United States Patent

Ruppert

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[45] May 23, 1972

[54] LINEAR PRISM DISPLAY

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[73] Assignee: **Oak Electro/Netics Corp.,** Crystal Lake, Ill.

[22] Filed: **May 19, 1969**

[21] Appl. No.: **825,487**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 747,717, July 25, 1968, abandoned.

[52] **U.S. Cl.** .....**40/28 R,** 40/33, 30/37, 40/331

[51] **Int. Cl.**.....**G09f 11/00**

[58] **Field of Search** .....40/130 B, 137, 61, 62, 28, 40/331, 52; 350/287, 112

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Primary Examiner—Robert W. Michell

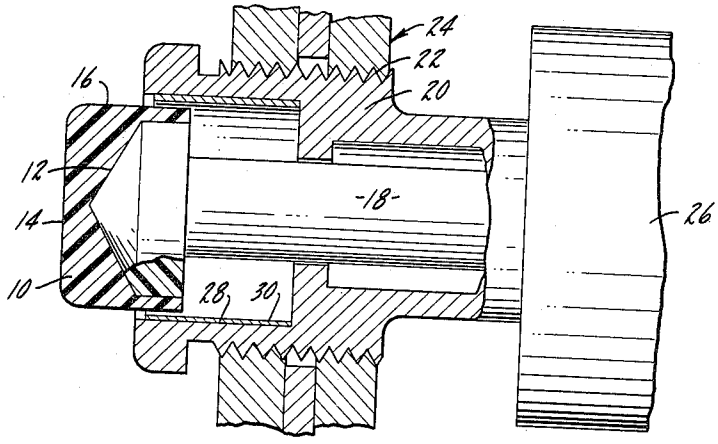
Assistant Examiner—Wenceslao J. Contreras

Attorney—Parker, Carter & Markey

[57] **ABSTRACT**

A display device including a prism having an object surface, an image surface and a reflecting surface. The reflecting surface is symmetrical in configuration and the object surface is outside the reflecting surface. There is indicia positioned adjacent and outwardly spaced from the object surface such that relative movement between the object surface and indicia along the axis of symmetry of the reflecting surface changes the display visible at the image surface.

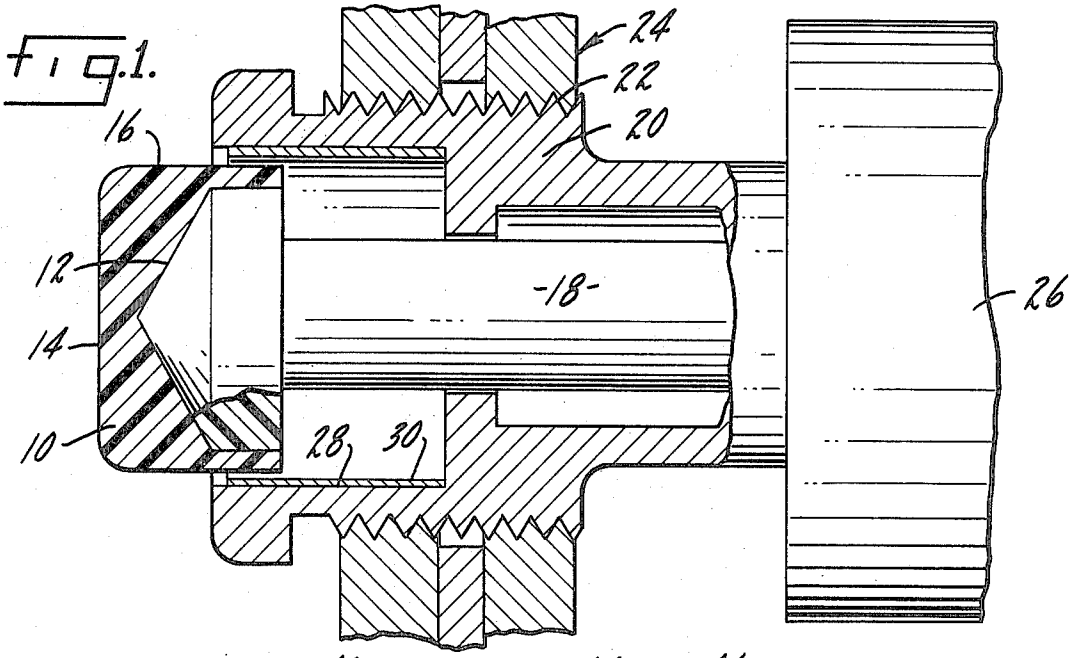
31 Claims, 32 Drawing Figures



Patented May 23, 1972 3,664,047

6 Sheets-Sheet 1

Fig. 1.



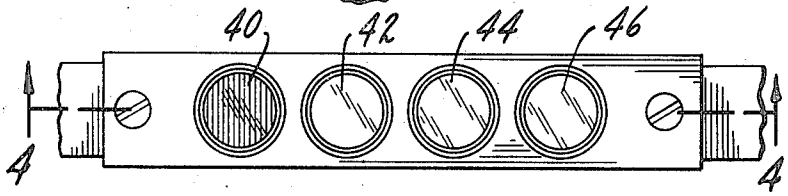


Fig. 3.

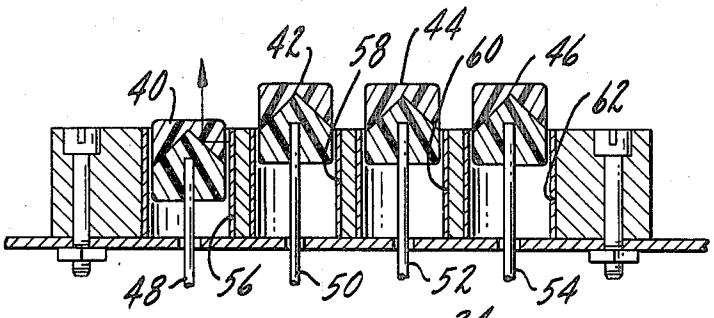


Fig. 4.

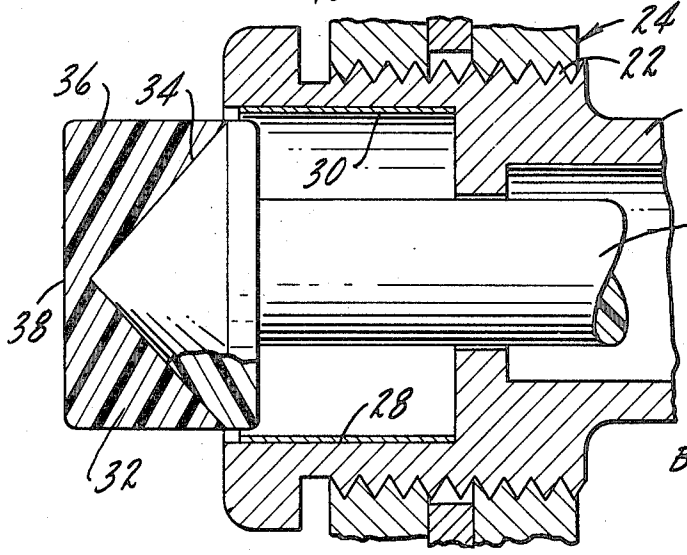


Fig. 2.

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fig.7.

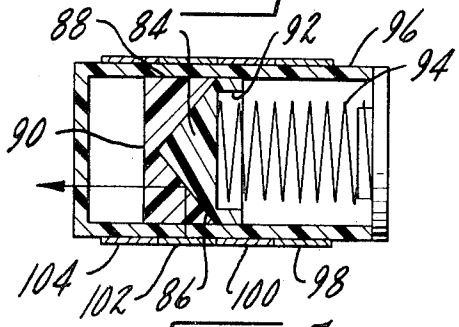


fig.8.

