

Sauriol et al.

[11] 3,920,347

[45] Nov. 18, 1975

[54] **MANHOLE COVER**

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[22] Filed: **Oct. 29, 1973**

[21] Appl. No.: **410,491**

[52] U.S. Cl..... 404/25; 219/166
[51] Int. Cl.²..... E02D 29/14
[58] Field of Search 404/26, 25, 19; 52/21,
52/20; 210/163, 164, 166; 137/371

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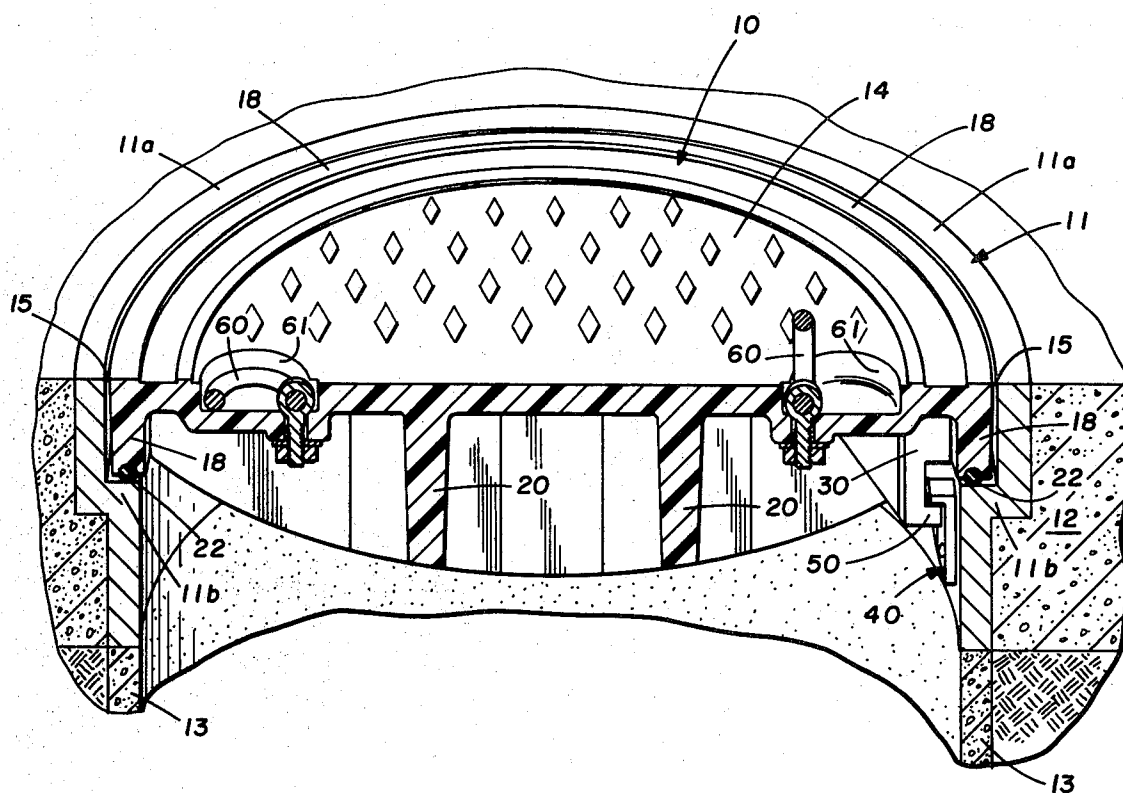
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[57] **ABSTRACT**

Disclosed is a manhole cover constructed of structural foam molded synthetic polymeric material and having a transversely intersecting structural rib network integrally joined with the top surface portion and enclosing annular peripheral portion of the cover, the structural rib network preferably being dome shaped with the principal structural support being disposed centrally of the cover at the apex of the dome.

