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REFRIGERATED DISPLAY COUNTER WITH AUTOMATIC DOOR OPENING

Filed May 29, 1957

3 Sheets-Sheet 1

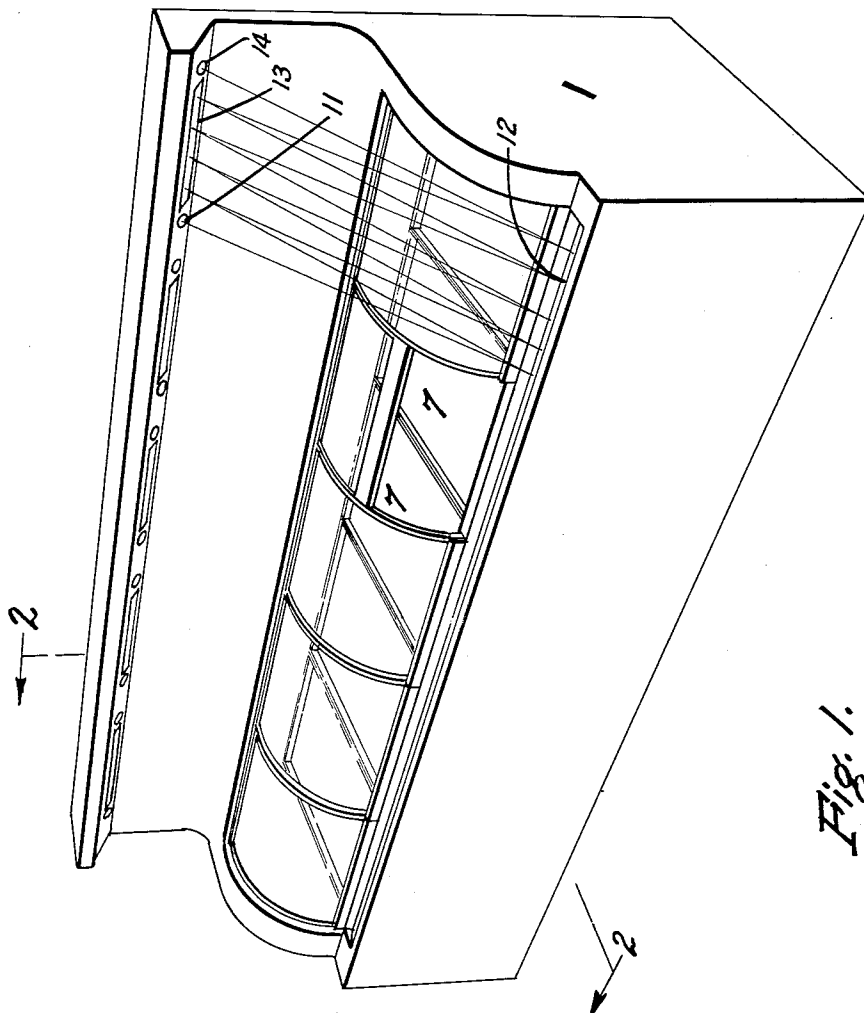


Fig. 1.

