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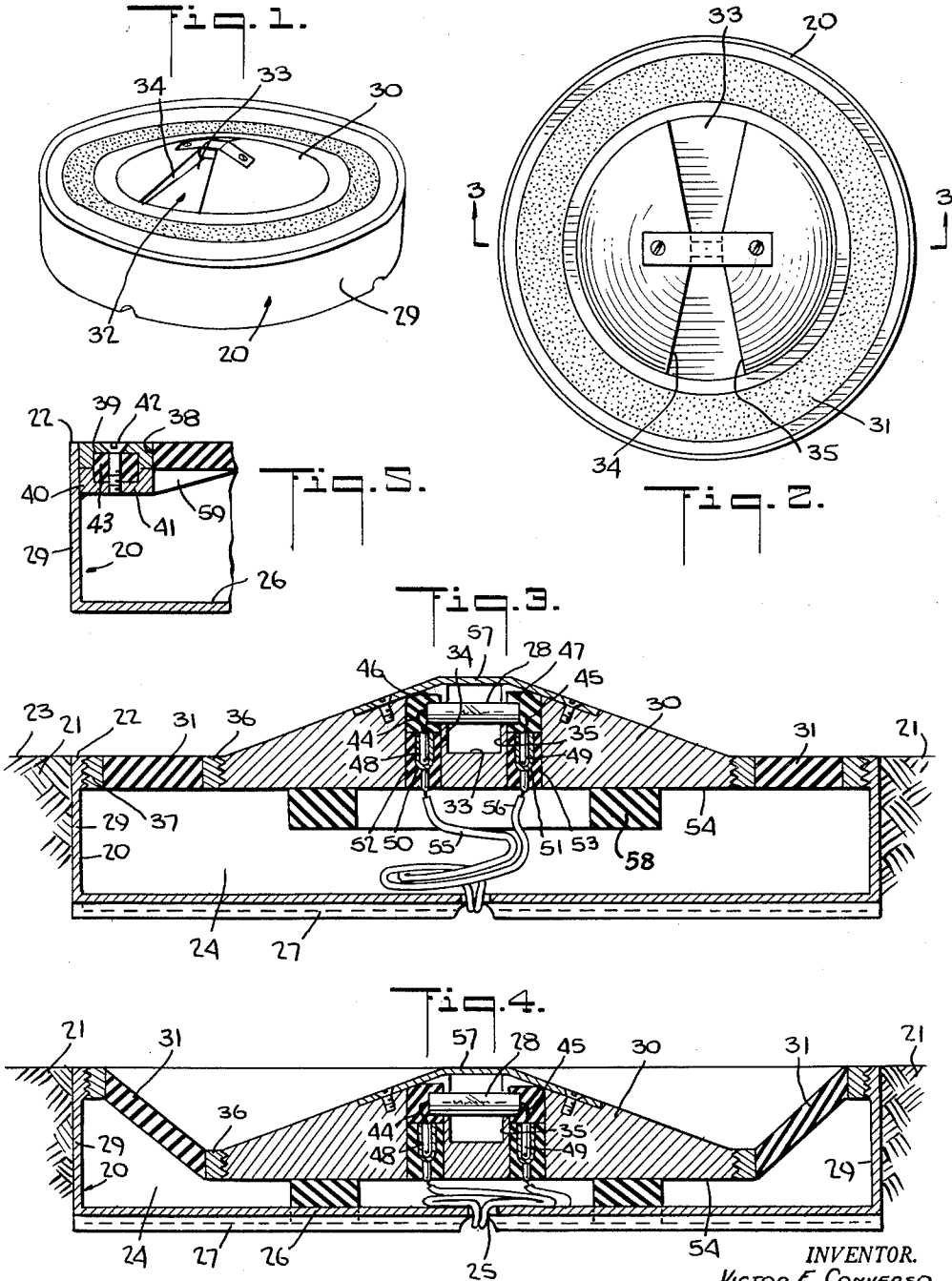
V. E. CONVERSO