12 Claims, 5 Drawing Figures



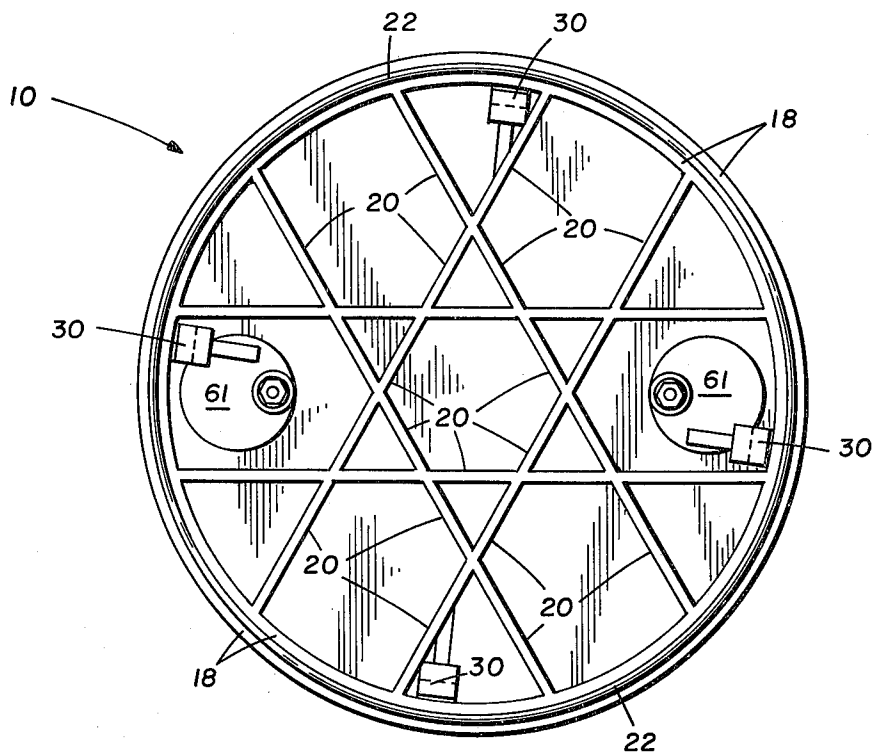


FIG. 3

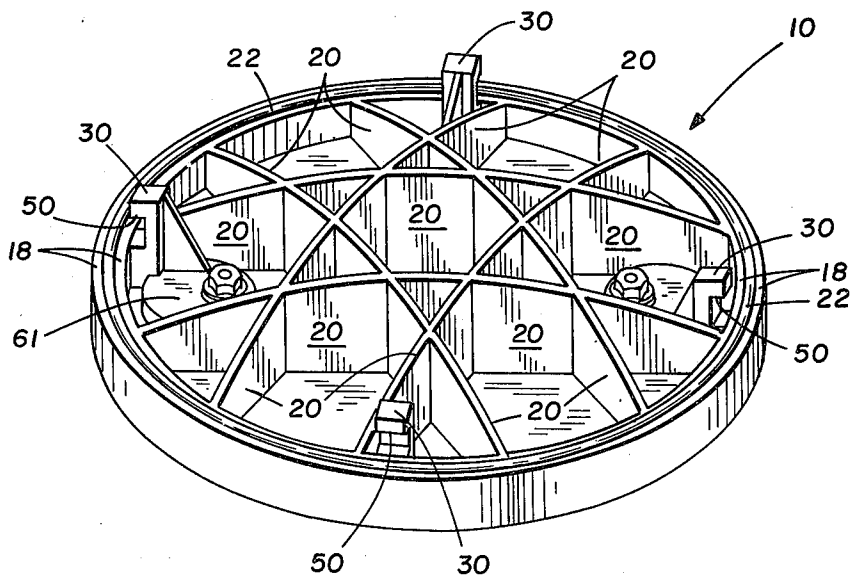


FIG. 4

MANHOLE COVER

The present invention relates to closures for underground housings having surface access openings, and more particularly to manhole covers.

As is well known, construction of streets and roads includes the underground provision and installation of public utilities such as storm sewers, electric, gas, and telephone lines, etc. Access by workmen to these utilities is by way of openings in the street or road, these openings being sealed by closure members commonly referred to as manhole covers. Conventionally, these manhole covers have traditionally been formed of cast iron or steel, and consequently have been difficult to handle because of their bulkiness and great weight. Additionally, their size and weight normally require the use of winches or other tools in installing and removing the manhole covers and involve an excessive amount of workmen time for such installation and removal.

In an attempt to overcome some of these disadvantages, other lightweight materials, such as plastics, have been experimented with in the construction of these manhole covers, but the resulting structures have generally been unsuccessful for a number of reasons. First, the plastics that have been utilized in the manhole cover construction, as well as the design of the manhole cover itself, have not produced resulting structures with sufficient strength characteristics to support the excessive vehicular weights to which they are normally subjected. Furthermore, the casting or molding techniques utilized for forming these manhole covers have generally placed undesirable limitations on the size and shapes of the final structures.

It is a primary object of the invention to provide a new and improved closure for surface access openings to underground structures.

It is another object of the present invention to provide a new and improved manhole cover construction.

