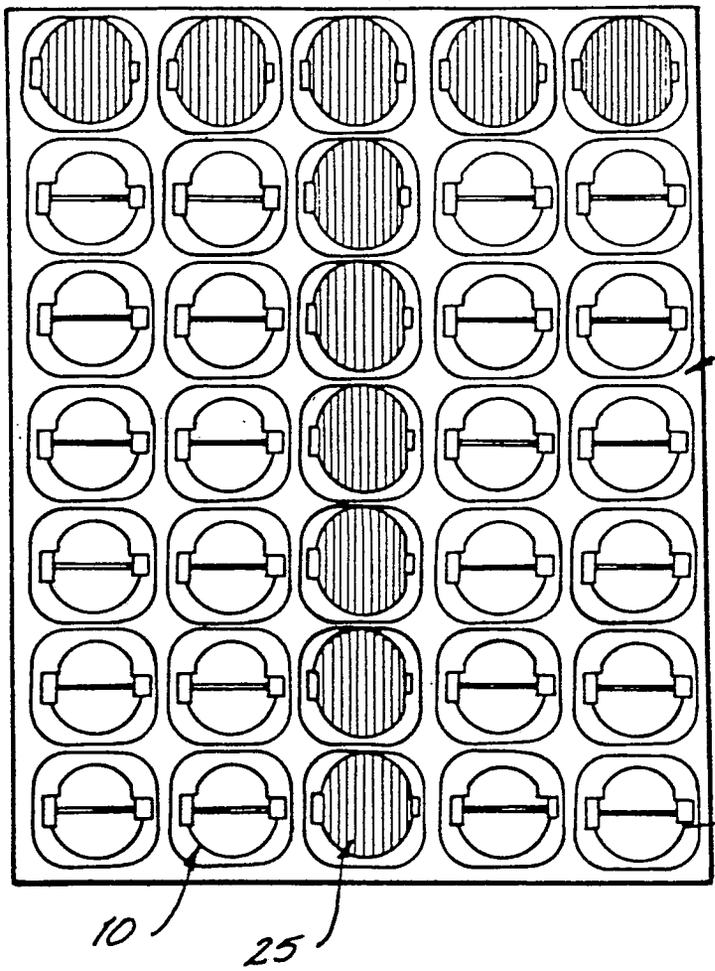


Fig 1

Fig 2

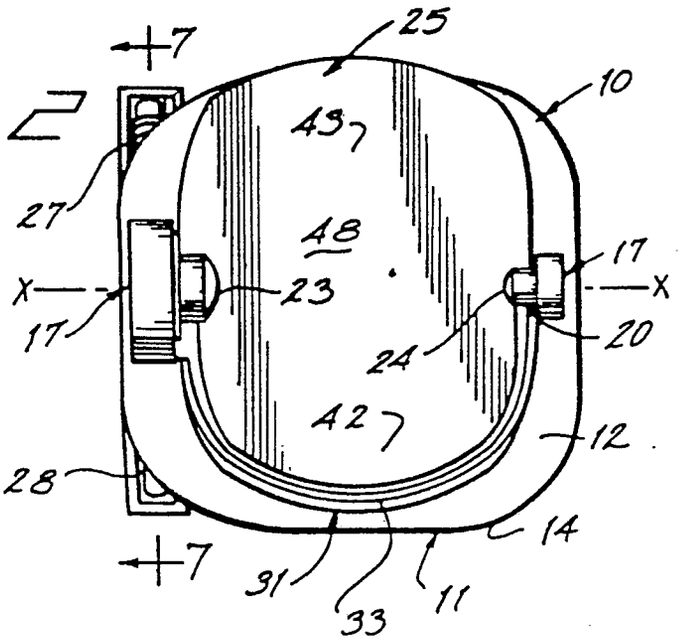


Fig 3

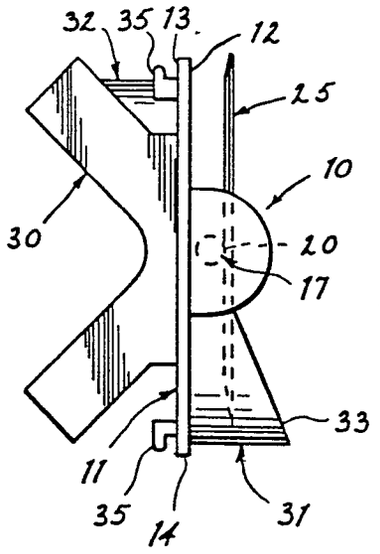
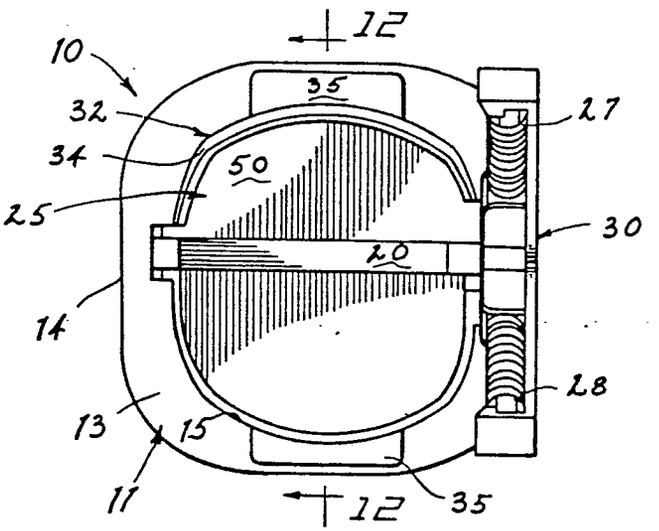