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FLUSH LAMP MOUNTING DEVICE

Filed Sept. 3, 1963

2 Sheets-Sheet 1



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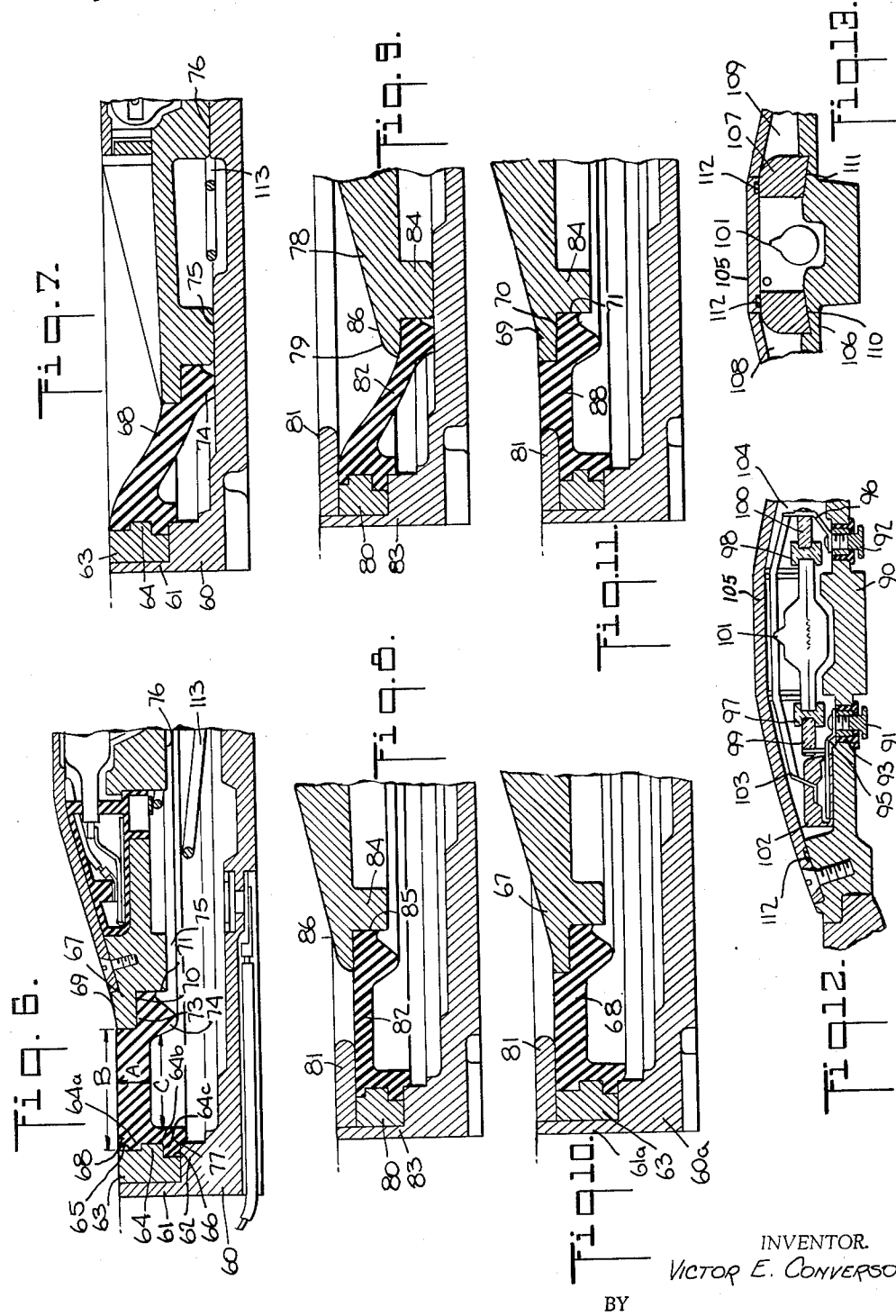
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1

3,257,552

FLUSH LAMP MOUNTING DEVICE

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8 Claims. (Cl. 240-1.2)

This is a continuation-in-part of my copending application Serial No. 24,084, filed April 22, 1960, and entitled "Flush Lamp Mounting Device" (now abandoned).

This invention relates to means for mounting an illuminating device and more particularly to a device for mounting an illuminating source which will be above the surface of a pavement to provide illumination and rapidly and resiliently respond on impact to recess below the pavement surface. The mounting means is directed particularly as a runway, taxiway or other marker on an airfield or an airport.

The main object of the invention is to provide a flexible lamp mounting device that supports an illuminating element above the surface of a pavement and readily flexes downward to recess the element as a vehicle passes thereover and then flexes to the illuminating position after passage of the vehicle.

Another object of the invention is to provide a recessible illuminating device that is rugged and withstands erosion and corrosion of the surface due to weather and impact of sharp severe blows.

Another object of the invention is to provide a flexible lamp mounting device wherein the lamp may be easily removed and replaced.

