

July 26, 1966

R. J. MULLER

3,262,599

PLUGS FOR PLUGGING HOLES IN MANHOLE COVERS

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2 Sheets-Sheet 1

FIG. 1.

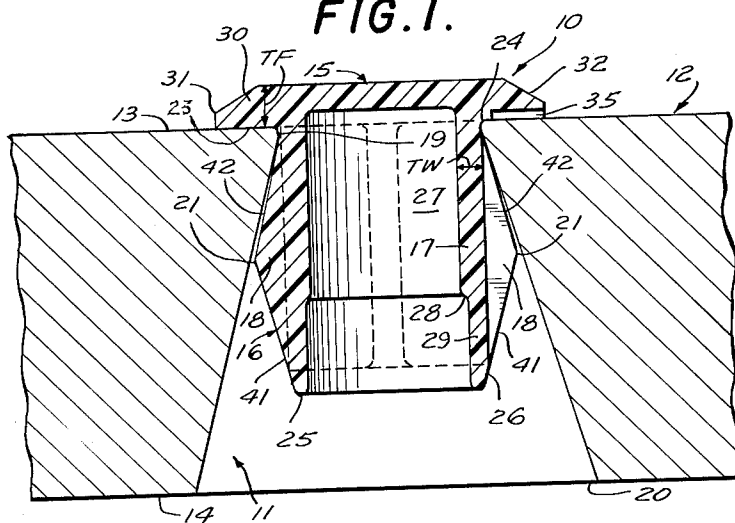


FIG. 2.

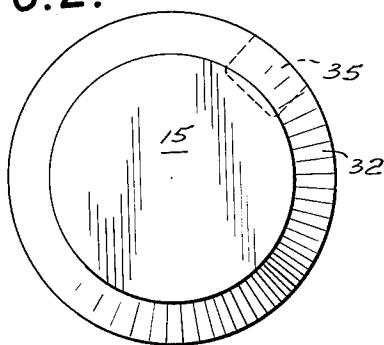


FIG. 3.

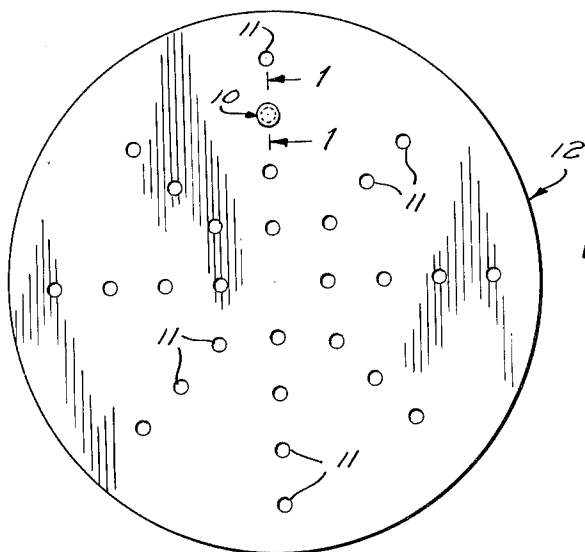
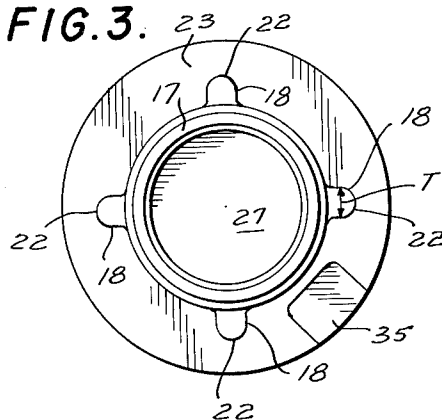


FIG. 4.

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FIG. 5.

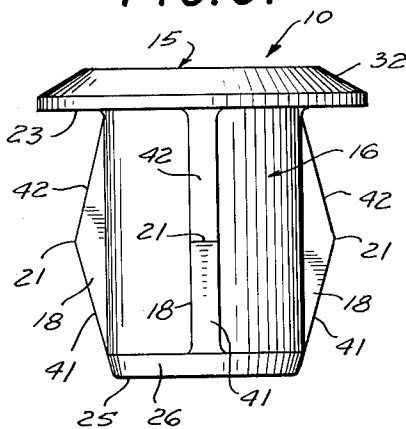


FIG. 6.