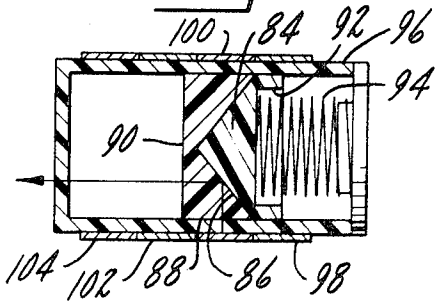


fig.5.

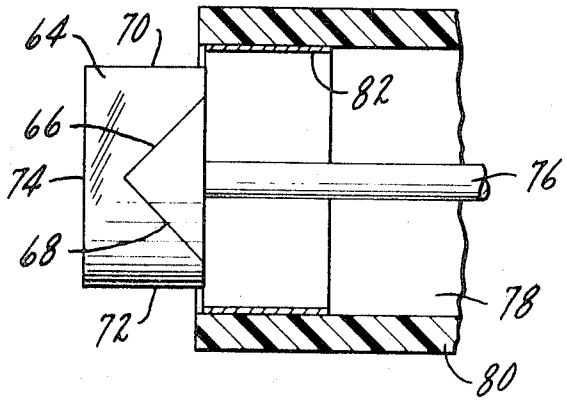


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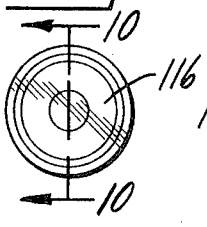
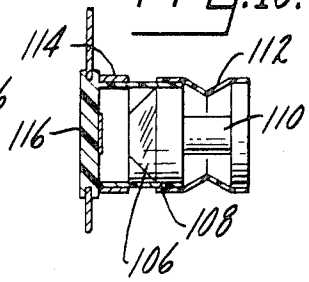
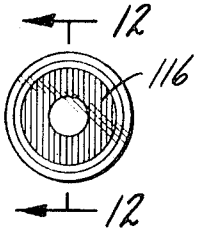


fig.10.





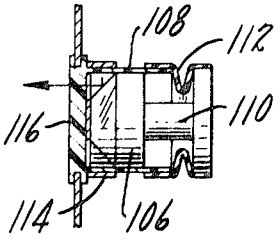


fig.11.

fig.12.

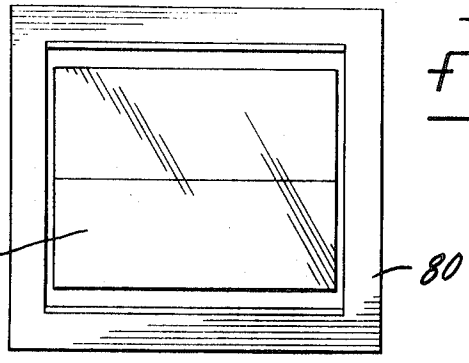


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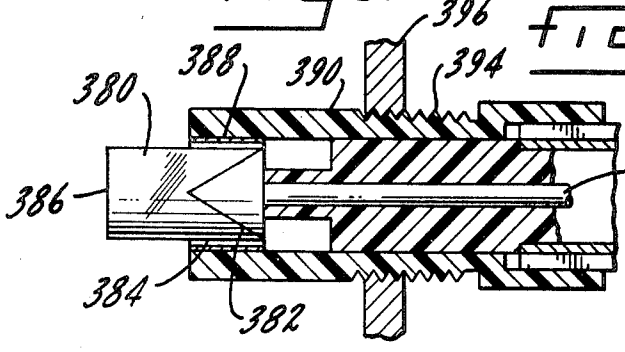


fig.32.

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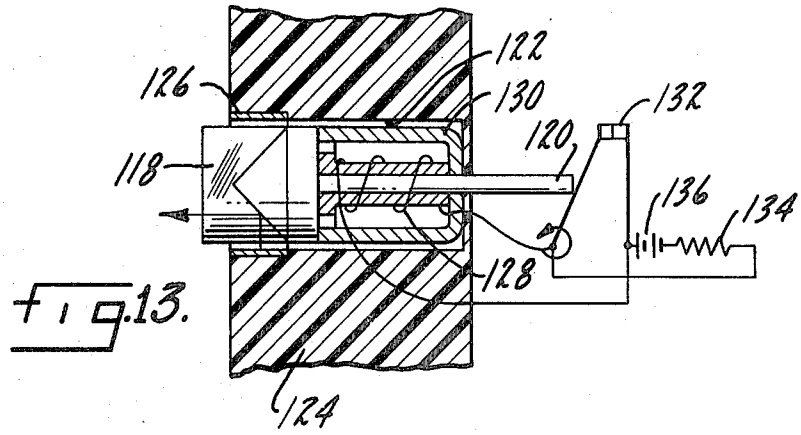


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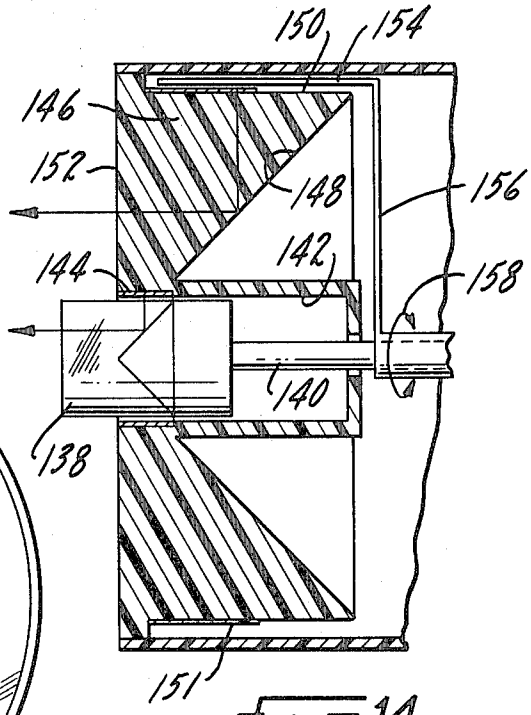


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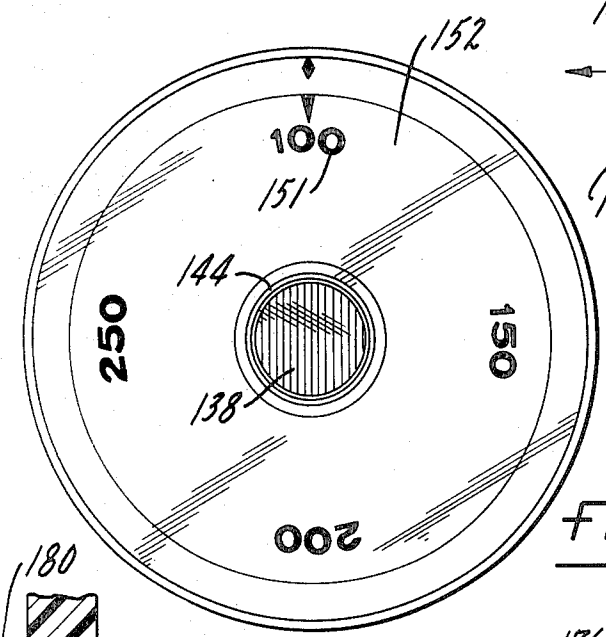


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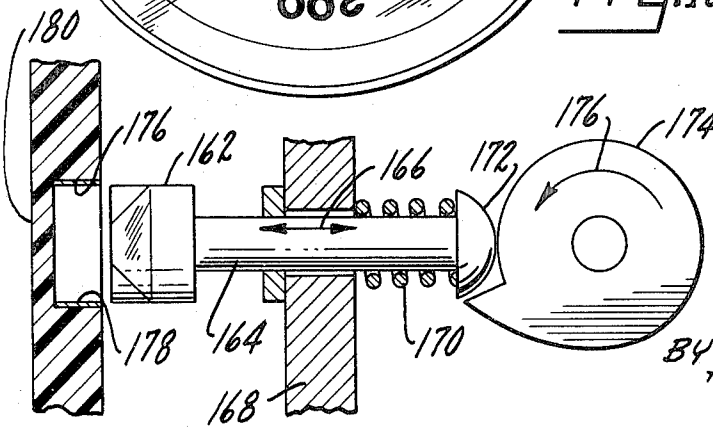


Fig. 16.

