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(54) Illuminated rotary display unit.

(57) A rotary display unit of the type having rotatably mounted, parallel vanes or louvres of triangular cross-section, is arranged to provide a back lit display without an internal light fitting within each vane (120). The vanes (120) are of transparent or translucent material. One end of each vane (120) is rotatably mounted by means of an axially apertured bearing (182). An external dichroic lamp (192) axially aligned with the bearing (182) directs light axially into the vane (120). The vane (120) is lined internally with a material (200) having a structured surface, as by axially extending microprisms (202), which provides a tunnel along which the light is subject to a combination of multiple reflections internally while a proportion of the light is emitted. A particular material disclosed is that manufactured by 3M under the name SOLF. The assembly of vanes may be rotated by a cam drive arrangement at the other end of the vanes remote from the lamps.

EP 0 615 220 A1

FIELD OF THE INVENTION

This invention relates to a rotary display unit of the kind having a plurality of parallel multi-sided vanes or louvres that are rotatable to provide a number of display surfaces.

BACKGROUND TO THE INVENTION

The vanes of such display units are usually of a triangular cross-section so that each vane or louvre has three display facets and the display unit provides three display surfaces. The vanes are intermittently driven, by 120° per step in the case of triangular cross-section vanes so that the three display surfaces are sequentially presented with a dwell period for each surface. An example of this kind of rotary display unit is disclosed in patent specification EP-A1-0 249 396, the disclosure of which is incorporated herein by reference. The vanes used in the unit described in that specification are hollow aluminium extrusions. They rely on external lighting for viewing.

There has been a general development of back lit poster displays of various kinds and it is desirable to be able to offer a back lit display in a rotary display unit. Prior proposals have involved using transparent hollow vanes with a light source, such as a fluorescent tube, axially mounted in the vane and extending the length of the vane. Such arrangements pose considerable practical problems and are costly. Each vane must be provided with an internal lamp and the necessary support and electrical fittings while at the same time maintaining the necessary provision to rotatably mount the vanes. Fluorescent tubes are unsatisfactory in display units having smaller cross-section vanes because the external surface of the tube too closely approaches the surfaces of the vane in which it is mounted. This leads to non-uniform illumination of the surface and may give rise to undue local heating.

SUMMARY OF THE INVENTION

There will be described hereinafter an embodiment of the present invention which is believed to offer advantages over the prior art by having each vane back lit by a light source that is external to the vane.

Broadly stated the present invention provides a rotary display unit of the kind having a plurality of essentially parallel, multifaceted vanes and means for rotating said vanes to provide a plurality of display surfaces in succession, wherein

at least one vane is of a light transmissive material,

the vane has an interior hollow extending lengthwise along the vane,

a layer of an optical lighting material having at least one structured surface is disposed in said hollow,

means are provided at one end of the vane to allow light to be introduced into the hollow interior, and

said layer of optical material has its structural surface arranged to provide a controlled emission of the introduced light along the length of the vane to back light the facets of the vane.

The present invention will be described as applied to an embodiment founded on the construction disclosed in EP-A1-0 249 396. An adaptation in accordance with the present invention of the display unit described in the earlier specification will now be described with reference to the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

Fig. 1 shows a cross-section the display unit showing a plan view of one end of a vane to which a light source is applied to internally illuminate the vane;

Fig. 2 shows an end view of the vane along the line 2-2 of Fig. 1; and

Fig. 3 shows a section through part of the vane wall and optical lighting film lining on the line 3-3 of Fig. 1, the film thickness being exaggerated for clarity of illustration.

DESCRIPTION OF PREFERRED EMBODIMENT

Rotary vane displays are well known. The practice of the present invention will be described in relation to the most common type of vane which has a cross-section that is essentially an equilateral triangle. In general such displays comprise a housing having parallel sides between which the vanes are mounted in parallel. the vanes are rotatably mounted at each side to allow rotation of vanes. Along one side of the housing, each vane is provided with means to co-operate with a drive system for imparting intermittent drive to the vanes to rotate them in 120° steps with a dwell period at each step. Various drive mechanisms are known, such as using gears from a common drive shaft, chain and sprocket arrangements and cam-drive from a common cam shaft as is disclosed in EP-A1-0 249 396. Each vane is of the same size and is mounted and driven in a similar way. Therefore, the incorporation of the present invention into a rotary display unit will be described for just one vane. It will be understood that the other vanes are constructed, arranged and back lit in similar fashion.