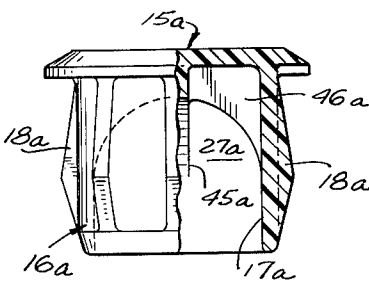


FIG. 7.

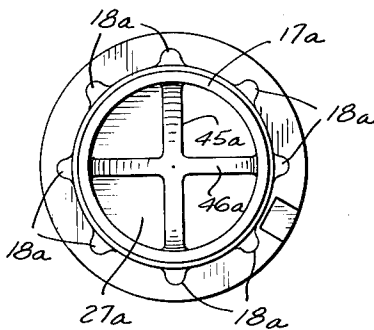


FIG. 8.

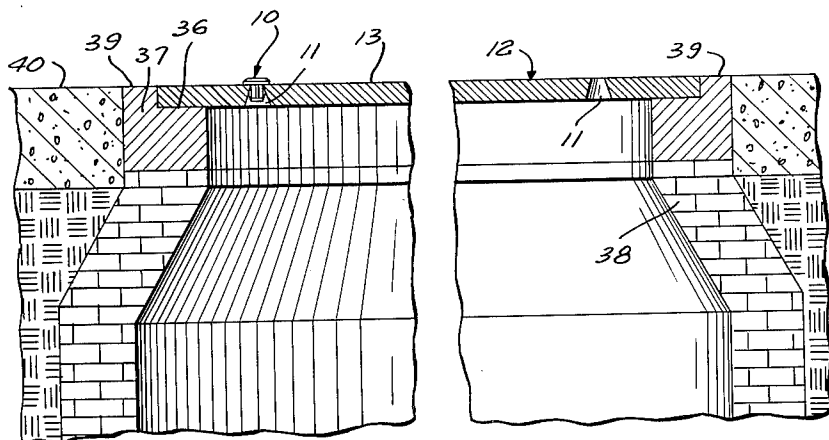
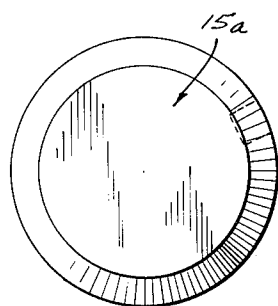


FIG. 9.

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PLUGS FOR PLUGGING HOLES IN
MANHOLE COVERS

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6 Claims. (Cl. 220-24.5)

This invention relates to plugging holes in manhole covers and more particularly to closure plugs for plugging or closing holes in manhole covers.

Conventional manhole covers now in common use are made of cast metal, such as cast iron or iron alloys of suitable characteristics. They are generally in the form of circular discs and they are used to cover the manholes that are located underground; such manholes forming a part of underground electric power, gas or steam distribution systems, and they are used particularly in systems in which the lines are buried under the surface of streets or roadways. The manhole opening at the surface of the street is of a size that permits workmen to get into the manhole for repairing or otherwise servicing the equipment or connections located within the space in the manhole below the surface of the street. The manhole cover is a separate, removable cast iron piece and when in place it rests at its periphery upon a supporting shoulder which in turn is permanently supported by and usually forms a part of the wall of the sub-surface manhole itself. When the manhole cover is in its place, and supported as mentioned above, its upper surface lies substantially flush with the surface of the street or roadway so that traffic may pass over it.

