Feb. 22, 1938. V. ELKINGTON 2,109,287

MANHOLE COVER AND FRAME

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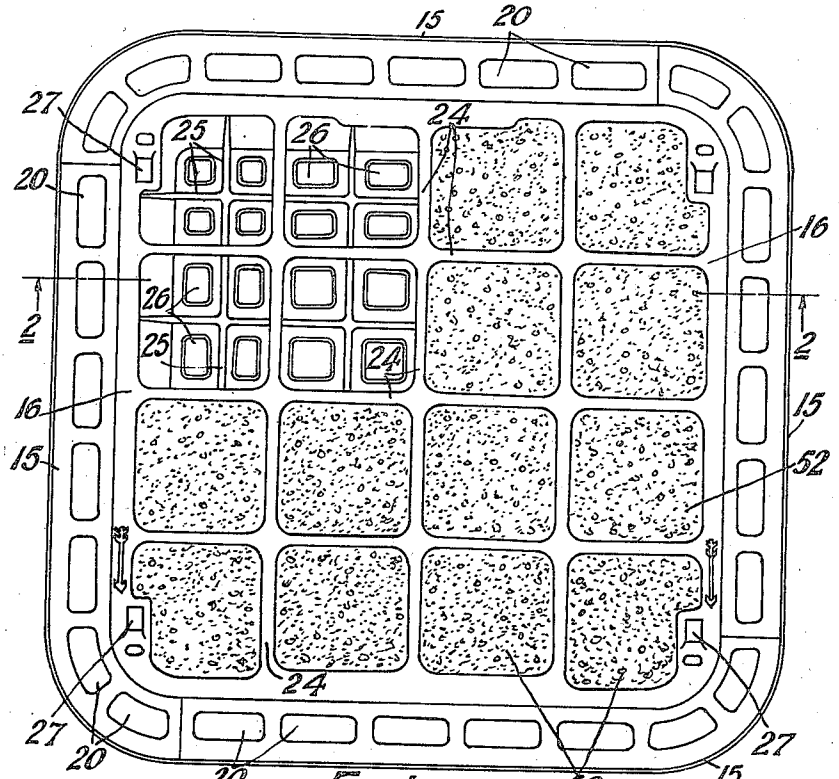


FIG. 1.

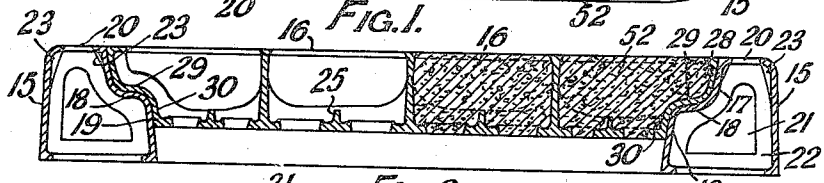


FIG. 2.

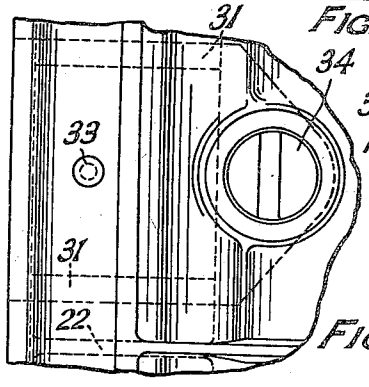


FIG. 3.

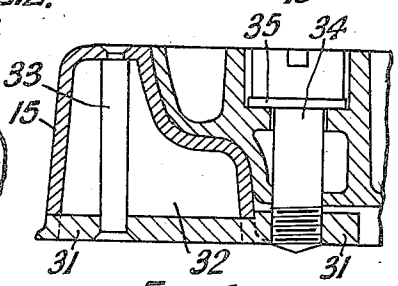


FIG. 4.

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MANHOLE COVER AND FRAME

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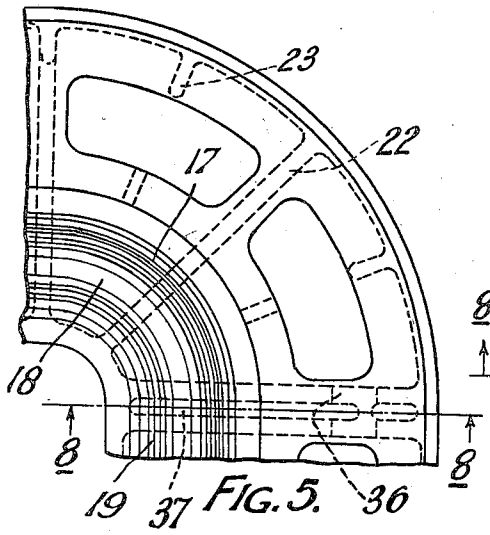


FIG. 5.

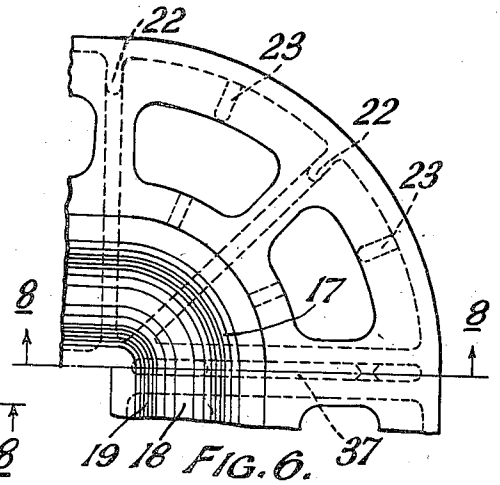


FIG. 6.