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fig. 17.

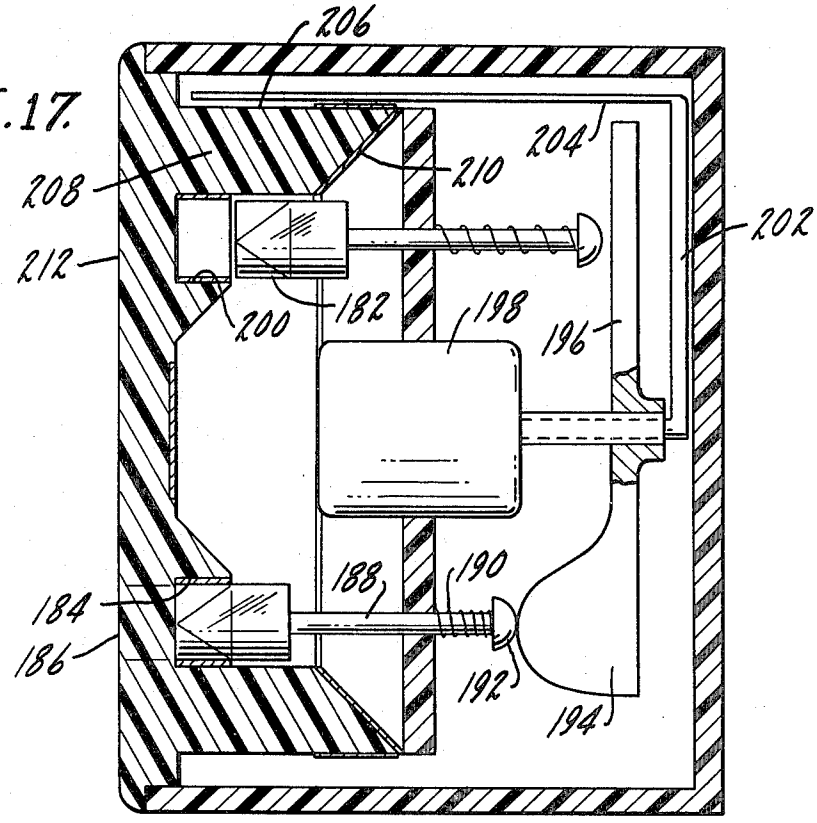
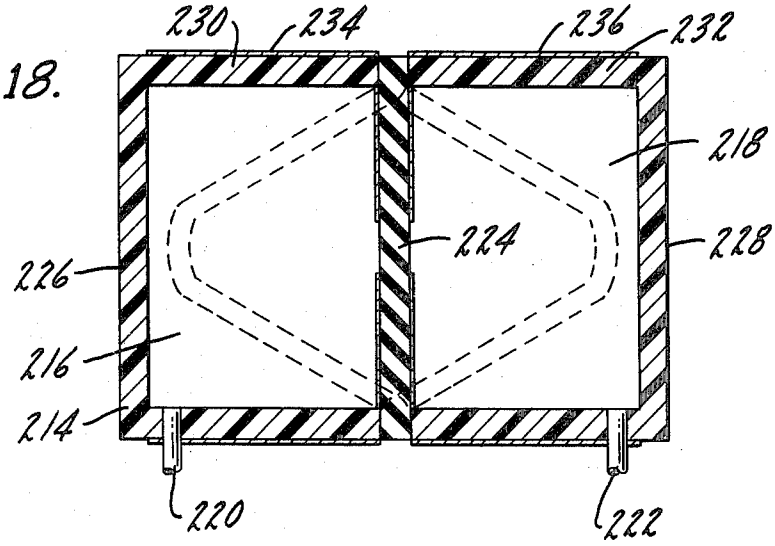


fig. 18.



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Fig. 19.

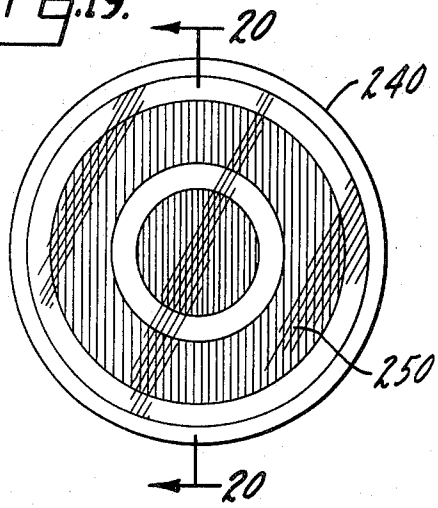


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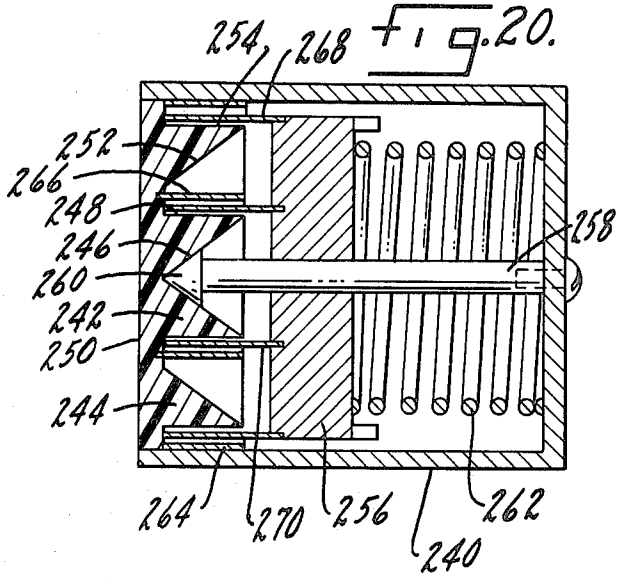


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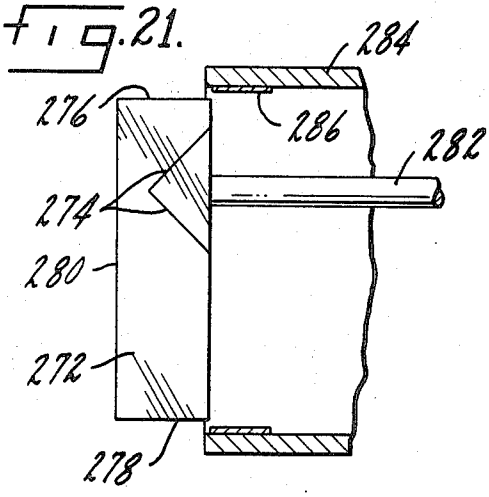
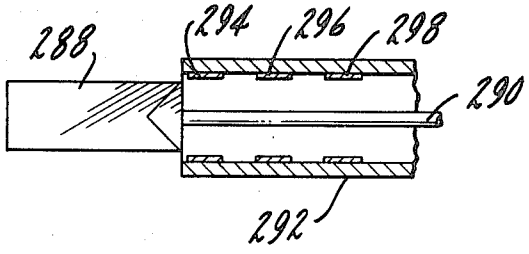


Fig. 22.



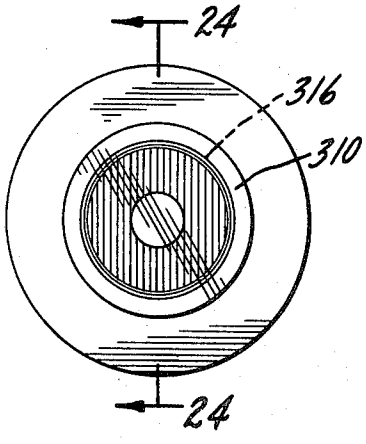


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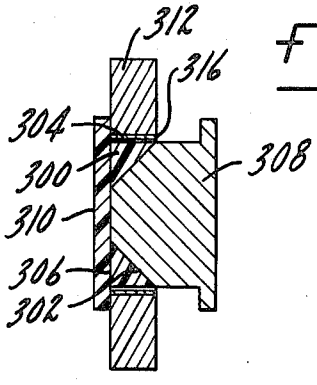


Fig. 24.