Referring now to Fig. 1 of the accompanying drawing, there is shown one end portion of one vane of the plurality forming a complete display unit. As already stated all the vanes are of like construction. The vane 120 is of like construction to that shown in Fig. 5 of EP-A1-0 249 396 but is light transmissive, being formed of a transparent or at least translucent material. A plastic material such as Acrylic is suitable.

It is preferably formed as a hollow extrusion. The other end portion (not shown) of the vane 120 to the left of Fig. 1 is arranged to be cam-driven by a cam drive assembly of the kind shown in Figs. 5 and 5a of EP-A1-0 249 396. Attention will be concentrated on the illustrated right hand side of the vane seen in the present Fig. 1. This is adapted to provide back lighting of the transparent vane 120.

In the Fig. 1, one upright side wall of the display housing is provided by an extrusion 150. The rear of the unit is closed by a rear wall 152. The display is viewed in the direction of arrow A. The side wall extrusion 150 and the rear wall 152 support an internal wall 160 which is part of a general Z-shaped support 162 whose extremities 164 and 166 are secured to the side wall 152 and the front part of the extrusion 150 respectively. The wall 160, which extends the length of the assembly of vanes, bounds an internal space 163 within the extrusion in which light fittings are mounted as will be described. The ends of the vanes are supported at wall 160. In alignment with each vane the wall 160 has an aperture 170 in which is received a plain bearing bush 172 that seats in aperture 170. The bush 172 is of a material such as Delrin and has a locating flange 174 that bears against the inner surface of the wall 160 around the aperture 170. The end of vane 120 carries an opaque closure member 180 to which is affixed an Acrylic spigot 182 having an outer portion 184 of circular cross section that rotates within bearing bush 172.

Referring also to Fig. 2, it is seen that the spigot 182 is annular and provides an opening 190 that is coaxial with vane 120 and that extends through closure member 180 and leads to the interior 191 of the vane. Light is shone into the vane interior through this opening from a lamp 192 of circular cross-section supported in the interior extrusion space 163 by a fitting 194 on the housing extrusion 150. The lamp 192 is axially aligned with vane 120 and opening 190. The light-emitting end of lamp 192 has no mechanical connection to the end of the vane or its bearing spigot 184 so that the latter may rotate freely and be freely withdrawn from aperture bush 172.

The lamp 192 is a high intensity tungsten halogen lamp, such as a 12 volt, 20W-35W, dichroic lamp (that is to say a combination of a bulb and surrounding directive reflector). It will be understood that the lighting arrangement described thus far is provided for each vane of the rotary display unit.

Although each vane is internally illuminated by the lamp, for a satisfactory display, the illumination of each vane should be as uniform as possible. To this end the surface internal to each external display surface of each vane - comprising the three internal surface areas of the vane, which is of triangular cross-section at both its exterior and interior - is lined with an optical lighting film 200 shown in chain line in Fig. 2. Fig. 3 shows a portion 200a of the film lining the inner surface of one triangular facet 120a of the vane 120. The properties of this film are to disperse and emit the light uniformly along the vane.

Optical lighting film is a film having at least one surface structured to provide internal reflection characteristics, as by the provision of microprisms. Such a film and the principle of its operation is described in U.S. patent 4 906 070 to Cobb, Jr. and assigned to Minnesota Mining and Manufacturing Company. The film is available commercially from 3M Co. under the name Scotch optical lighting film (SOLF). Further detail of the film and its practical application is given in a bulletin number 75-0299-6018-6 available from 3M Light Management, 3M Technical Centre, Easthamstead Road, Bracknell, Berkshire, RG12 13E, England. Other application data is available from the same source in relation to the application of SOLF material to light boxes - for example bulletin number 75-0299-6017-8.

The SOLF material described in the above-mentioned documents has one surface formed with parallel microprisms and the other is smooth. The microprisms from ridges with sides at 45° to the plane (or local plane) of the film material so that each ridge has an included apex angle of 90° for internal reflection. One suggestion for practical application of the film is to form a hollow tube with the smooth surface inside and the microprism surface outside. The microprisms extend in the axial direction. Light is shone into one end of the tube (the other end may be provided with a reflector) and is emitted from the tube along its length by a combination of multiple internal reflection and at a controlled proportion of external emission so that a controlled diffusion of the light is obtained.