Other and further objects of the invention will become apparent from the following description taken in connection with the accompanying drawings, in which:

FIG. 1 is a perspective view of the mounting means and lamp;

FIG. 2 is a top view of the mounting means;

FIG. 3 is a sectional view taken along lines 3-3 of FIG. 2;

FIG. 4 is a sectional view of the mounting means in a recessed position taken in a sectional plane corresponding to the section along lines 3-3 of FIG. 2;

FIG. 5 is a fragmentary sectional view of a modification of the means for attaching the diaphragm to the receptacle;

FIGS. 6 and 7 are fragmentary sectional views illustrating a modification of the diaphragm;

FIGS. 8 to 11 are fragmentary sectional views illustrating another modification of the mounting means with a metal ring or flange overlapping the diaphragm; and

FIGS. 12 and 13 are fragmentary sectional views of a modification of the lamp mounting.

Referring to the drawings the lamp mounting device has a receptacle 20 embedded in a concrete runway 21. The edge 22 of the receptacle is substantially flush with the surface 23 of the runway. The receptacle forms a chamber or space 24 recessed below the surface of the runway. The receptacle has an opening 25 in the center of the bottom 26 and exterior grooves or channels 27 radiating to the periphery for passing electrical cables connecting the light source 28 to a main power line (not shown). The receptacle has an annular rim 29 extending from the bottom 26 to the surface of the runway and forming the edge 22.

The light source 28 is mounted in a generally conical shaped plate 30 supported on the receptacle by a resilient diaphragm 31. The resilient diaphragm is fastened to the annular rim 29 to support the plate 30 above the surface of the runway.

The plate 30 is preferably made of aluminum or stainless steel to withstand the impact of wheels and snowplow blades. The upper surface is generally conical in shape with a horizontal transverse groove 32 extending

2

across the plate. The light source 28 is positioned at the center of the groove and plate. The groove has a bottom wall 33 sloping downwardly from the center and side walls 34, 35 flaring from the center. The light source 28 is recessed between the walls 34, 35 and above the wall 33.

The resilient diaphragm 31 comprises a flat ring-shaped member made of rubber and is bonded to an inner ring 36 and an outer ring 37. The inner ring is threaded on the plate 30 and the outer ring threaded on the rim 29 to form a seal against the passage of air and water. The ring member has a resiliency to firmly support the plate 30 in position above the ground and flex under the pressure of the wheel of an aircraft or the blow of the blade of a snowplow. This foregoing attaching means is permanent. In FIG. 5 means for removably attaching the plate 30 to the receptacle 20 is illustrated. The diaphragm 31 is bonded to a ring member 38 having a circumferential extending groove 39. A ring member or flange 40 is welded to the inner wall of the rim 29 inwardly from the edge 22 to receive and recess the member 38. The flange 40 has a circumferential groove 41 complementary to the groove 39. A rubber ring or gasket 43 fits in the groove. Bolts 42 extend through the outer ring member 38, the gasket 43, and flange 40 threading in the latter member to securely fasten the member 38 to the flange 40 and provide an air-tight, water-tight seal. Thus the plate 30 and diaphragm 31 are removably fastened to the receptacle by a water-tight, air-tight fastening means.

The light source comprises a tungsten filament lamp 28 with leads 44, 45 extending from the ends. The ends of the lamp are embedded in resilient mountings 46, 47 recessed in plate 30 on opposite sides of the groove 32 to position the lamp below the top of the plate 30 and in the groove 32. Prongs 48, 49 are attached to the resilient mounting 46, 47 and the leads 44, 45 are in firm electrical contact with the prongs 48, 49 respectively. The prongs 48, 49 fit into sockets 50, 51 in resilient mountings 52, 53, respectively, embedded in the plate 30 from the inner surface 54. The resilient mountings 46, 47 form an air-tight, water-tight seal around the ends of the lamp and with the plate 30. Similarly, the resilient mountings 52, 53 form an air-tight, water-tight seal with the plate 30 and the sockets 50, 51. The cables 55, 56 are securely attached to the sockets 50, 51 and formed in loops in the chamber 24 to provide sufficient length to the cables to prevent fatigue at the terminals. The cables pass through the opening 25 and channel 27 for connection to the main power line. A water-tight, air-tight seal is provided around the cables and against the edges of the opening 25.