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Fig. 25.

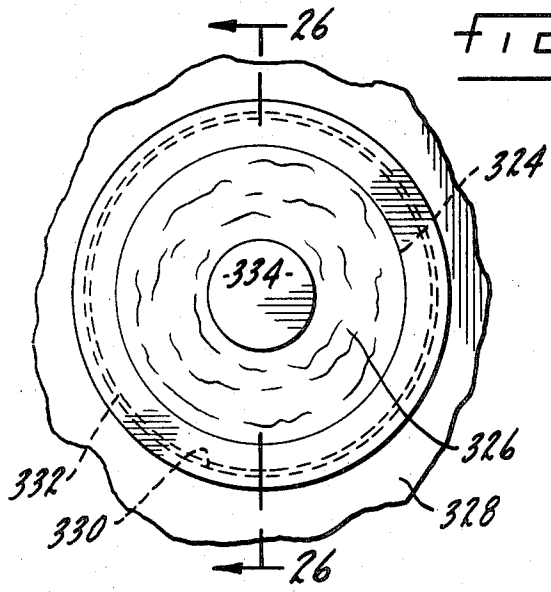


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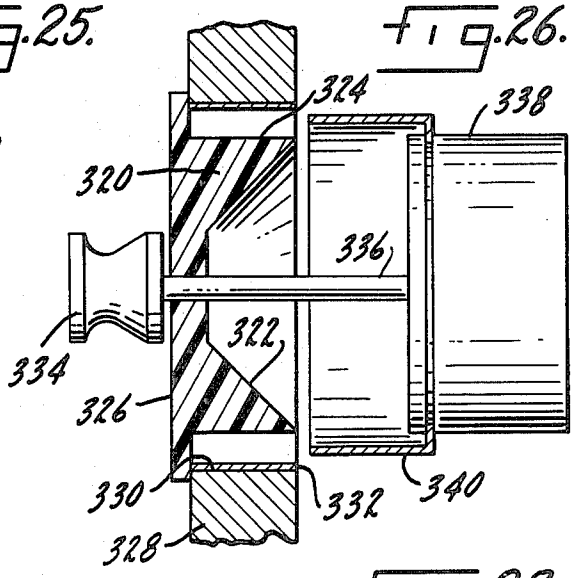


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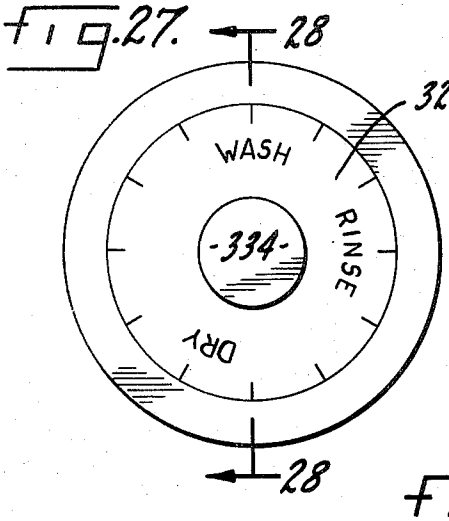


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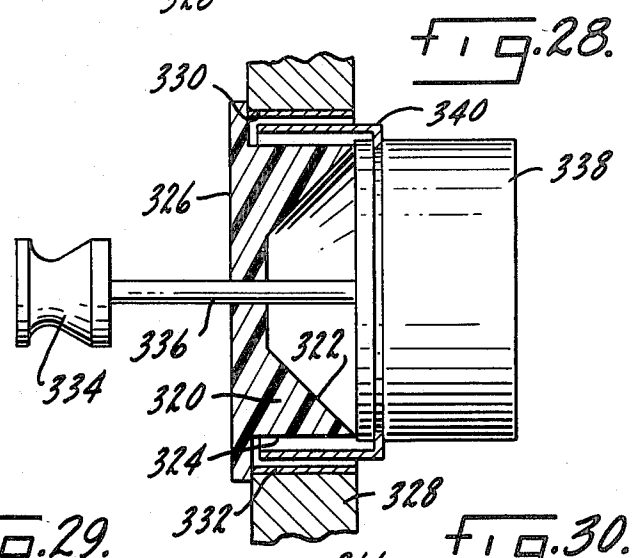


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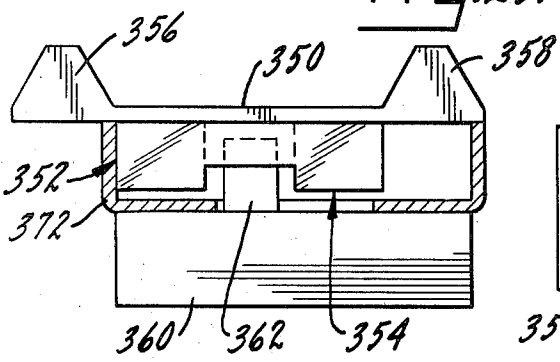


Fig. 30.

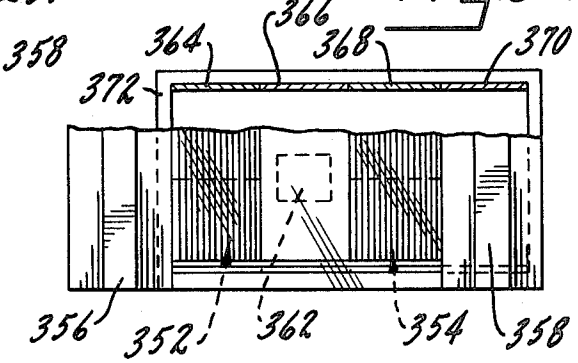
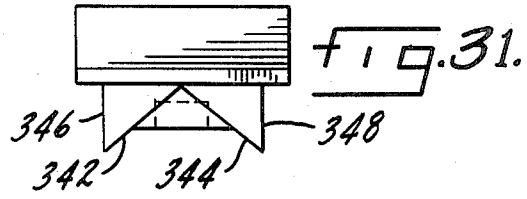


Fig. 31.



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LINEAR PRISM DISPLAY

SUMMARY OF THE INVENTION

This invention relates to display devices utilizing reflecting prisms and is a continuation-in-part of my copending application Ser. No. 747,717, filed July 25, 1968, now abandoned.

A primary purpose of the invention is a display device utilizing a reflecting prism which moves linearly along the axis of symmetry of the reflecting surface of the prism.

Another purpose is a display device of the type described in which the reflecting surface is generally conical, the object surface is cylindrical and positioned outside of the reflecting surface, and in which the indicia, visible at the image surface, is concentric with and spaced outwardly from the object surface.

Another purpose is a prism display device in which linear movement between the prism and fixed indicia is effective to change the display at the image surface of the prism.

Another purpose is a display device including a linearly movable prism, with indicia extending about and outwardly spaced from the prism, and pressure responsive means urging the prism in one direction to change the indicia visible at the image surface.

Another purpose is a display device utilizing a plurality of linearly movable reflecting prisms, each of which have reflecting surfaces which are generally symmetrical in configuration and movable along their axes of symmetry.

Another purpose is a display device utilizing a plurality of reflecting prisms, at least one of which is linearly movable.