One of the purposes of providing holes in the cast iron manhole covers is to provide vents, as it was at one time generally thought that such holes were required to provide escape for vapor or gases from the interior of the manhole. But it is now considered not to be necessary to provide such vents in many instances. Nevertheless, and whatever be the explanation, most, if not all, manhole covers that have been installed in the past were manufactured with holes in them; the size of the holes varying from less than an inch up to perhaps one and one half inches in diameter and the number varying from one or two up to as many as thirty to forty and in some instances, even more. The holes may vary as to size from cover to cover. Conventionally, the holes do not have cross sectional areas which are the same throughout. That is, the holes which pass through the cover from its top surface to its bottom surface are not cylindrical but are in the shape of a truncated cone; the smaller circular end being at the top surface of the cover and larger circular end being at the bottom surface of the cover. Conventionally, the size of the hole at the top surface may measure from $\frac{3}{4}$ " up to $1\frac{1}{2}$ ", and, conventionally, the thickness of the covers may range from $\frac{1}{8}$ " up to $1\frac{1}{2}$ ". One standard form of cover may be $\frac{1}{8}$ " thick, having holes therein which are $\frac{3}{4}$ " diameter at the top and $\frac{1}{8}$ " diameter at the bottom. Another standard size may have a thickness of $\frac{1}{8}$ " and holes which are $1\frac{1}{2}$ " in diameter at the top and $\frac{1}{4}$ " in diameter at the bottom. A cover having a thickness of $\frac{1}{2}$ " may have holes the same as a cover having a thickness of $\frac{1}{8}$ ". Such manhole covers when in place for covering manholes in the streets permit rain and water that flows over the manhole cover to run down through the holes into the sub-surface manhole. Nowadays, especially in winter, salt and other substances are used in the streets to melt snow that falls on the street or ice that forms there in cold weather, it being necessary to keep the surface free of the traffic hazards caused by ice and snow. Although the use of salt and other like substances in the streets serves to solve traffic

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problems, it gives rise to others in that the salt water or water contaminated with other substances, flows or drips through the open holes in the manhole covers and causes unwanted corrosion and other damage to the electrical or other connections within the manhole.

It is an object of this invention to eliminate, in so far as is practical, the flowing or dripping of surface water through the holes of the covers into the manholes, thus to avoid damage to equipment or connections within the manhole that is caused by water getting into the manhole through the holes in the cover. This object is accomplished by providing means, in the form of hole plugs that are easily inserted from the top surface of the cover into the holes and which form a watertight seal, the plugs being removable and replaceable, if desired. The plug is made of a material that is cheap and which is sufficiently rigid and wear resistant to carry traffic travelling in the streets and has sufficient resiliency to permit insertion of the plug in the hole from the top surface of the manhole cover without damage to the cast iron cover and which is so shaped as to clamp itself within the hole when inserted in its place so that it will tightly seal the hole and remain in place notwithstanding the wear and tear and impacts to which it is subjected as a result of street traffic passing over the cover.

According to a preferred embodiment of the invention, the plug is made of a suitable, moldable thermoplastic, which has a high heat distortion temperature, a high tensile strength, high resistance to abrasion, and which will withstand impacts and shocks resulting from the traffic moving in the street without breaking or cracking, notwithstanding the low temperatures to which it is subjected in winter and the high temperatures to which it is subjected in summer. And the plug is of such size and shape, as described in further detail hereinafter, that it will not cause obstruction or traffic hazards and will remain in place and form a watertight seal.

Although the novel features which are believed to be characteristic of the invention are pointed out in the annexed claims, the invention itself as to its objects and advantages and the manner in which it may be carried out may be better understood by reference to the following more detailed description, taken in connection with the accompanying drawings, forming a part hereof, in which:

FIG. 1 is a view in cross section of a plug embodying the invention in place in the hole of a manhole cover and taken on line 1-1 of FIG. 4;

FIG. 2 is a top plan view of the plug shown in FIG. 1;

FIG. 3 is a view looking toward the bottom of the plug shown in FIG. 1;

FIG. 4 is a view to much smaller scale illustrating a top plan view of a conventional manhole cover having a plurality of holes;

FIG. 5 is a view in elevation of the plug shown in FIG. 1;

FIG. 6 is a view in elevation and partly in section of a modified form of plug;

FIG. 7 is a bottom view of the plug shown in FIG. 6;

FIG. 8 is a top plan view of the plug shown in FIG. 6; and

FIG. 9 is a sectional view partly broken away and to larger scale to illustrate one manner of supporting the manhole cover on the manhole.