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3 Sheets-Sheet 2

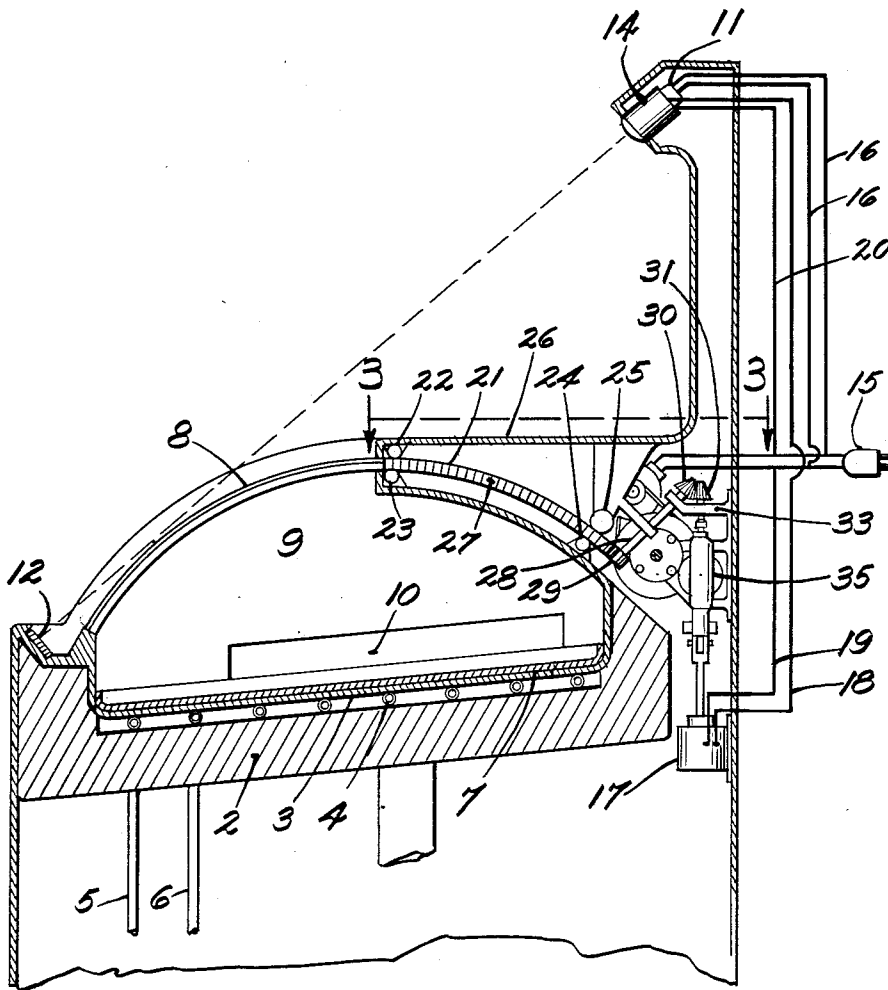


Fig. 2.

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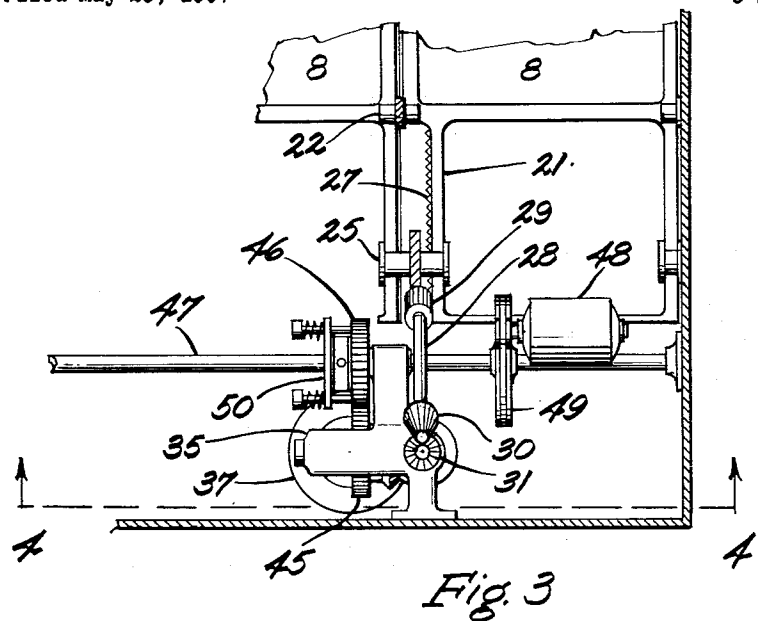
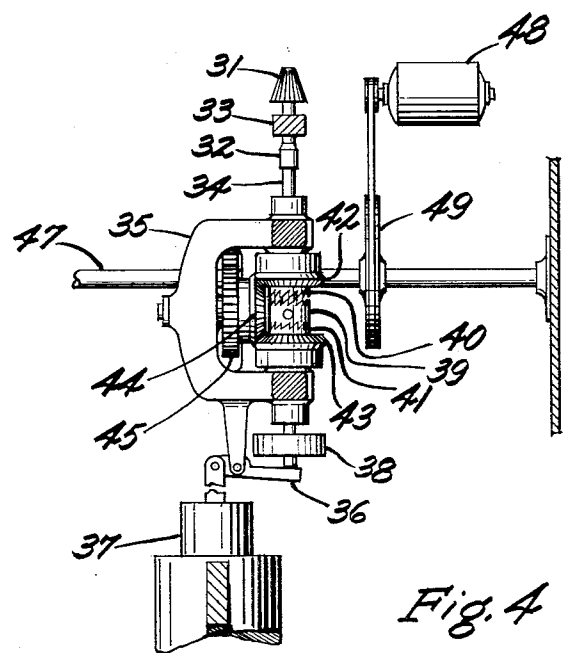
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3 Sheets-Sheet 3