Other purposes will appear in the ensuing specification, drawings and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is illustrated diagrammatically in the following drawings wherein:

FIG. **1** is a vertical section through a display device of the type described illustrating the prism in one position,

FIG. **2** is a vertical section, similar to FIG. **1**, showing a modified form of display device,

FIG. **3** is a top plan view of a display device utilizing a plurality of reflecting prisms,

FIG. **4** is a vertical section along plane **4—4** of FIG. **3**,

FIG. **5** is a vertical section, similar to FIGS. **1** and **2**, but showing a further form of display device,

FIG. **6** is a front end view of the display device of FIG. **5**,

FIG. **7** is a vertical section illustrating yet a further form of display device,

FIG. **8** is a vertical section, similar to FIG. **7**, showing the prism in a second position,

FIG. **9** is a front end view of yet a further form of reflecting prism utilizing a linearly movable display device,

FIG. **10** is a section along plane **10—10** of FIG. **9**,

FIG. **11** is a front end view of the device of FIG. **9**, with the prism in a different position,

FIG. **12** is a section along plane **12—12** of FIG. **11**,

FIG. **13** is a vertical section through yet a further form of display device utilizing a linearly movable prism,

FIG. **14** is a vertical section illustrating a further form of display device utilizing a linearly movable reflecting prism,

FIG. **15** is a front end view of the display device of FIG. **14**,

FIG. **16** is a vertical section through an additional form of display device utilizing a linearly movable reflecting prism,

FIG. **17** is a vertical section of a display device utilizing a plurality of reflecting prisms,

FIG. **18** is a vertical section through yet a further form of display device using a linearly movable reflecting prism,

FIG. **19** is a front end view of a force-operated display device,

FIG. **20** is a section along plane **20—20** of FIG. **19**,

FIG. **21** is a vertical section of a modified form of display device in which the object surfaces are not directly adjacent the reflecting surfaces,

FIG. **22** is a vertical section through yet a further form of prism display device,

FIG. **23** is a front end view of a modified form of prism display device,

FIG. **24** is a section along plane **24—24** of FIG. **23**,

FIG. **25** is a front plan view of a further display device,

FIG. **26** is a section along plane **26—26** of FIG. **25**,

FIG. **27** is a front plan view of the device in FIGS. **25** and **26** in a second position,

FIG. **28** is a section along plane **28—28** of FIG. **27**,

FIG. **29** is a side view in partial section of a further form of display device using a reflecting prism,

FIG. **30** is a top plan view of the device of FIG. **29** with portions broken away,

FIG. **31** is an end view of the prism used in the structure of FIGS. **29** and **30**, and

FIG. **32** is a vertical section through an additional reflecting prism display device.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Reflecting prisms of a suitable transparent material, for example glass, plastic or the like, and having an object surface, an image surface and a reflecting surface, are useful in displaying, at the image surface, an object positioned on or adjacent the object surface. Such use requires that the reflecting surface either be highly polished so as to have high reflecting characteristics, or have a suitable mirrorized layer, for example a vacuum deposit of aluminum, applied thereto. If these criteria are met, any object or display adjacent or on the object surface can be viewed from the image surface. The present invention utilizes this principle in providing a plurality of different display devices.

Turning to FIG. **1**, a push-button is indicated at **10** and may include a prism having a reflecting surface **12**, an image surface **14** and an object surface **16**. Note that the image surface is generally flat and circular. The object surface is generally cylindrical and the reflecting surface **12** is substantially conical. The three surfaces, in section, form a right triangle with the reflecting surface **12** being the hypotenuse. The member **10** may be attached to a suitable shaft or the like **18** for movement along the axis of symmetry of the conical reflecting surface **12**.

Partially enclosing the member **10** and its shaft **18** is a housing **20**, which may be attached by means of threads or the like **22** to a structure indicated generally at **24**, which may conveniently be the front panel of an instrument or the like. The shaft **18** may extend rearwardly into a member indicated at **26** which may represent a conventional switch or other instrument. The member **10** is effective upon linear movement to change the condition of the switch or instrument **26**.

Within a cavity **28** formed in the housing **20** is cylindrical indicia indicated at **30**, which may take a variety of forms. For example, the indicia **30** may be merely a colored tape. It may be a tape having alpha-numeric information applied thereto or embedded therein. In either event, the indicia **30** is effective to provide a display. When the device is in the position of FIG. **1**, note that the reflecting surface **12** is not adjacent the indicia **30**. However, when the member **10** has been moved into the cavity **28**, for example to change the condition of the instrument or switch **26**, the indicia **30** will then be opposite the reflecting surface **12** so that whatever is on the indicia **30** in the way of color or alpha-numeric information, will be reflected to the image surface **14**. Anytime the position of the display device is changed to cause a change in the instrument or switch, the indicia displayed at the front of the device or on its image face will also be changed.

FIG. **2** shows a modified form in which like parts have like numerals. The principal difference between the structure of FIGS. **1** and **2** is that the angular relationship of the reflecting surface, object surface and image surface is changed. In FIG. **2**, a push-button **32** has a reflecting surface **34** which forms a 45° angle with an object surface **36** and a further 45° angle with an image surface **38**. This particular angular relationship is not necessary. In FIG. **1** there is a 30°–60° angular relationship between the hypotenuse or reflecting surface and the ob-

ject and image surfaces. In other respects the structures of FIGS. 1 and 2 are the same.

FIGS. 3 and 4 show the use of a plurality of push-button indicating devices, such as shown in FIGS. 1 and 2 in a single display device. Reflecting prism push-buttons are indicated at 40, 42, 44 and 46. Each have conical reflecting surfaces which are adapted to move along the axis of symmetry of the cones. Each of the push-buttons are attached to shafts indicated at 48, 50, 52 and 54. The various push-buttons and their shafts move in cylindrical passages, the sides of which may mount suitable indicia. For example, cylinders indicated at 56, 58, 60 and 62 may enclose the paths of movement of the push-buttons 40–46 and each of these cylinders 60–62 may be suitably colored or have other indicia such as alpha-numeric information, printed or embedded therein. When a push-button has been moved inwardly, as the push-button 40, the reflecting surface is then positioned adjacent the indicia such that the indicia is at the image surface. The entire assembly may be suitably mounted, as in the dashboard of an automobile radio or in any other construction in which a plurality of push-buttons are arranged for individual operation of various switches or other instruments.

In FIG. 5 a push-button 64 may be generally rectangular in cross section and may have a pair of converging generally symmetrical reflecting surfaces 66 and 68. There are object surfaces 70 and 72 on opposite sides of the push-button and generally coextensive with the reflecting surfaces 66 and 68. A generally flat image surface 74 extends over the entire front of the push-button 64. The push-button 64 may be suitably attached to a shaft 76 for movement into a cavity 78 formed in a body member 80. Suitable indicia 82 is attached to opposite walls of the cavity 78 such that when the push-button is in the in position, the indicia will be visible at the image surface 74.

The structure in FIGS. 5 and 6 is substantially the same as that of FIGS. 1 and 2, except that the reflecting surface is not conical, but does have a triangular cross section with convergent sides and a generally symmetrical configuration. The push-button is movable along the axis of symmetry.

It is important to have the object surface of the prism outside of the reflecting surface. All of the structures shown herein utilize prisms which are constructed in this manner. It has been determined that when the object surface is within or inside of the reflecting surface, the display at the image surface is not satisfactory and is not complete. By using the construction disclosed herein, the indicia is visible at the image surface from substantially any position in front of and to the side of the image surface. However, when the object surface is inside of the reflecting surface, a viewer must be directly in front of the image surface before he can see the indicia.

In FIGS. 7 and 8 a reflecting prism 84 has a conical reflecting surface 86, a cylindrical object surface 88 and a generally flat image surface 90. The prism 84 may have a socket 92 which seats a coil spring 94. The prism is movable within a generally cylindrical transparent housing 96. The position of the prism in the housing is determined by the spring and by any force which opposes the spring.