A strap 57 is positioned above the lamp 28 to protect the lamp from a downward force. The strap presses against the resilient mountings 46, 47 to hold the lamp in place and to form a watertight contact between the mountings 46, 47 and the mountings 52, 53 which are bonded to the plate 30. The lamp 28 is thus supported above the surface of the runway to provide illumination through a vertical arc of approximately 180° and the flared channel provides substantial illumination on each side of the vertical. A plurality of lights are aligned to form a straight or curved path to guide the pilot of an aircraft in his approach to the runway or after landing. The light source is also visible from a side elevated position, such as a control tower, so that maintenance and operating personnel may determine the operability of each light source without entering the runway or taxiway.

When a wheel or other moving member engages the plate 30 the diaphragm 31 flexes and the plate 30 moves downward to recess the lamp and the top of the plate

30 below the edge 22 so that the wheel of the aircraft does not feel any jar or bump. The diaphragm 31 has a thickness in the order of one-quarter to one-eighth the width of the diaphragm. The diaphragm is made of a rubber or rubberlike material that is easily deformed and twisted under impact so that the plate 30 easily tilts and recesses and shifts laterally in relation to the cylindrical rim 29 permitting the plate to move with the wheel or snowplow blade engaging the plate 30. The diaphragm compresses on one side and stretches on the other side while the plate tilts and recesses into the chamber 24. This transversely bendable feature of the resilient diaphragm permits the plate 30 to be engaged by a wheel traveling at high speeds in the order of about 100 miles per hour without damage to the diaphragm or the bonding of the diaphragm to the plate and rim.

A ring-shaped cushion 58 is mounted on the underside of the plate 30 for engaging the bottom of the receptacle. The cushion has a sufficient inner diameter to clear the electrical cables. Since the chamber 24 is airtight and watertight in addition to the resiliency of the diaphragm a cushioning effect is produced by the compression of the air within the chamber 24. As a further support to the plate 30 the diaphragm may be provided with rubber ribs 59 engaging the rim 29 or the flange 40 to assist in the repositioning of the plate 30 and the light source. Rigid stops may be provided on the lower surface of the plate 30, as illustrated in FIGS. 6 to 11, to limit the downward movement of the plate so that the top of the conical surface is flush with or slightly below the edge 22 or surface of the pavement.

Snowplows are driven longitudinal to the runway and, therefore, longitudinal to the groove 32. A snowplow would approach the lamp mounting device in the longitudinal direction of the groove 32 so that the blade engages the plate 30 so as not to catch in the groove.

In FIGS. 6 and 7 a modified embodiment is illustrated in which the receptacle 60 has a rim 61 with an annular shoulder 62. An outer annular ring 63 rests on the shoulder 62 within the rim 61 and is secured thereto by suitable fastening means, such as bolts. The ring 63 has an intermediate annular tongue 64 with an upper annular surface 65 above the tongue and a lower annular surface 66 below the tongue with the annular surface 66 having a greater diameter than the annular surface 65. The plate 67 is supported by the annular ring diaphragm 68. The center plate 67 has an annular surface 69 and a radial surface 70 extending inwardly from the surface 69 and a second annular surface 71 of lesser diameter than the annular surface 69 with the radial surface 70 positioned therebetween. These surfaces extend circumferentially around the center plate.

The resilient ring diaphragm 68 is made of a rubber or rubberlike material and is molded to the ring 63 and the center plate 67 forming a firm bond with the surfaces 65, 64a, 64b, 64c, 66 of the ring 63 and the surfaces 69, 70 and 71 of the plate 67. The ring has a substantial thickness to provide the bonding surfaces with sufficient bonding area. This area is increased by the tongue 64 on the ring 63. Similarly, the surface 70 is provided to increase the bonding area of the center plate.

An annular bumper or cushion 74 generally backed by the surface 70 is provided on the undersurface of the diaphragm 68 and extends below the annular surfaces 75 and 76 which engage the bottom of the receptacle 60. The cushions dampen the impact of the surfaces on the bottom wall. When in place the diaphragm has an annular bulge 77 overlapping with the shoulder 62 to form an air and moisture seal between the receptacle below and inside the ring 63.

The diaphragms illustrated in FIGS. 6 to 11 have a thickness A, an exterior width B and an inner width C. The width B is preferably five to twelve times the thickness A and the width C is preferably three to six times

the thickness A. In FIGS. 6 and 7 the thickness A is approximately twice that of the diaphragms 82 in FIGS. 8 and 9.