In the present case, a single sheet of a SOLF material is folded round to line and conform to the interior shape of the vane as shown at 200. Because light is emitted from the tube as it progresses axially from the light source, the amount of light available at the far end (to the left of Fig. 1) is less than at the input end of the tube. We have employed a SOLF film which has a gradient of small dots screen-printed onto the smooth side of the film. The density of the dots increases from one side of the film to the other in the direction of the microprism grooves. The film is arranged in the vane with the microprisms 202 on the outside of the SOLF lining and extending in the lengthwise direction of the vane. The higher density dots at the inner smooth surface 204 are at the far end of the vane from the light source 192. The film lining the interior of the vane provides an interior hollow or tunnel into one end of which light is directed for diffused emergence along the length of the vane. The provision of the graded dot density on the smooth film side is intended to compensate for the loss of light along the tunnel by allowing a greater proportion to emerge as the dot density increases.

The aperture of lamp 192 is about the same size

as the bearing opening 190 into the vane interior. The bearing opening is about the diameter of the inscribed circle touching the internal triangular cross section of the vane. The combination is designed to aid in distributing light into the interior at an angle which causes light to be distributed along the vane by internal reflection with an even outward leakage or diffusion along the length of the vane. A reflective surface could be provided at the end of the vane interior remote from the lamp but has not proved to be essential.

In the complete display unit the assembly of lamps along one side of the display housing generates some considerable heat. The internal wall 160 carrying the bearing apertures 170 is conveniently of sheet metal. It is preferred to mount the internal Z-shaped member 162 to provide a degree of movement to allow for the expansion of the sheet due to the heat from the lamps. To this end the end flange 166 of the member 162 is yieldably mounted abutting the rear wall 152 of the display unit, as by interposing a strip of double-sided adhesive tape between the two.

It will be appreciated that the lamp 192 is remote from the cam drive arrangement which is not therefore subject to the heat generated with enclosure 163. The cam drive could be substituted by other drives such as by gear drives or chain and sprocket drives. It is feasible to mount a chain and sprocket drive at the lamp end of the vane. For example, in Fig. 1 the spigot is extended axially outwardly (to the right) to receive a sprocket with the lamp 192 being moved axially outwardly to provide room to accommodate the extended spigot. With such a drive it is also possible to open up the other end of the vane to accommodate a second lamp beaming light into the interior in the opposite axial direction.

The invention has particular advantage with a smaller type rotary display units in which a conventional fluorescent tube would be unduly close to the facet surfaces of the vane. Typically such a vane has a facet width W (Fig. 2) of say 60-70 mm or under.

Claims

1. A rotary display unit of the kind having a plurality of essentially parallel, multifaceted vanes and means for rotating said vanes to provide a plurality of display surfaces in succession, wherein

   at least one vane is of a light transmissive material,

   the vane has an interior hollow extending lengthwise along the vane,

   a layer of an optical lighting material having at least one structured surface is disposed in said hollow,

   means are provided at one end of the vane to allow light to be introduced into the hollow interior, and

   said layer of optical material has its structural surface arranged to provide a controlled emission of the introduced light along the length of the vane to back light the facets of the vane.

2. A display apparatus as claimed in Claim 1 in which said optical film is formed to provide a hollow interior and said light introduction means comprises a light source directed into said hollow.

3. A rotary display apparatus as claimed in Claim 1 or 2 in which said light introduction means comprises a lamp exterior to the vane and an opening at the end of vane leading to said interior hollow.

4. A rotary display apparatus as claimed in Claim 1, 2 or 3 in which said vane has a triangular cross-section.

5. A rotary display apparatus as claimed in any preceding claim in which the other end portion of vane comprises means for rotatably driving the vane.

6. A rotary display apparatus as claimed in Claim 5 in which said means for rotatably driving the vane comprises cam surfaces engageable by a cam drive means mounted in the apparatus.

7. A rotary display unit as claimed in any preceding claim in which said means at one end of the vane comprises an annular bearing member, and further comprising a source of light arranged to direct light into the opening provided by said annular bearing member.

8. A rotary display unit as claimed in Claim 7 in which said opening in the bearing member is about the same size as the inscribed diameter of the internal cross-section of the vane.