Positioned about the outside of the transparent housing 96 are a plurality of indicia indicated at 98, 100, 102 and 104. Each of the indicia 98–104 may be colored bands or tapes, with each band being a different color than the one adjacent to it. The structure shown in FIGS. 7 and 8 may find application as a means for measuring acceleration. For example, if attached to an automobile, the force caused by acceleration of the automobile would be effective to move the prism against the action of the spring 94 with the amount of acceleration determining the position of the prism within the transparent housing 96. The position of the prism would determine what band of colored indicia would be visible at the image surface. The force of acceleration of the automobile could thus be determined by the color display at the image surface.

FIGS. 9–12 show a further form of pressure-responsive display device. A prism indicated at 106 may have a conical reflecting surface, a cylindrical object surface and a generally flat image surface. The prism 106 is movable within a cylinder 108 and is attached to a plunger 110. A bellows or the like 112 may be attached to the cylinder 108 at one end and may be attached at its opposite end to the plunger 110. Any fluid pressure, for example air, hydraulic, water or the like, from the right-hand side or acting against the right-hand side of the plunger 110, is effective to collapse the bellows 112, as indicated in FIG. 12, and change the position of the prism 106 within the cylinder 108. A band of indicia indicated at 114, which again may be a colored tape or film, is positioned outside of the cylinder 108 which is preferably transparent, at least in the area adjacent the band 114. When the plunger has moved the prism to the position indicated in FIG. 12, the indicia band 114 will create a display not only at the image surface of the prism, but at the image or front surface 116 of the cylinder 108. Note FIG. 11 which shows a different display at the surface 116 than is shown in FIG. 9. The position of the plunger determines what display, if any, is visible at the front surface 116.

In FIG. 13 a reflecting prism 118, again having a conical reflecting surface, a cylindrical object surface and a generally flat front image surface is attached to a shaft 120. The prism 118 and the shaft may move within a cavity 122 in a member 124 which may conveniently be the front face of an instrument or switch. Indicia is indicated at 126 and may be a colored band or a band containing suitable alpha-numeric information.

Positioned within the cavity 122 and surrounding the shaft 120 is a coil 128. The coil 128 may be a part of a solenoid structure which includes a core 130 with the shaft 120 forming the movable armature. When the push-button or prism 118 is pushed inwardly to the position of FIG. 13, an electrical circuit including contacts 132, a resistance 134 and a battery 136 is closed. The coil 128 will then be energized to hold the push-button in the position of FIG. 13. In like manner, rather than having the circuit arranged to hold the push-button in a particular position so that indicia may be visible at the image face, a solenoid may be arranged to operate the push-button and thus move it to its new position. In either event, when the push-button has been moved to the position of FIG. 13, the indicia 126, whether it be merely a band of color or alpha-numeric information, is visible at the image face of the prism 118.

FIGS. 14 and 15 illustrate a display device utilizing different prism configurations. A linearly movable prism is indicated at 138 and again may have a conical reflecting surface, a cylindrical object surface and a generally flat image surface. The push-button 138 is attached to a shaft 140 with both the shaft and the push-button being movable within a cavity 142. Indicia 144 is positioned at the wall of the cavity and concentric with and outwardly spaced from the object face so that when the push-button is in the position of FIG. 14 the particular information on the indicia 144 will be visible at the image face of the push-button or prism.

Concentric with the prism 138 is a second reflecting prism 146 having a generally conical reflecting surface 148, a cylindrical object surface 150 and a generally flat or planar image surface 152. Adjacent the object surface 150 is a pointer 154 attached to an arm 156. The arm 156 may be movable about the shaft 140 as indicated by arrow 158. The position of the movable pointer 154, which can move in a path generally uniformly spaced from the object surface 150, is visible at the image face 152. Note in FIG. 15 the arrow 160 which is the position of the pointer 154 relative to the object surface 150. Suitable indicia 151, in the form of alpha-numeric information, may also be adjacent or on the object surface 150 so that the combination of the movable pointer 154 and the fixed indicia 151 adjacent the object surface 150 displays useful information at the front face 152. The push-button displays one form of information, for example an on-off indication, and the fixed and movable indicia adjacent the outer object surface 150, displays a particular condition of operation, for example, the heat of an oven or the temperature of a refrigerator or freezer.

In FIG. 16 a prism 162, which again may have a reflecting surface, an object surface, and an image surface as described above, is attached to a plunger 164 movable in the direction of arrows 166. The plunger 164 passes through an opening in a support 168 and there is a coil spring 170 positioned about the plunger 164 and bearing against the support 168. The plunger 164 may have a head 172 positioned against a rotating cam 174. When the cam moves in the direction of arrow 176, it is effective to cause reciprocation of the plunger 164 and thus to move the prism 162 into and out of a cavity 176. The wall of the cavity may have indicia 178 such that when the prism 162 has moved into the cavity there will be a display at the image face of the prism and this display will be visible from the front face 180. Again, the front face 180 may conveniently be part of an instrument or switch.

In FIG. 17 a clock mechanism is illustrated which uses a combination of two different types of prism display devices. There may be 12 generally equally spaced linearly movable prisms indicated at 182. Each of the prisms 182 may be constructed as described above, having a conical reflecting surface, a cylindrical object surface and a generally flat front image surface. There are 12 generally equally spaced sockets 184 peripherally spaced about a front transparent face 186. Each of the prisms 182 are attached to shafts 188 which use the combination of a coil spring 190, head 192 and a rotating cam 194 as described in connection with FIG. 16. The cam 194 is part of an arm 196 which is driven by a clock motor 198. As the clock motor turns, successive prisms 182 will be moved into one of the cavities 184 so that indicia 200, in the form of a tape or film positioned inside of the cavity, and preferably colored, will be visible through the front face to indicate the hour.

Also attached to the clock motor is an arm 202 having a pointer 204. The pointer 204 moves adjacent an object surface 206 of a conical prism 208. The prism 208 has a reflecting surface 210 and an image surface 212 which is the front face of the entire structure or clock. Suitable indicia in the form of the minutes of a clock face may be arranged at the object face 206 so that the position of the pointer 204 will give an indication in minutes to cooperate with the prisms 182 which display the particular hour.

In FIG. 18 an enclosure 214 may be divided into two chambers indicated at 216 and 218. There are pipes 220 and 222 extending into the chambers 216 and 218, respectively. A flexible diaphragm 224 is positioned within the enclosure 214 and may take either one of the two positions indicated in FIG. 18, depending upon the pressure conditions at the pipes 220 and 222. The enclosure 214 is transparent and the opposite faces 226 and 228 act as image surfaces. The cylindrical surfaces 230 and 232 are object surfaces and the indicia indicated at 234 and 236 can be displayed at either of the image surfaces depending upon the position of the flexible diaphragm 224. In this connection, the diaphragm 224 may be covered with a suitable reflective material, again a coating of aluminum may be satisfactory. However, it should be understood that the diaphragm 224 has to be not only reflective, but flexible. When the flexible diaphragm has moved to the left, indicia 234 will be visible at image surface 226, whereas when it has moved to the right indicia 236 will be visible at image surface 228. Thus the pressure conditions of the pipes 220 and 222 can be visually indicated by the position of the flexible diaphragm 224. Not only can it be determined which of pipes 220 and 222 have greater pressure, but the pressure difference can be determined by the position of the diaphragm, which in turn controls the extent to which the indicia is visible at the image surface.

In FIGS. 19 and 20 a housing is indicated at 240 and may include a cylindrical wall and a generally circular end wall. The front face of the housing includes a pair of conical prisms indicated at 242 and 244. Interior prism 242 may have a conical reflecting surface 246, a cylindrical object surface 248 and its image surface may be formed by the transparent front 250 of the housing 240. The outer prism 244 may include a conical reflecting surface 252, a cylindrical object surface 254 and the common image surface 250.

Mounted within the housing 240 is a plunger 256 movable on a shaft 258. The shaft is positioned in the housing by a conical shaped end 260 which mates with the back of the conical reflecting surface 246. A spring 262 is positioned within the housing behind the plunger 256 and normally urges the plunger to the position of FIG. 20.