Referring now to the drawings and more particularly to FIGS. 1 to 3, the closure plug designated generally by reference number 10 is shown in place in the hole 11 of the manhole cover 12. It will be observed that the hole 11 at the top surface 13 of the cover is smaller than the hole at the bottom surface 14 of the cover. This hole is conventional. It tapers outwardly in a downward direction and, thus forms a circular lip 19 at the top of the

hole. As shown, the diameter of the hole at the top is $\frac{3}{4}$ " and at the bottom is $1\frac{1}{8}$ "; the thickness of the cover being $1\frac{1}{8}$ "; this being typical and illustrative of a conventional manhole cover.

Preferably the plug 10 is made of a suitable thermoplastic polyethylene resin having the characteristics mentioned above and it may be molded by known methods. A polyethylene resin sold under the trademark Du Pont "Alathon" which may be had in high density form having the desired characteristics is a suitable thermoplastic for producing the plug. But other known thermoplastics having the desirable characteristics may be used. A small amount of carbon black in the polyethylene resin will improve the resistance of the plug against deterioration from sunlight. Alathon polyethylene resin is available having a heat distortion temperature of 175° F., a high density and a sufficient tensile strength, and stiffness, and a sufficiently high melting point and having a good abrasion resistance and it is substantially inert to most inorganic and organic materials that might come from automobile and trucks and traffic of that sort passing over the manhole covers. It will stand up at winter and summer temperatures.

The plug 10 is molded in one piece and comprises a circular top wall 15 from which depends a hollow stud post 16 which rests within the hole between the upper surface and lower surface of the cover when the plug rests in its place in the hole. The stud post comprises a cylindrical wall 17 having an outside diameter corresponding to the diameter of the hole 11 in the cover 12 at its upper surface 13. As illustrated in FIG. 1, the lip 19 of the hole has a diameter of $\frac{3}{4}$ " at its lip. The cover is $1\frac{1}{8}$ " thick and the bottom 20 of the hole is $1\frac{1}{8}$ " in diameter, that is, at the bottom surface 14 of the cover. A plurality of circumferentially spaced vertically disposed reinforcing buttress ribs or fins 18 extend radially outward from the outer surface of the cylindrical wall 17. As shown in FIG. 1, there are four buttress fins 18 circumferentially spaced 90° apart, but three or more fins equally spaced about the periphery of the hollow cylindrical part of the post, might be used. The thickness of the ribs 18 should be sufficient to provide appreciable strength to the post 16 to maintain it rigid when in its place in the hole of the manhole cover. As shown, the thickness T of a typical rib is $\frac{3}{32}$ ", and it will be noted that the outside edges 22 of the fins are rounded and free from sharp corners. And the thickness TW of the cylindrical wall 17 at its upper end portion is $\frac{1}{16}$ ". The central bore 27 of the post at its upper end, as shown, is $\frac{9}{16}$ " in diameter. Each fin 18 is V-shaped, when viewed in elevation, as in FIG. 1, having its vertex 21 located at approximately midway of the vertical length of the hollow post 16. The diameter of a circle through the vertexes 21 of the four ribs 18, as shown, is .950". The radial thickness of each fin decreases in equal increments in a direction toward the top wall 15 and the fin merges into the outside surface of the cylindrical wall 17 just short of the bottom surface 23 of the top wall 15 of the plug, it being noted that a fillet 24 of small radius, approximately $\frac{1}{16}$ " radius, extends around the cylindrical wall where it joins with the undersurface 23 of the top wall 15. The external diameter of the post at its upper end is such as to provide a tight, gripping fit with the lip 19. Likewise, the lower half of each fin decreases in radial thickness in equal increments in a direction toward the bottom end 25 of the cylindrical wall 17 and merges into the outside surface of a bevelled portion 26 at the outside periphery of the open bottom end of the hollow post 16. This bevelled portion 26 extends around the bottom end of the post and provides, in effect, a pointed end which is smaller in diameter than the diameter of the hole 11 at its upper end at lip 19, to facilitate starting or guiding the post into the hole when it is desired to insert the plug into the hole. It will be observed also that the diameter of the bore 27 of the hollow post is greater at its lower end than at its upper end, this bore being in-

creased in diameter from a place 28 a little below the plane through the vertexes 21 of the buttress fins 18, thus the cylindrical wall 17 is thinner at its lower end portion 29 than at its upper end portion to provide more flexibility at the lower end of post 16 as this facilitates driving the plug into the hole 11 from above the upper surface 13 of the cover 12.