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REFRIGERATED DISPLAY COUNTER WITH
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2 Claims. (Cl. 312-116)

This invention relates to improvements in a sensing mechanism and has specific application to a display counter wherein refrigerated material may be maintained at a proper temperature generally insulated from contact with the ambient air, but visible to the customer through the transparent cover or door. The sensing mechanism is connected to the door in such a way that a customer without touching the transparent cover of the display counter automatically opens the cover by simply reaching for the material in the display counter.

Other objects will appear from time to time throughout the specification and claims.

My invention is illustrated more or less diagrammatically in the accompanying drawings, wherein—

FIGURE 1 is a perspective of a counter embodying my invention;

FIGURE 2 is a section along the line 2—2 of FIGURE 1;

FIGURE 3 is a section along the line 3—3 of FIGURE 2;

FIGURE 4 is a section along the line 4—4 of FIGURE 3.

Like parts are indicated by like characters throughout the specification and drawings.

I have illustrated my invention as associated with a light beam which when interrupted will actuate a mechanism to open the door and which when no longer interrupted will close the door. I propose electric mechanisms for opening and closing the door in response to the interruption or lack of interruption of the light beam but other mechanical means might be used to open and close the door.

The display counter 1 may contain any suitable type of refrigeration mechanism, the details of which are not illustrated. Suffice it to say that the counter has an insulated floor 2 which supports a cold plate 3 cooled by cooling coils 4 connected by ducts 5 and 6 with a suitable refrigeration system. The cold plate 3 supports a plurality of removable food trays 7 adapted to support and display meat or the like. In this instance, I have illustrated five trays and there is associated with each tray a curved movably mounted transparent door 8. These doors arranged side by side provide a continuous closure for the food containing portion of the counter defining a food storing chamber 9. Means not further illustrated as their details form no part of the present invention, will circulate a continuous current of cold, preferably moist, saturated air through the chamber 9. For example, it could enter from the left hand through a port 10 and be withdrawn from a similar port at the right hand end. Thus material in storage or display in the counter is supported by one or other of the trays 7 which are cooled by heat exchange and the material is also cooled by contact with the moist or cold air circulating through the closed chamber 9.

The improved sensing mechanism comprises a light source 11 mounted on the top of the counter by any conventional means. The light source directs a narrow beam of light (see FIG. 1) against an edge portion of an elongated mirror 12 which is horizontally disposed and mounted on the lower edge of the display counter. As seen in FIG. 1, this mirror extends substantially the entire width of the counter although it is to be under-

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stood that any width comparable in size to the width of door 8 would be sufficient. As seen in FIG. 1, the angle of incidence between the light beam directed against a point on the surface of mirror 12, and a perpendicular to the surface of mirror 12 at that point is small.