Cylindrical indicia 264 in the form of a colored tape or the like is positioned on the interior wall of the housing 240 and opposite the object surface 254. In like manner, there is indicia 266, again a colored tape or the like, positioned adjacent and opposite the object surface 248. The plunger 256 carries a pair of cylindrical screens. The outer screen is indicated at 268 and when the plunger is in the position of FIG. 20 is positioned between the indicia 264 and the object surface 254. The interior screen 270, when the plunger is in the position of FIG. 20, is positioned between the indicia 266 and the object surface 248. The screens 268 and 270 may be opaque or colored such that when they are positioned as shown in the drawings, it is the screen color or colors which will be reflected by the reflecting surfaces to the image face of the compound prism. However, when suitable forces, for example the force of acceleration of an automobile, have caused the plunger to be moved to the right, compressing spring 262, the screens will be moved away from the prism object surfaces, to permit the indicia 264 and 266 to form a color display at the image surfaces of the compound prism. Thus the particular color or colors visible at the image surfaces, and the amount of colors and the relationship between contrasting colors, can give a visual indication of a force, for example the force of acceleration. In this connection, the device performs a function similar to that of the structure in FIGS. 7 and 8, except rather than have the indicia linearly spaced along the path of movement of the prism, it is concentric with the prism.

In FIG. 21, a prism 272 may have symmetrical convergent reflecting surfaces 274, object surfaces 276 and 278 and an image surface 280. The prism 272 is attached to a shaft 282 and is thus movable within a housing 284. Attached to the interior of the housing 284 is a suitable tape or other indicia 286. The structure shown in FIG. 21 differs from that of FIGS. 5 and 6 only in that one of the object surfaces is not directly adjacent its reflecting surface, but has been moved outwardly from it. The display at the image surface will still be the same and will be directly in alignment with the reflecting surfaces. However, in some instances it may be advantageous and desirable to place some legend or the like on the image face between the object surface 278 and its corresponding reflecting surface 274. Thus, by moving the object surface outwardly from its reflecting surface, there is room for the legend. The operation of the device shown in FIG. 21 is the same as described above.

In FIG. 22 a prism 288 is elongated in form and has a reflecting surface, object surface and image surface, as described above. The prism 288 is attached to a shaft 290 and is movable in a housing 292. Linearly spaced along the interior of the housing 292 are tapes 294, 296 and 298. Each of these tapes may be merely a colored tape, or they may include alpha-numeric information. The shaft 290 may have suitable mechanical means, not shown, so that the prism 288 may be held at various positions within the housing 292. Thus, at a first position, the indicia on tape 294 may be visible at the image surface of the prism. In a second position, the indicia on tape 296 may be visible, etc. The structure shown in FIG. 22 is advantageous for use as a variably positioned push-button switch or operator.

FIGS. 23 and 24 show a further form of prism display device in which the indicia moves and the prism is stationary. A conical prism 300 may have a reflecting surface 302, a cylindrical object surface 304 and a generally flat image surface 306. The prism 300 is fixed in a housing 308 and there may be a front transparent cover for the housing indicated at 310. A movable cylinder 312 may have indicated at 316 on its interior surface. In the position of FIG. 24 this indicia will be reflected by the reflecting surface 302 to the image surface 306. By pushing the cylinder 312 the indicia will be moved away from the ob-

ject surface 304 and will thus no longer be visible at the image surface. Relative linear movement between the indicia and the object surface changes the display visible at the image surface. The cylinder 312 may be connected, by means not shown, to operate a suitable switch or instrument. However, it is the indicia which moves relative to the prism, and not the prism which moves relative to the indicia, which differentiates the structure shown in FIGS. 23 and 24 from the previous forms of the invention.

FIGS. 25, 26, 27 and 28 show a further form of rotary display device including a circular prism 320 having a reflecting surface 322, an object surface 324 and an image surface 326. The prism 320 may be suitably attached to a mounting plate 328 having an aperture 330. Along the sides of the aperture 330 is an indicia tape or the like 332, which in the position of FIG. 26 will be reflected by the reflecting surface 322 to the image surface 326. As illustrated in FIG. 25, the tape or indicia 332 may contain a graphic design, for example a wood grain effect.

A control member 334 is fastened onto a shaft 336 which extends outwardly from a switch or instrument 338. The control member 334 may have a suitable legend, for example "-Pull to Start." FIGS. 28 and 29 show the operating position or the "on" position of the construction in FIGS. 25 and 26. The control member 334 has been pulled outwardly such that the switch 338 has been moved forward. A second set of indicia indicated at 340 is attached to the switch 338 and extends between the indicia 332 and the object surface 324. Thus, the indicia visible at the image face 326 has been changed by an outward pull on the control member 334. The indicia on the tape 340 may consist, for example, of control information for a washer or dryer or for a stove. In the "off" position of FIGS. 25 and 26, only a graphic design is visible. The control information, for example temperature, different cycles of a washer or the like, are only visible when the "Pull to Start" control member 334 has been moved to the "on" position. The indicia 340 moves in a path parallel to the object surface and is inserted between the indicia 332 and the object surface 324. Thereafter, rotation of the control member 334 is effective to control the operation of the switch 338. In addition to having the indicia 340 merely indicate various operating conditions, there may be a moving window or a color band such that as the control member is rotated, there is an indication of the particular condition of operation of the machine, be it a washer, dryer, stove or the like.

In FIGS. 29, 30 and 31, there may be two sets of prisms, one set being illustrated in FIG. 31. Each set of prisms is identical and may have reflecting surfaces 342 and 344, object surfaces 346 and 348 and a common image surface 350. A top plan view of the prisms is indicated in FIG. 30, and one set of prisms is indicated generally at 352 with the other set of prisms being indicated generally at 354. The common image surface 350 for both sets of prisms may have operating handles or the like 356 and 358 which are used to move the sets of prisms 352 and 354, which are connected together, as a unit, in the manner of a slide switch. The switch itself is indicated at 360 and may have an upwardly-extending switch member 362 which is positioned between the sets of prisms 352 and 354. Thus, movement of the slide switch either to the right or left, is effective to move the prisms as well as the switch member 362.

There are four sets of indicia tapes at each side of the slide switch. As illustrated particularly in FIG. 30, there may be tapes 364, 366, 368 and 370. In the position of FIG. 30, indicia tapes 364 and 368 will cause a display through the two sets of prisms. For example, the two sets of prisms may have a red color displayed at the image surface. When the slide switch is moved to the right, then indicia tapes 366 and 370 will be positioned adjacent the object faces such that a different color will then be displayed at the common image face. Thus, the condition of the slide switch, either on or off, for example, is readily visible at the common image face. FIG. 30 shows one-half of the housing 372 containing the tapes and mounting the slide switch, while the other side is beneath the slide member formed of the two sets of prisms and the operating means 356 and 358.

FIG. 32 illustrates a further form of linearly moving display device in which there is a combination of an on-off control, as well as a potentiometer control, for example to control the volume of a radio. A prism 380 may have a reflecting surface 382, an object surface 384 and an image surface 386. Adjacent the object surface 384 is an indicia tape 388 which is fastened on the inside of a sleeve 390. The prism member 380 may be attached to a shaft 392 for in and out movement. The inner end of the shaft may be connected to a suitable switch or the like for controlling an on or off function. The sleeve 390 may have a threaded section 394 which permits rotation of the sleeve in control panel surface 396. Rotation of the sleeve 390 is effective to move it in or out to thus change the position of the indicia 388 relative to the object surface 384. In addition, rotation of the sleeve may be arranged, at its inner end, to operate a variable resistor or potentiometer. In the position of FIG. 32 the prism member 380 is in an " on" position, or has been moved inwardly. Thus, the indicia tape 380, in its entirety, will be visible at the image surface 386 to give, for example, a one color indication that the device is "on" and at full volume. By rotating the sleeve 390, which would cause it to move outwardly, less color or less of the information on the indicia tape becomes visible at the image surface 386. Thus, as the volume is decreased, there is less color visible at the image surface. When the prism member 380 is moved to the "off" position, there will be no color visible as the prism member 380 would then be outwardly or to the left of the position shown in FIG. 32.