It is a still further object of the present invention to provide a new and improved design of manhole cover of plastic or synthetic polymeric material construction which has desirable strength characteristics, but is generally lightweight and convenient to handle.

In accordance with these and other objects, the present invention is directed to a manhole cover having a transversely intersecting structural rib network providing the structural support therefor, the network preferably being dome shaped and having the maximum support at the center of the cover. In accordance with a unique feature of this design, the cover is molded from a foamable polymeric material, such as structural foamed polycarbonate.

Additional features, objects, and advantages of the invention can be more readily ascertained by the following detailed description thereof taken in conjunction with the accompanying drawings wherein:

FIG. 1 is a top view of the manhole cover of the present invention disposed within the surface access opening to the underground structure;

FIG. 2 is a pictorial view, partially in section, of the structure depicted in FIG. 1 taken along section line 2-2;

FIG. 3 is a bottom view of the manhole cover of the present invention;

FIG. 4 is a perspective view of the bottom of the manhole cover of the present invention; and

FIG. 5 is an illustration of one method for locking the manhole cover depicted in FIGS. 1-4 in place.

The drawings are not necessarily to scale and in some instances have portions which are exaggerated in order to illustrate specific features of the invention.

Referring initially to FIGS. 1 and 2, the manhole cover in accordance with a preferred embodiment of the present invention is broadly depicted by the reference numeral 10 and includes a top surface portion 14 upon which instructional and decorative indicia may be impressed, if desired, as indicated. The cover 10, when in place, is disposed within a retaining ring or frame 11 which itself is disposed within the pavement 12. While not forming a part of the present invention, the retaining ring 11 would normally abut against, and be mutually aligned with, the circumferential wall 13 of the manhole which vertically extends below ground level. Thus, the manhole cover 10, when in place, closes the opening 15 to the manhole and, in that position, has its top surface 14 substantially coplanar with the circumferentially extending surface portion 11a of the retaining ring.

In accordance with a unique feature of the invention, the manhole cover 10 is constructed of a lightweight synthetic polymeric material, preferably polycarbonate, and in accordance with a process which provides a structure having a high degree of rigidity, strength, and impact resistance. Preferably, the cover is produced by a structural foam molding process utilizing the teachings of U.S. Pat. Nos. 3,268,636 and 3,436,446.

In accordance with a unique feature of the present invention, the manhole cover 10 includes an annular peripheral portion 18 enclosing and integrally joined with a network of transversely intersecting ribs 20, as best viewed in FIGS. 3 and 4. Preferably, and for the purpose of concentrating maximum strength centrally of the manhole cover, the network of ribs 20 is generally dome shaped with the apex of the dome generally disposed at the center of the manhole cover, as illustrated in FIGS. 2 and 4. Furthermore, the maximum number of intersections of these ribs 20 occur at this apex and at the center of the cover 10 to maximize the strength and impact resistance thereat.

As an additional feature, an annular slot is provided in the underside of the annular peripheral portion 18 in which is disposed a flexible tubing or O ring 22. As a consequence, and as best viewed in FIG. 2, when the manhole cover 10 is disposed within the retaining ring or frame 11 to close the opening 15 (the cover 10 being supported by the shelf-like extension 11b thereof), the ring 22 provides a seal to prevent debris or other material from entering the manhole, irrespective of whether the annular peripheral portion 18 directly engages the retaining ring 11.

Locking of the manhole cover 10 within the opening 15 may be accomplished in one of a variety of ways. For instance, it may be desirable to semi-permanently secure the manhole cover 10 within the opening 15 by directly bolting the cover 10 to the shelf extension 11b of retaining ring 11, the bolts being extracted when the cover is to be removed.

In accordance with an alternative locking scheme, a plurality of locking lugs 30 (four, in this example) are preferably equidistantly spaced around the circumference of the cover 10 at the underside thereof. Disposed around and affixed to the retaining ring 11, and being of the same number and circumferential spacing as the locking lugs 30, are a plurality of brackets 40 (one such

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bracket being shown in FIG. 2) adapted to respectively engage and mate with the locking lugs 30 when the manhole cover 10 is to be "locked" in place. For this purpose, the bracket 40 includes (FIG. 5) a sloping cam surface 41 contiguous to a land surface 42 and a projecting stop 43 transverse to the surface 42. The bracket may be mounted or secured to the retaining ring 11 by way of bolts (not shown) extending through counterbores 44 and 45.