The mirror 12 is positioned so the light beam from source 11 is reflected from mirror 12 back toward the top of the counter over the door 8, and since the angle of incidence is small the angle of reflection, which is the same size, will also be small, so that the light beam 11 will return to the top of the counter at a point only slightly displaced from light source 11.

A second mirror 13 having a length comparable to the width of door 8 is mounted on the top of the counter with its reflecting surface facing and parallel to the reflecting surface of mirror 12, defining an opening therebetween. With this arrangement, the light beam reflected from mirror 12 encounters the surface of mirror 13, and will again be reflected back toward mirror 12. Since the angles of incidence and reflection are always small, the light beam returning to mirror 12 will encounter this mirror at a point slightly horizontally displaced in the direction of elongation in comparison to its point of origin on mirror 13 (see FIG. 1). This process continues with the light beam reflected back and forth between mirrors 12 and 13 many times until the light beams move off the edge of the mirror, defining thereby a sheet or grid of light formed by a single continuous light beam folded many times between mirrors 12 and 13.

A sensitive photoelectric cell 14 is mounted on the top of the counter in the path of the light beam missing the edge of mirror 13, as shown in the drawing. With this arrangement, any object penetrating the light sheet at almost any point will interrupt the light beam reaching the photoelectric cell.

As described below, in this particular embodiment, the photoelectric cell is connected to a control circuit and a mechanism which operates to open door 8 of the display counter when the light reaching the cell is interrupted, and which closes door 8 and the light beam reaching cell 14 is restored. As seen, there is a grid or sheet of light and a photoelectric cell in front of each door of the display counter so that more than one customer may open a door of the counter without interfering with the other doors.

It is important to note that it is impossible for a person to insert his hand through any part of the light sheet without interfering with the light reaching the photoelectric cell. Because of this unusual property, this sensing device may have other important applications for which prior light sensing devices are unsuited.

The light source may be energized, for example, from any suitable source 15 of electric current through conductor 16. The photoelectric cell is in series with an electro magnet or solenoid 17 with the electric source 15 through conductors 18, 19 and 20 so that the photoelectric cell controls the flow of current to the electro magnet or solenoid to actuate the door opening and closing mechanism as will hereafter appear.

Extending rearwardly from each window 8 on the same arc as and concentric with the window is a supporting plate 21, guided between rollers 22, 23, 24 and 25 in a supporting frame 26 forming part of the counter. One edge of each panel 21 is toothed as a rack at 27. A shaft 28 carries a pinion 29 in mesh with the rack 27. At the other end, the shaft carries a miter gear 30 in mesh with a second miter gear 31 on the shaft 32. The shaft 32 on which the miter gear 31 is rigidly mounted, rotates in the bracket 33, being held against longitudinal displacement thereby and the shaft 32 is splined to a shaft 34 which

extends through the U-shaped frame 35 being rotatable therein, terminates at a lever 36 adapted to be actuated by the solenoid 37. A weight 38 biases the shaft 34 downwardly against the solenoid lever 36.

Keyed to the shaft 34 is a toothed clutch body 39. Opposed clutch members 40, 41 are in opposition to the toothed clutch member 39 and so disposed that the member 39 is in interlocking engagement with one or the other. Drive gears 42, 43 are rotatable on the shaft 34, being driven in opposite directions by a miter gear 44 in mesh with both of them. The gear 44 rotates with a spur gear 45 in mesh with a spur gear 46 rotatable on the shaft 47. The shaft 47 is continuously driven by a motor 48 through a belt and pulley combination 49. A slip clutch 50 is provided so that the shaft 47 may rotate whether the gear 46 rotates or not.

Under normal circumstances, the weight 38 biases the shaft 34 to down position and applies force through the clutch and the miter gears 31 and 30 to hold the door 8 in the closed position.