The top wall 15 has an annular flange portion 30, the peripheral vertical edge 31 of which extends radially beyond the vertexes 21 of the fins 18. The top or cap 15 is bevelled at its periphery to provide bevel 32 to avoid a sharp corner and to provide an easier path for traffic over the top or cap portion 15 of the plug when it is in place in a manhole cover in the street. The thickness of the top wall should be sufficient to carry the weight of traffic which passes over it but no thicker than necessary so as not to rise high enough to cause undue obstruction to such traffic. As shown, the thickness TF of the flange is $\frac{1}{16}$ ". A small recess 35 is provided under the flange 30 with an open end at its periphery. This is useful for insertion of a screw driver or other suitable tool to pry up the plug from the hole in the cover after it is inserted in place when it is desired to remove it from the hole.

Referring to FIG. 9 it will be seen that the peripheral portion of the manhole cover 12 is shown as resting upon an annular shoulder 36 of the manhole ring 37, the ring thus providing a seat for the manhole cover. The cast metal ring 37 forms the cap member for the top of the manhole wall 38 conventionally constructed of laid up brick. The manhole wall 38 usually has a tapered or truncated cone portion at its upper end. The top 39 of the seating ring lies substantially flush with the surface 40 of the street where the subterranean manhole is located.

When it is desired to plug the holes 11 of the manhole cover with a watertight seal, this may easily be done without lifting the manhole cover from its seat. The plug 10 is readily started into the hole at the lip 19 (see FIG. 1) at the top of the hole by inserting the end 25 into the hole. The bottom end of the post 16, being bevelled at 26 and therefore smaller than the lip 19 of the hole, is easily guided or "stabbed" into the hole. Then when the lower portions 41 of the fins engage the periphery of the lip 19 of the hole 11 the thinner walls at the bottom end of the post taken together with the inherent flexibility or "give" of the plastic material itself permits the post to be driven downwardly until the vertexes 21 of the fins 18 pass the peripheral lip 19 of the hole and then the fins pass downwardly until the undersurface 23 of flange 30 engages the top surface 13 of the manhole cover. The outside diameter of the post at its upper end is such that it engages the lip 19 of the hole with a tight gripping fit to provide a watertight seal. The outwardly and downwardly flaring portions 42 of the fins may hug the interior surface of the downwardly and outwardly flaring hole and they are sufficiently rigid to prevent removal upwardly of the plug by reason of any forces that are applied to the plug by the movement of traffic over the manhole cover. The plug, however, may be removed when desired by using a tool to pry upwardly under the flange. It will be observed also that there are no sharp corners in the plug, there being fillets molded in where two walls meet and the exposed edges of the fins and other parts are rounded to eliminate, in so far as possible, any sharp corners that might chip, if subjected to impacts.

The modified form of closure plug illustrated in FIGS. 6, 7 and 8 is substantially the same as the structure described above, the difference being that the upper end of the bore 27a of the hollow post 16a is provided with cross reinforcing ribs 45a, 46a, molded to the top or cap portion 15a and to the interior surface of the cylindrical wall 17a. And the hollow post 16a is provided with eight reinforcing buttress fins 18a of the same shape as the fins 18 of FIG. 1. This construction is preferred for holes in manhole covers which are of larger diameter, for example, holes having a lip periphery of $1\frac{1}{2}$ " at the upper

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surface of the cover, it being understood, of course, that the dimensions of the plug will be selected to provide a gripping action on the outside surface of the upper end of the post to provide a watertight seal when the plug is driven in the hole.

The terms and expressions which have been employed herein are used as terms of description and not of limitation, and there is no intention in the use of such terms and expressions of excluding any equivalents of the features shown and described or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed.