Fig 4



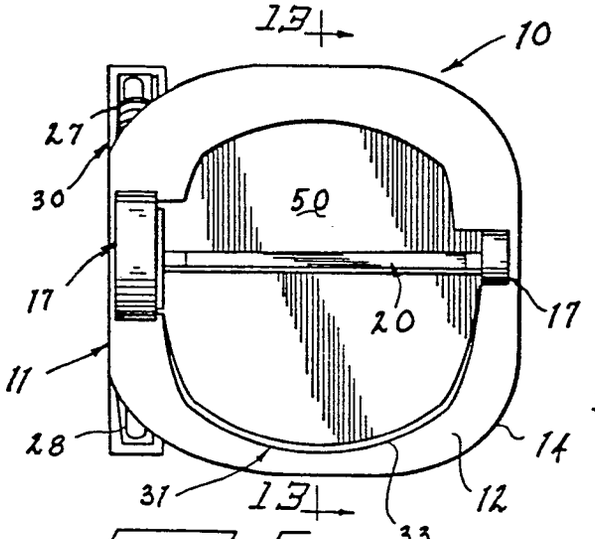


Fig 5

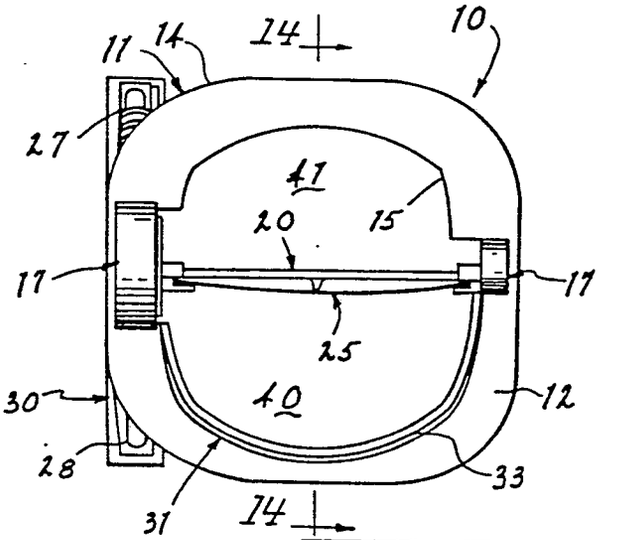


Fig 6

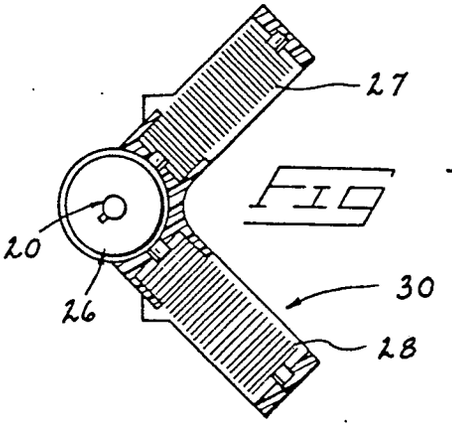


Fig 7

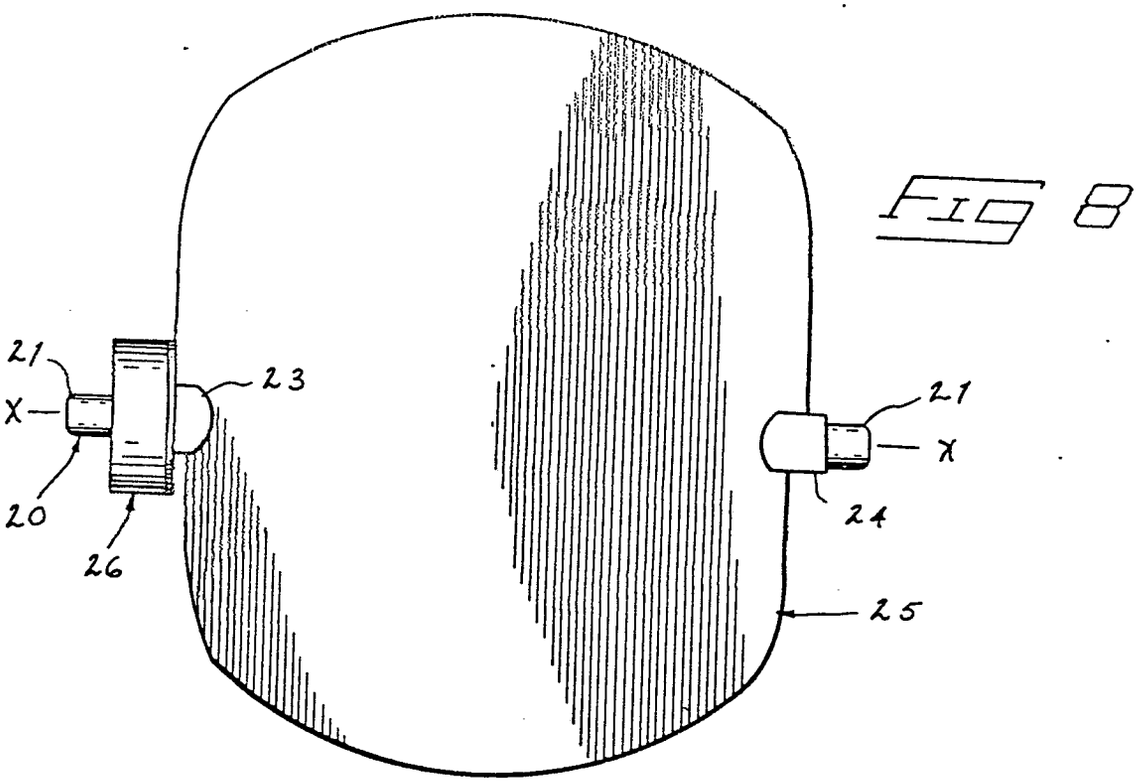


FIG 8

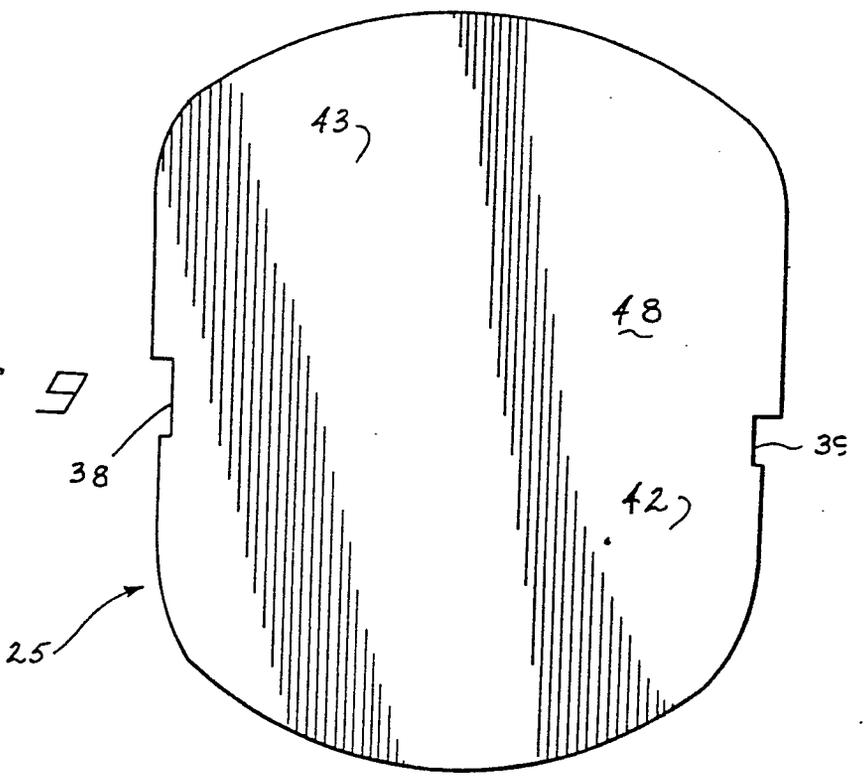


FIG 9

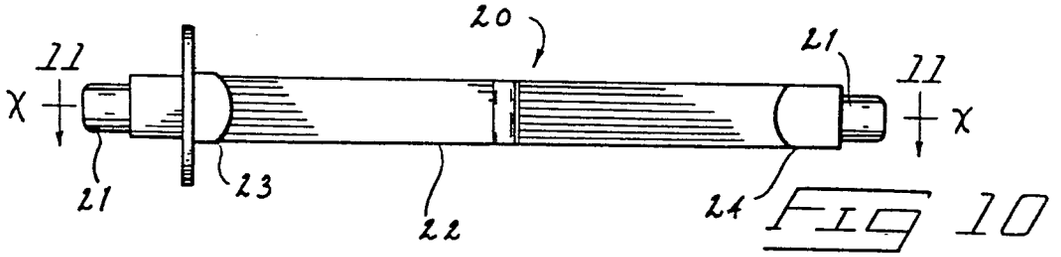


FIG 10

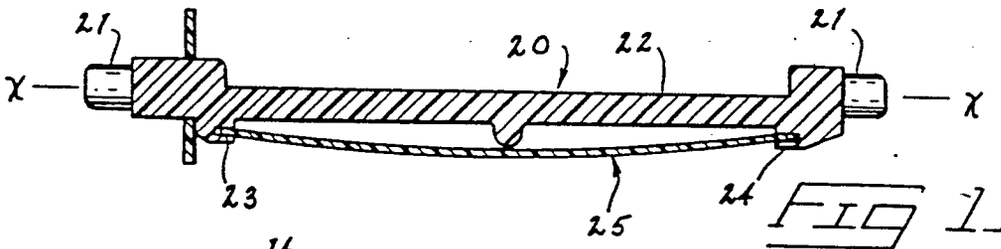