When the customer interferes with the light beam, the solenoid 37 is actuated, overcomes the weight 38, causes the opposite clutch to come into connection and reverse the direction of power application to open the door and so long as the customer's hands intersect the light beam, the door is held open. When the customer takes her hand away, having withdrawn what she wants, the photoelectric cell is again energized, the solenoid is deenergized, the weight 38 operates to reverse the direction of drive of the miter gear 30 and cause the door to shut.

While I have shown a photoelectric cell controlled opening mechanism to open and close the door, it will be understood that other mechanisms might be used. One type of mechanism that has been used under such circumstances as this is a floor mat where a circuit is closed when the customer stands on the mat and such an arrangement could equally well be used with this counter.

I claim:

1. A refrigerated display counter comprising at least one chamber, a door for each chamber movably mounted on the display counter to provide access to the material stored therein, automatic means for opening and closing the door when material is removed from the chamber, said automatic means including a sensing device and a mechanism controlled thereby, said sensing device comprising a light source mounted on said display counter in spaced relation to said door for transmitting a narrow beam of light, a first elongated mirror whose length is at least comparable to the width of said door mounted on said display counter, said mirror positioned so the angle of incidence between said narrow light beam passing over said door to a point on the reflecting surface of said first elongated mirror and a perpendicular to the mirror at that point is small, a second elongated mirror mounted on said display counter in spaced relation to said first mirror and defining an opening therebetween which is at least equal in size to the area of the door, said mirror positioned so its reflecting surface is substantially parallel to the reflecting surface of said first mirror so that the angle of incidence between a beam of light reflected from said first mirror to a point on said second mirror displaced slightly in the direction of elongation and perpendicular to the reflecting surface of the second mirror at that point is small, and positioned so the beam of light reflected from said point on the reflecting surface of said second mirror is reflected back to another point on the reflecting surface of said first mirror which is displaced slightly in the direction of elongation from the position of said point on the reflecting surface of said second mirror whereby said

beam of light is reflected back and forth many times between said first and second mirrors as the beam of light moves in the direction of elongation until it reaches the edge of one of the reflecting devices, defining thereby substantially a sheet of light over said door formed by a single continuous light beam folded many times between said first and second mirrors, and a light sensing device mounted on said display counter in the path of said beam of light passing the edge of one of said mirrors so that any light disturbing object which penetrates almost any part of said light sheet will prevent said light beam from reaching said light sensitive device, and a mechanism connected to said door and controlled by said light sensing device in such a way that the door is held closed when light from said light beam reaches said light sensing device and is opened while the light beam directed against said light sensing device is interrupted.

2. A refrigerated display counter comprising at least one chamber, a door for each chamber movably mounted on the display counter to provide access to the material stored therein, automatic means for opening and closing the door when material is removed from the chamber, said automatic means including a sensing device and a mechanism controlled thereby, said sensing device comprising a first elongated mirror dimensioned to have a length corresponding to the width of said door mounted on the display counter and positioned adjacent one side of said door, a second elongated mirror dimensioned to correspond with the first and positioned adjacent the opposite side of said door with its reflecting surface in substantially parallel relation to the reflecting surface of the first mirror so that a light beam striking one with a low angle of incidence will be reflected back and forth between the mirrors with each beam offset slightly from the others in one direction to cover the entire door opening between said reflectors with a series of reflected light beams emanating from but a single source, a light source in longitudinal alignment with one of said mirrors and closely spaced from one edge thereof and positioned to direct its beam onto the corresponding edge of the opposite mirror with a low angle of incidence whereby the beam will travel back and forth between the mirrors with substantially equal incident angles, a light sensing device in longitudinal alignment with one of said mirrors and closely spaced from the opposite end thereof whereby the beam of light bouncing back and forth between the mirrors to traverse the lengths thereof will ultimately strike the sensing device unless the beam is interrupted by an object interposed in its path of travel, and a mechanism connected to said door and controlled by said light sensing means whereby the door is maintained in closed position when the beam of light strikes said sensing device and is displaced to open position when the beam of light is interrupted thereby to be incapable of striking said sensing device.

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