Although I have described many of the reflecting surfaces as being conical in configuration, it should be obvious, particularly considering FIGS. 5 and 6, that what is essential is that the reflecting surfaces be symmetrical about either a point or a line or that there is an axis of symmetry. The object surfaces will be coextensive with the reflecting surface. Thus, if there are two convergent reflecting surfaces, there will be two object surfaces. If the reflecting surface is conical, then the object surface will generally be coextensive with it.

It is the combination of a prism having a symmetrical reflecting surface, a generally coextensive object surface and an image surface, and being relatively movable with respect to indicia positioned outside of and adjacent the object surface, which provides the particular advantages of the display device shown.

The various push-buttons or linearly moving prisms have been described as providing a changing display. This can be either an indicia display where there previously was none, or a change in the visible display.

Whereas the preferred form of the invention has been shown and described herein, it should be realized that there are many modifications, substitutions and alterations thereto within the scope of the following claims.

I claim:

1. In a display device, a reflecting prism having an image surface, a reflecting surface having a pair of generally symmetrical convergent sides and object surfaces outside of and generally coextensive with said reflecting surface sides, indicia positioned outside of said object surfaces, said indicia and prism being relatively movable along a path defined by the axis of symmetry of said reflecting surface to change the indicia reflected to said image surface.

2. The structure of claim 1 further characterized by and including a plurality of similar reflecting prisms each having object surfaces, an image surface and a reflecting surface, each reflecting surface having convergent generally symmetrical sides, with each object surface being outside of its reflecting surface, indicia positioned outside of and generally uniformly spaced from each object surface, with each indicia and its associated prism being relatively movable along a path defined by the axis of symmetry of each reflecting surface to change the indicia reflected to each image surface.

3. The structure of claim 2 further characterized in that each of said axes are parallel such that said prisms move in generally parallel paths.

4. The structure of claim 1 further characterized in that said prism is generally rectangular in configuration.

5. The structure of claim 1 further characterized by and including pressure-responsive means urging said prism in one direction along its path of movement.

6. The structure of claim 5 further characterized by and including a plurality of different indicia positioned outside of and generally uniformly spaced from said object surface, said indicia being axially positioned along the path of movement defined by said object surface, such that different indicia will be visible at the image surface at different positions of the object surface, which positions are at least in part controlled by said pressure-responsive means.

7. The structure of claim 6 further characterized in that said pressure-responsive means includes a spring.

8. The structure of claim 7 further characterized by and including a housing enclosing said prism and spring, said prism being movable in said housing and being urged in one direction by said spring, the position of said prism, in the housing, relative to the different indicia positioned along the path of said object surface being determined by a force applied opposite to the spring.

9. The structure of claim 1 further characterized in that said indicia is movable and said prism is stationary.

10. The structure of claim 1 further characterized by a plurality of different indicia, spaced along the path of movement.

11. The structure of claim 10 further characterized in that said different indicia are generally uniformly spaced, one from another, such than only one indicia is positioned adjacent the object surface at a time.

12. The structure of claim 1 further characterized by and including additional indicia, positioned outside of the path of movement of said first-named indicia, and fixed in position relative to the object surface.

13. The structure of claim 12 further characterized in that said fixed indicia is visible at the image surface when the first-named indicia is not between the fixed indicia and the object surface.

14. The structure of claim 13 further characterized in that said first-named indicia is rotatable relative to the object surface.

15. The structure of claim 1 further characterized by and including additional indicia, positioned outside of said object surface and along the path defined by the axis of symmetry of said reflecting surface, movement of said prism along said path changing the indicia visible at the image surface.

16. The structure of claim 15 further characterized by and including a second reflecting prism having an object surface, an image surface and a reflecting surface, the reflecting surface of said second prism being generally symmetrical with its object surface being outside of its reflecting surface, indicia positioned outside of the object surface of said second prism, with movement of said second prism along a path defined by the axis of symmetry of its reflecting surface changing the indicia reflected to its image surface.

17. The structure of claim 16 further characterized in that said first and second prisms have a common axis of symmetry and are arranged for simultaneous movement.

18. The structure of claim 1 further characterized by and including means for moving said indicia relative to said prism.

19. The structure of claim 18 further characterized in that said indicia is both rotatably and linearly movable relative to said prism.

20. The structure of claim 19 further characterized in that said prism is movable relative to said indicia.

21. In a display device, a reflecting prism having an object surface, an image surface, and a reflecting surface, said reflecting surface being generally symmetrical and said object surface being outside of said reflecting surface, indicia positioned outside of said object surface, said indicia and prism being relatively movable along a path defined by the axis of symmetry of said reflecting surface to change the indicia reflected to said image surface, and fluid pressure-responsive means urging said prism in one direction along its path of movement.

22. The structure of claim 21 further characterized by and including a collapsible annulus positioned about said prism, a plunger connected to said prism, said plunger being adapted to be moved by fluid pressure.

23. In a display device, a reflecting prism having an object surface, an image surface and a reflecting surface, said reflecting surface being generally symmetrical and said object surface being outside of said reflecting surface, indicia positioned outside of said object surface, said indicia and prism being relatively movable along a path defined by the axis of symmetry of said reflecting surface to change the indicia reflected to said image surface, and a solenoid for moving said prism relative to said indicia.

24. In a display device, a reflecting prism having an object surface, an image surface and a reflecting surface, said reflecting surface being generally symmetrical and said object surface being outside of said reflecting surface, indicia positioned outside of said object surface, said indicia and prism being relatively movable along a path defined by the axis of symmetry of said reflecting surface to change the indicia reflected to said image surface, and means for moving said prism relative to said indicia including a spring, and means for periodically compressing said spring to change the position of the prism relative to said indicia.

25. The structure of claim 24 further characterized in that the means for periodically moving said spring includes a rotating cam, a shaft connected to said prism, said cam being positioned to periodically move said shaft and prism against the force of said spring.

26. In a display device, a reflecting prism having an object surface, an image surface and a reflecting surface, said reflecting surface being generally symmetrical and said object surface being outside of said reflecting surface, indicia positioned outside of said object surface, said indicia and prism being relatively movable along a path defined by the axis of symmetry of said reflecting surface to change the indicia reflected to said image surface, and a second prism, extending about said first prism and having a conical reflecting surface, a cylindrical object surface and an image surface, movable indicia positioned adjacent said cylindrical object surface for viewing at said image surface.

27. The structure of claim 26 further characterized by and including fixed indicia positioned adjacent said cylindrical object surface and visible at said image surface, said movable indicia being positioned to move in a path generally uniformly spaced from said cylindrical object surface.

28. In a display device, a reflecting prism having an object surface, an image surface and a reflecting surface, said reflecting surface being generally symmetrical and said object surface being outside of said reflecting surface, said reflecting surface being flexible and expandable along its axis of symmetry, indicia positioned outside of said object surface, said indicia and prism being relatively movable along a path defined by the axis of symmetry of said reflecting surface to change the indicia reflected to said image surface.

29. In a display device, a plurality of concentric conical reflecting prisms, each having conical reflecting surfaces, cylindrical object surfaces and a common image surface, each of said reflecting surfaces being generally symmetrical with said object surfaces being outside of said reflecting surfaces, movable indicia arranged for simultaneous movement in a path adjacent the cylindrical object surfaces, and fixed indicia, positioned adjacent the cylindrical object surface, said movable indicia moving in a path between the fixed indicia and the cylindrical object surfaces.

30. The structure of claim 29 further characterized by and including spring means normally urging said movable indicia toward the cylindrical object surfaces.

31. The structure of claim **29** further characterized by and including a plunger, said movable indicia being attached to said plunger, with said spring means being positioned against said plunger.

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