In FIGS. 8 to 11 the ring member 80 has been modified by having a flange 81 extend inwardly over the diaphragm 82. The center plate 78 has a rounded annular edge 79 and a radial annular surface 86. On the annular stop 84 is the annular bonding surface 85. The rim 83 extends to recess the flange 81. The function of the flange 81 and radial surface 86 is to protect the surface of the diaphragm 82 adjacent to the ring 80 and surface 85 so that the rubber wheels of the aircraft or metal dolly wheels of snowplows will not bite into the bonded joints and to preserve its integrity while permitting the diaphragm to stretch in response thereto. The diaphragm 82 is bonded to the plate 78 along the surface 85. The diaphragm 82 is not bonded to the radial surface 86. The diaphragm 82 is similar in structure to the diaphragm 68 of FIGS. 6 and 7 except that the diaphragm has a reduced thickness. Further, as illustrated in FIG. 9, the diaphragm 82 is not bonded to the flange 81 so that the diaphragm may bend inwardly away from the flange. In the embodiment of FIG. 10 the ring 63, diaphragm 68 and the plate 67 are identical to those of FIG. 6. The flange 61a of the receptacle 60a has been extended to recess the protecting flange 81. In FIG. 11 the diaphragm 88 extends to fill the space between the flange 81 and the plate 67. In this embodiment the diaphragm 88 is not bonded to the flange 81 or the surfaces 69 and 70 of the plate 67 but is bonded to the surface 71 of the plate 67.

In FIGS. 12 and 13 another form of the center plate is illustrated in another lamp mounting. The plate 90 has terminals 91, 92 extending therethrough and mounted in insulators 93 and 94. Supports 95, 96 are mounted on the terminals 91 and 92 and have studs 99 and 100 for holding the ceramic connectors 97 and 98 supporting the quartz lamp 101. A potted film disc cutout assembly 102 is connected to the terminal 91 and to the Teflon coated wire 103 which is connected across the plate to the terminal 92 for providing a parallel current path in case the quartz lamp 101 ceases to function. The lamp and terminals and Teflon wire and the cutout assembly are recessed in the chamber 104 of the plate 90, and a protective and retaining strap 105 extends thereacross. As illustrated in FIG. 13 prismatic lenses 106 and 107 are provided on each side of the lamp 101 in the radial channels 108 for distributing the light in a desired pattern and to magnify the candlepower of the bare lamp. This concept reduces relamping costs by eliminating customized molding of terminals to the basic lamp. The bottom surfaces of the lenses 106 and 107 are sloped to match the sloped surfaces 110 and 111 of the center plate to oppose any movement inward towards the lamp 101 of the lenses due to impact forces. Silicon rubber gaskets 112 seal the lamp chamber to keep out dirt and moisture.

As previously explained the chamber formed by the diaphragm, center plate and receptacle is hermetically sealed so that on recessing of the center plate 67 the air is compressed, which serves as a cushion and also aids in the return of the center plate to the upper position. The heat of the lamp expands the air in the chamber to raise the center plate approximately 1/4 inch. This assists in maintaining the illuminating channels clear and also improves the illumination during periods of precipitation. In connection with the seating of the center plate on the bottom of the receptacle, the bumper 74 is positioned beneath the surface 70 to transmit the impact on the cushion normal to the center plate.

As previously explained, the resilient ring supporting the center plate is narrow in thickness in comparison with the radial width so as to form a thin, resilient, transversely bendable diaphragm type of support. The diaphragm also provides for a twisting or torsional movement of the center plate, so that in addition to a univer-

sal movement the center plate has a twisting movement. In the normal position the center plate is evenly spaced a substantial distance from the rim or attaching ring 63 of the receptacle. The flexibility of the diaphragm permits the center plate to shift laterally and to tilt and twist in relation to the receptacle so that it may respond to the high speed of impacting wheel of an aircraft or snowplow blade.

The height of the center plate above the top of the resilient diaphragm is substantially less than the radial width of the diaphragm and may be in the order of one-quarter to one-half of the radial width. Since the center plate has a diameter approximately three to four times the radial width of the diaphragm, a low profile and a gradually sloping conical surface are provided to the center plate, which in combination with the thin diaphragm permits the movement and recessing of the center plate in response to impact.

At large major air terminals it is common practice to plow the runways at speeds of 40 m.p.h. and above with the plow blade riding on the pavement. At these plowing speeds the center conical plate will also recess when engaged by the plow blade without damage to plate or plow. When moving laterally to or longitudinally to the groove, there are no projections on which the blade can catch and it passes smoothly over the recessed plate. The lamp mounting device provides an inexpensive means for providing center runway lights that are rugged enough to withstand the blows of tires and plows.