FIG 11

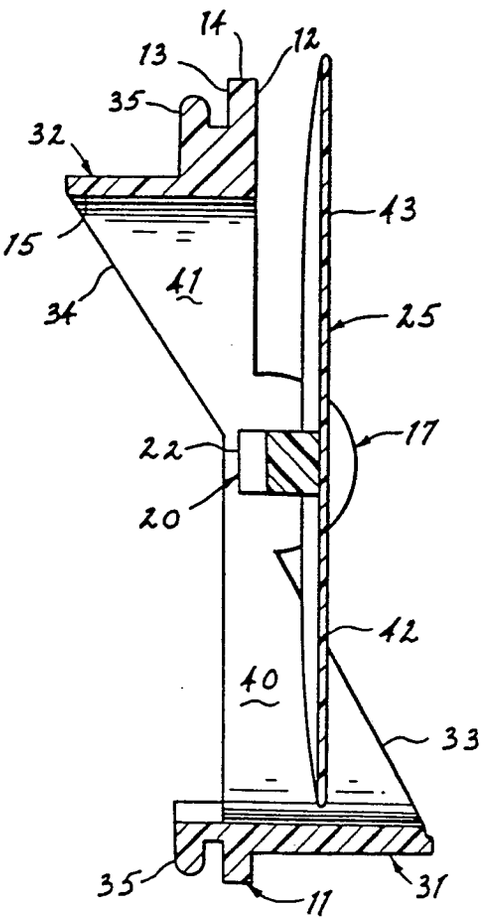


FIG 12

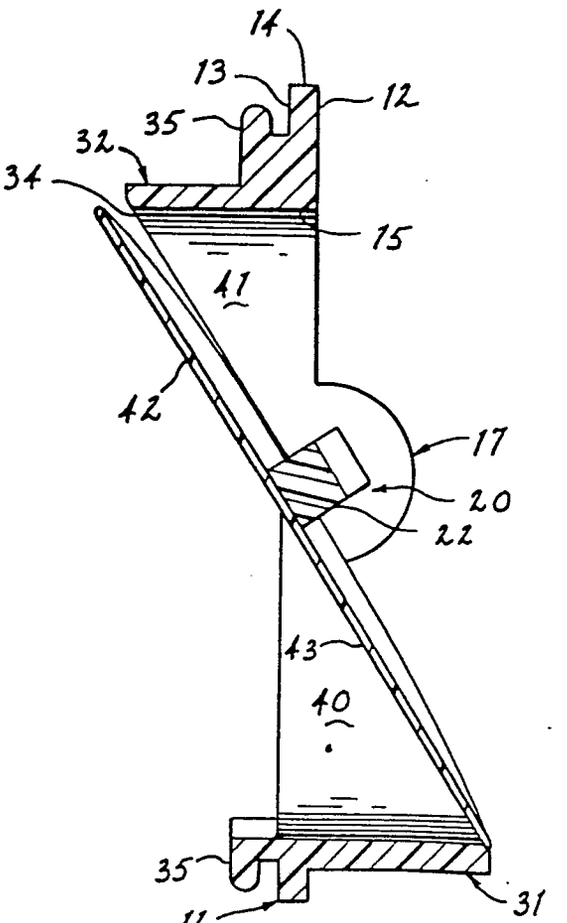


FIG 13

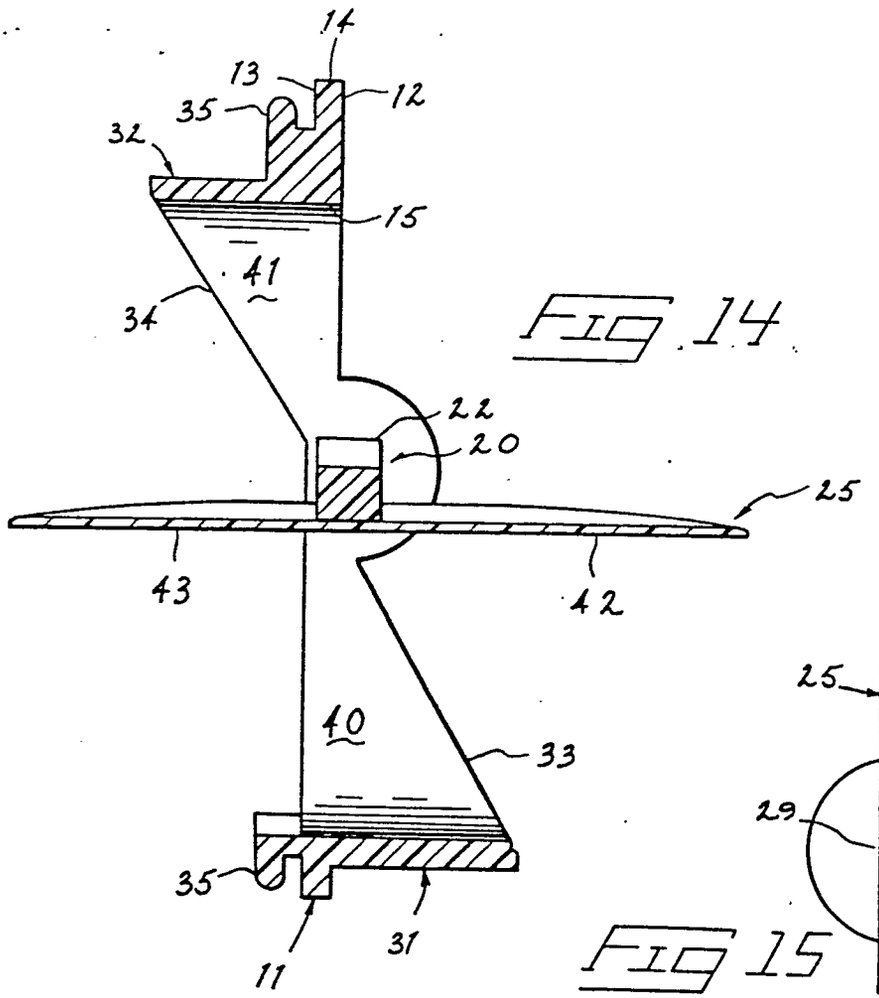


FIG 14

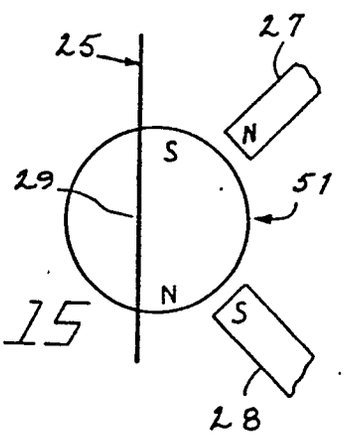


FIG 15

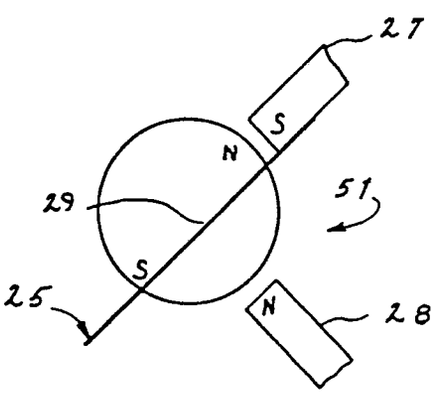


FIG 16

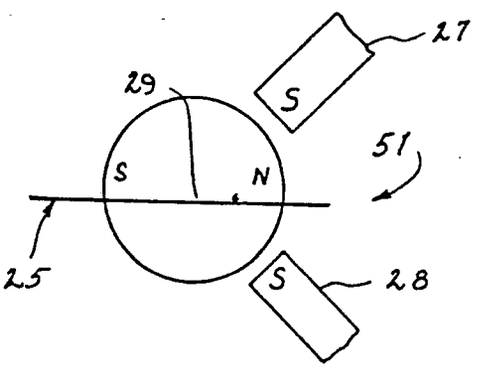


FIG 17

0054336

European Patent Office

EUROPEAN SEARCH REPORT

Application number
EP 81 20 1365

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
Y	US - A - 3 975 728 (DONALD WINROW) * column 1, lines 51-68; column 2; column 3; column 4, lines 1-43, 67-68; column 5, lines 1-5; figures *	1-19
Y	FR - A - 2 455 776 (SALAM HASSAN PADDY ABDEL) * page 1, lines 1-25; page 2, lines 12-38; page 3, lines 1-6; page 4, lines 11-38; page 5, lines 1-24; page 7, lines 2-35; figures 1-6B *	1-4, 15-19
A	FR - A - 2 443 731 (McGREEVY ROY) * claims 1,2; page 4, lines 23-30; figure 7 * & GB - A - 2 038 066	1,16,19
A	US - A - 3 518 664 (MAURICE K. TAYLOR) * column 4, lines 37-50; figures 2-3 *	5
A	US - A - 3 540 038 (MAURICE K. TAYLOR) * claims; figures *	1,16, 19

CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)

G 09 F 9/37

TECHNICAL FIELDS SEARCHED (Int.Cl. 3)

G 09 F

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
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D: document cited in the application
L: document cited for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26-02-1982	MIOT