What is claimed is:

1. A one piece plug for closing a hole in a manhole cover having top and bottom surfaces, which hole has a smaller opening at the top surface of the cover than at its bottom surface, said hole having a shape of a truncated cone and providing a circular lip at the top surface of said cover; which plug comprises a substantially flat cap member having an annular flange portion at its periphery, which flange portion has a bottom surface engageable with the top surface of said cover around said lip; a post having a lower end and an upper end depending from the underside of said cap member, said post being of a size permitting its passage downwardly through said circular lip; a plurality of circumferentially spaced, vertically disposed buttress fins extending radially outward from said post, said fins having radially extending portions, the extremities of which lie in a circle having a diameter greater than the diameter of said lip; said post at its upper end having a periphery which provides a gripping action between said post and the lip of said hole when said plug is placed in said hole with the bottom surface of said flange in engagement with the upper surface of said cover.

2. A one piece plug for closing a hole in a manhole cover having top and bottom surfaces, which hole has a smaller opening at the top surface of the cover than at its bottom surface, said hole having a shape of a truncated cone and providing a circular lip at the top surface of said cover; which plug comprises a substantially flat cap member having an annular flange portion at its periphery, which flange portion has a bottom surface engageable with the top surface of said cover around said lip, a post having a lower end and an upper end depending from the underside of said cap member, said post at its lower end having a cross sectional area in a plane parallel with the bottom surface of said flange which is not substantially greater than the area bounded by said lip, a plurality of circumferentially spaced, vertically disposed buttress fins extending radially outward from said post, said fins having radially extending portions, the extremities of which lie in a circle having a diameter greater than the diameter of said lip and which extremities lie in a plane parallel with the bottom surface of said flange; said post at its upper end having an external diameter of a dimension which provides a gripping action between said post and the lip of said hole when said plug is placed in said hole with the bottom surface of said flange in engagement with the upper surface of said cover.

3. A one piece plug for closing a hole in a manhole cover having top and bottom surfaces, which hole has a

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smaller opening at the top surface of the cover than at its bottom surface, said hole having a shape of a truncated cone and providing a circular lip at the top surface of said cover; which plug comprises a substantially circular flat cap member having an annular flange portion at its periphery and having a diameter greater than the diameter of said lip, said flange having a bottom surface engageable with the top surface of said cover; a hollow post having a lower end and an upper end depending from the center portion of said cap member within the annular area of said flange, said post comprising a substantially cylindrical wall having an outside diameter less than the diameter of said cap member and a plurality of circumferentially spaced, vertically disposed buttress fins extending radially outward from said wall, said fins being of generally V-shape with the vertexes of said fins lying in a circle having a diameter greater than the diameter of said lip, said post at its upper end having an external diameter of a dimension which provides a gripping action between said post and the lip of said hole when said plug is placed in said hole with the bottom surface of said flange in engagement with the top surface of said cover.

4. A molded one piece thermoplastic plug for closing a hole in a manhole cover having top and bottom surfaces, which hole has a smaller opening at the top surface of the cover than at its bottom surface, said hole having a shape of a truncated cone and providing a circular lip at the top surface of said cover; which plug comprises a circular cap member having a flat top portion and a beveled annular portion at its periphery surrounding said flat top portion and having an annular flange portion having a flat bottom surface under said beveled portion engageable with the top surface of said cover around said lip, said cap member having a diameter greater than the diameter of said lip; a hollow post having a lower end and an upper end depending from the center portion of the underside of said cap member within the area bounded by said flange portion, said post comprising a substantially cylindrical wall having an outside diameter less than the diameter of said cap member and a plurality of circumferentially spaced, vertically disposed buttress fins extending radially outward from said wall, said fins being of generally V-shape and with the vertexes of said fins lying in a circle having a diameter greater than the diameter of said lip and lying in a plane parallel with the plane of said cap member, said post at its upper end having an external diameter of a dimension which provides a gripping action between said post and the lip of said hole when said plug is placed in said hole with the bottom surface of said flange in engagement with the upper surface of said cover.

5. A plug according to claim 4 in which the cylindrical hollow post has a bevel portion around its outside periphery at its lower end.

6. A plug according to claim 5 in which the hollow cylindrical post has reinforcing ribs within its bore engaging the underside of said cap member and the inner surface of said cylindrical wall.

No references cited.

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