9. A rotary display unit as claimed in Claim 7 in which said bearing member rotates within and forms a plain bearing with an annular fixed bearing member.

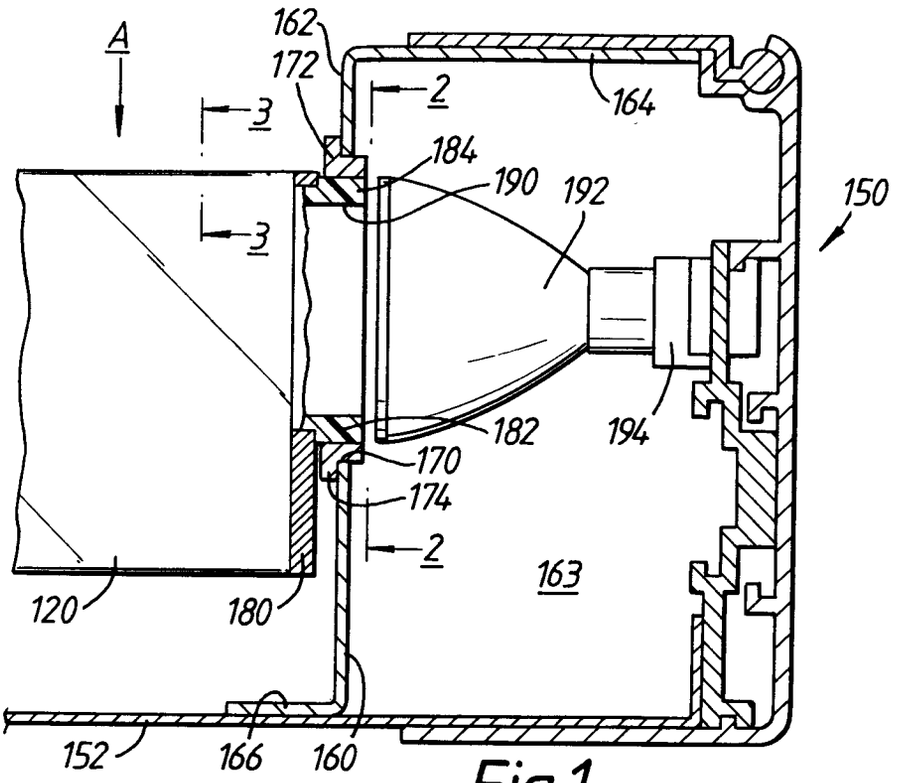


Fig.1

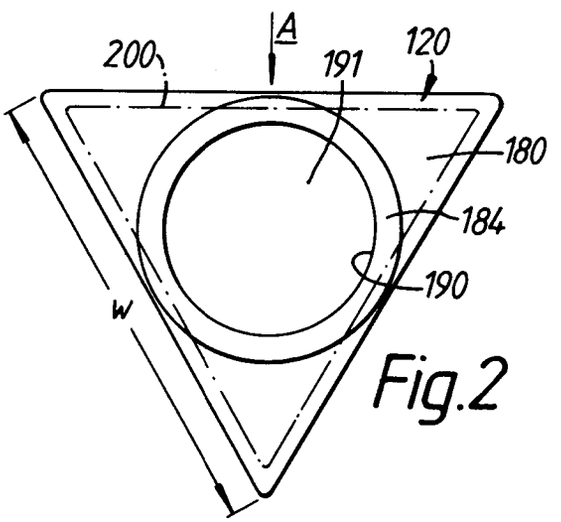


Fig.2



Fig.3

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EUROPEAN SEARCH REPORT

Application Number
EP 94 30 1711

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)
D,A	EP-A-0 249 396 (F.S. DISPLAYS LTD.) * page 7, line 16 - page 18, line 25; figures *	1,4-7,9	G09F11/02
A	US-A-4 381 616 (SAXER) * column 2, line 60 - column 4, line 29; figures *	1,4,5	
A	DE-A-41 15 784 (DPW DEUTSCHE PLAKAT-WERBUNG GMBH &CO) * page 2, line 42 - page 4, line 13; figures 1,3,5 *	1,4	
A	EP-A-0 426 411 (MINNESOTA MINING & MANUFACTURING CO.) * column 2, line 15 - column 3, line 54; figures *	1-3	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			G09F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	22 April 1994	Taylor, P

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
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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