To lock the manhole cover in place, the cover 10 is placed within the opening 15 to rest upon the shelf 11b of the retaining ring 11 and then rotated (in the opposite direction of the arrows shown in FIG. 1) to enable the bottom projection 50 of each of the locking lugs 30 to move along the land surface 42 until reaching the stop 43, the inclined surface portion 41 facilitating the engagement of each locking lug 30 with its mating bracket 40. Thus, it is observed that each of the brackets 40 will firmly engage a corresponding locking lug 30 and "lock" the manhole cover in place. When it is desired to remove the cover 10, the cover will then be rotated in the "open" direction (the direction indicated by the arrows in FIG. 1) releasing the locking lugs 30 and brackets 40 from engagement with one another, and the cover may then be lifted out of the opening. To facilitate the rotation of the cover, as well as the installation and removal thereof, a pair of hand rings 60 are affixed to, and within recessed portions 61 of, the top surface 14 of the manhole cover 10.

It can thus be seen that a manhole cover in accordance with the present invention affords a generally lightweight structure, but one having sufficient strength and resistance to impact, to enable convenient handling while at the same time capable of sustaining the extreme vehicular weights to which it will be subjected.

Various modifications of the disclosed embodiments, as well as additional embodiments, may become apparent to those skilled in the art after reviewing the foregoing description without departing from the spirit and scope of the invention as defined by the following claims:

What is claimed is:

1. Apparatus for closing the surface opening of a vertically extending passage to an underground installation, comprising:

a. closure support means for disposition within the ground and defined by an annular retaining ring circumscribing said surface access opening, and an annular flange having a top surface recessed a defined depth from the top surface of said retaining ring to provide a support ledge, and

b. closure means disposed within said surface access opening, said closure means comprising a top surface portion, a peripheral portion enclosing said top surface portion supported solely by the support ledge of said closure support means, and a network of transversely intersecting ribs enclosed by said peripheral portion and contiguous with said top surface portion and said peripheral portion, said network of transversely intersecting ribs providing the principal structural support for said closure means,

said network further comprising a first plurality of ribs extending to a depth greater than said defined depth and a second plurality of ribs extending to a depth greater than said defined depth, said second plurality of ribs having ends integrally joined with said annular peripheral portion

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and respectively transversely intersecting and joined with said first plurality of ribs at locations along their length and equidistantly spaced from the center of said top surface portion.

2. The apparatus as defined in claim 1 wherein the top surface portion, peripheral enclosing portion, and the transversely intersecting rib network of said closure means are of unitary construction.

3. The apparatus as defined by claim 2 wherein said closure means is constructed from a foamed synthetic polymeric material.

4. The apparatus as defined by claim 3 wherein said closure means is constructed from foamed polycarbonate.

5. The apparatus as defined by claim 2 wherein said network of transversely intersecting ribs is generally dome shaped with the apex of the dome generally disposed below the center of said top surface portion.

6. The apparatus as defined by claim 5 wherein said closure means is constructed from a foamed synthetic polymeric material.

7. The apparatus as defined by claim 6 wherein said closure means is constructed from foam polycarbonate.

8. The apparatus as defined by claim 5 further including means for securing said closure means to said closure support means.

9. In an assembly for closing the surface access opening to an underground installation, the assembly being of the type including closure support means disposed within the ground and formed by an annular retaining ring which circumscribes said surface access opening and has a peripheral shelf extension recessed from the top surface of said retaining ring at a first depth and closure means supported by said closure support means solely at said shelf extension for closing said surface access opening, the improvement wherein said closure means comprises:

a body of synthetic polymeric material defined by a generally flat top surface portion enclosed by an annular peripheral portion dimensioned to fit within the inner periphery of said retaining ring, said annular peripheral portion having a depth substantially equal to said first depth, and a network of ribs integrally joined with said top surface portion and said annular peripheral portion for providing the principal structural support for said closure means,

said network comprising a plurality of first ribs extending to a depth greater than said first depth and a plurality of second ribs integrally joined at their ends with said annular peripheral portion and respectively transversely intersecting and joined with said first plurality of ribs at locations along their length and equidistantly spaced from the center of said top surface portion.

10. The improvement as defined by claim 9 wherein said top surface portion, said annular peripheral portion, and said network of transversely intersecting ribs are of foamed polycarbonate.

11. The improvement as defined by claim 10 wherein recessed portions are disposed within said top surface portion and handrings are disposed within said recessed portions.

12. The improvement as defined by claim 10 wherein a plurality of circumferentially spaced locking lugs are integrally joined with said annular peripheral portion.

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