Various modifications and changes may be made in the device without departing from the scope of the invention as set forth in the appended claims.

I claim:

1. A flexible mounting for embedment in a vehicle supporting way and recessibly supporting a fixture above the way and comprising a shallow receptacle having a circular bottom and an annular cylindrical rim extending generally normal to the bottom and having a height substantially less than the diameter of the bottom to form a shallow chamber, a circular fixture holding means having a generally conically shaped part extending over a major portion of the periphery of said holding means and upwardly therefrom to present gradually sloped contactable surface means around said fixture holding means and having a diameter less than the diameter of the rim to form a large annular space between the fixture holding means and the rim with a height less than the height of the conically shaped part, rubberlike resilient ring positioned between the rim and the fixture holding means and attached respectively thereto to normally support the contactable surface means above the rim and having a radial width between points of attachment of said rim and said fixture holding means substantially greater than the vertical thickness to form a thin, resilient, transversely bendable diaphragm type of support bending and flexing on application of lateral forces to said contactable surface to resiliently shift laterally and flex said fixture holding means laterally clear of the rim and downward to provide an unobstructed path for a vehicle moving over a vehicle supporting way.

2. A flexible mounting as set forth in claim 1 wherein said receptacle, said fixture holding means and said ring form an airtight chamber beneath said ring and holding means to form compressed air on recessing the fixture holding means forcing the holding means to the normally raised position on removal of the applied external force.

3. A flexible mounting as set forth in claim 1 wherein resilient cushion means are provided to soften the impact of the downward force on bottoming of the flexible holding means.

4. A flexible mounting as set forth in claim 1 wherein said resilient ring has a width in the range of four to twelve times the thickness.

5. A flexible mounting for embedment in a vehicle

supporting way and recessibly supporting a fixture above the way and comprising a shallow receptacle having a bottom and rim extending generally normal to the bottom and forming a shallow chamber, a fixture holding means positioned within the rim and spaced a substantial distance therefrom and having an upper contactable surface normally above the rim and gradually sloping downwardly to the edge surface, rubberlike resilient ring positioned between the rim and the fixture holding means and attached respectively thereto to resiliently support said fixture holding means within said rim and said ring having a horizontal width between points of attachment greater than the vertical thickness and greater than the amplitude of movement of the fixture holding means to form a thin, resilient, transversely bendable diaphragm type of support and resiliently responding by bending and flexing to high lateral forces applied against the sloped surface to move the fixture holding means laterally and downwardly clear of the rim to provide an unobstructed path for a vehicle moving over a vehicle supporting way.

6. A flexible mounting for embedment in a vehicle supporting way and recessibly supporting a fixture above the way and comprising supporting means forming a circular opening, a fixture holding means positioned within said supporting means and spaced therefrom a substantial distance completely around said fixture holding means, a thin, resilient transversely bendable diaphragm between and attached to said supporting means and said fixture holding means in said circular opening to form the sole support for said fixture holding means in a raised position and having a horizontal width in the range of four to twelve times the thickness of the diaphragm to quickly respond to lateral forces on the fixture holding means permitting the fixture holding means to shift laterally and downwardly clear of the supporting means.

7. A flexible mounting as set forth in claim 6 wherein a circular ring is provided secured to said supporting means and extending radially inward to overlap said diaphragm to protect the diaphragm adjacent to said supporting means from direct engagement.

8. A mounting for recessibly supporting in a circular receptacle an illuminating device above a vehicle supporting way comprising the combination of a circular fixture holding means having a circular base and a generally conically shaped portion extending upwardly therefrom to a maximum height substantially less than the diameter of the circular base to form said fixture holding means with a low profile, said circular base having a diameter substantially less than the diameter of the receptacle to annularly space said fixture holding means a radial distance around said base greater than the maximum height of the fixture holding means for lateral movement of said fixture holding means, and a thin resilient transversely bendable supporting diaphragm between and attached to said receptacle and said base to form the main support for normally holding said fixture holding means in an illuminating position and having a radial width in the range of four to twelve times the thickness of the diaphragm to dynamically and flexibly support said fixture holding means for lateral movement within the annular space with a lateral force on said fixture holding means while moving downwardly clear of the circular receptacle for an unhindered and responsive recessing of the fixture holding means.

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75 NORTON ANSHER, *Primary Examiner*.