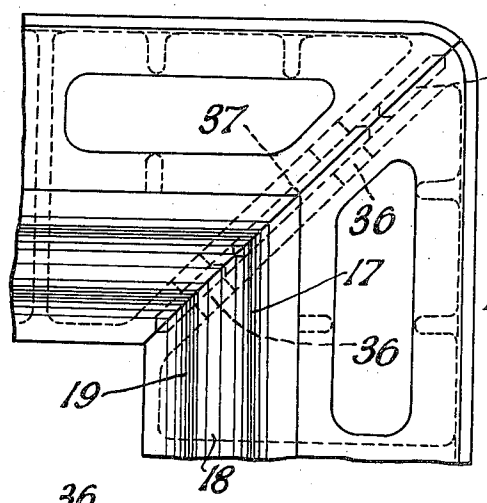


FIG. 7.

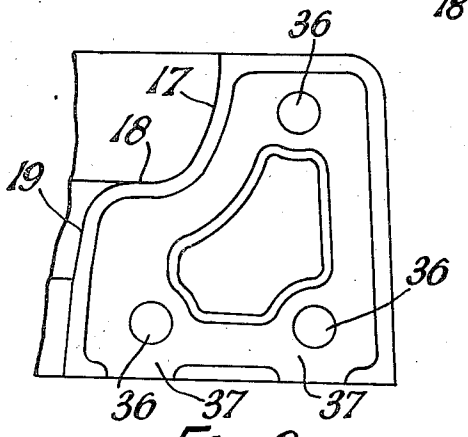


FIG. 8.

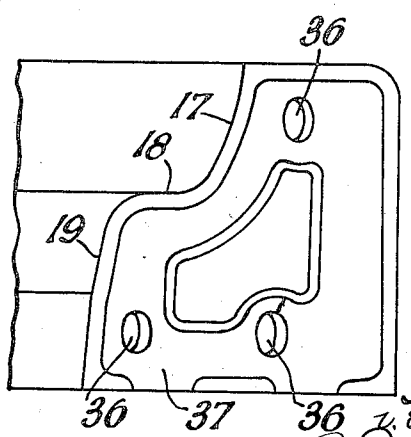


FIG. 9.

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MANHOLE COVER AND FRAME

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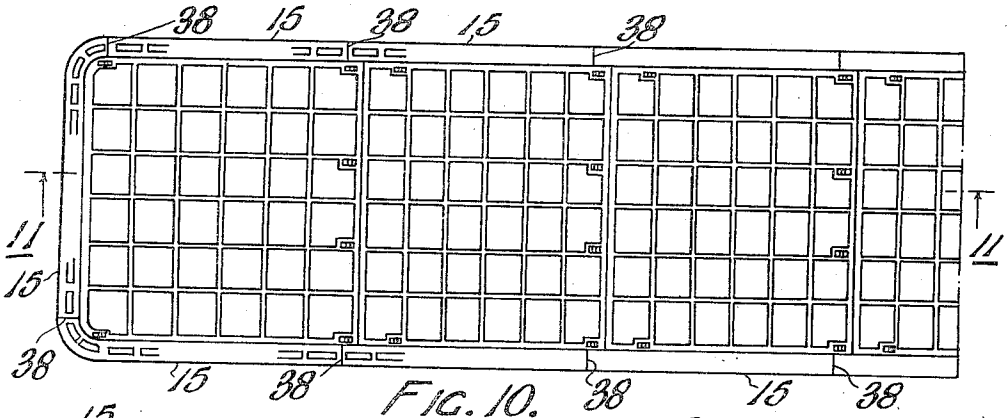


FIG. 10.

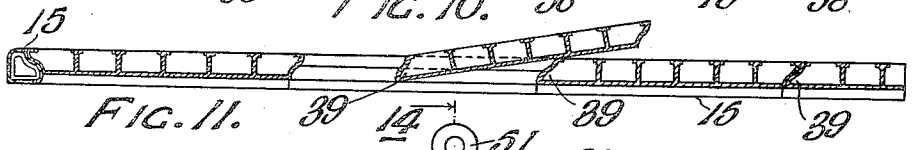


FIG. 11.

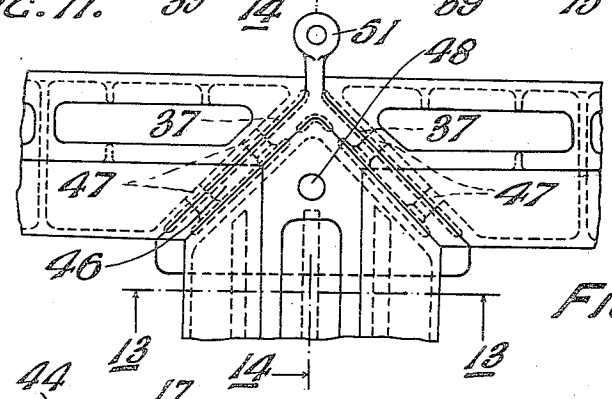


FIG. 12.

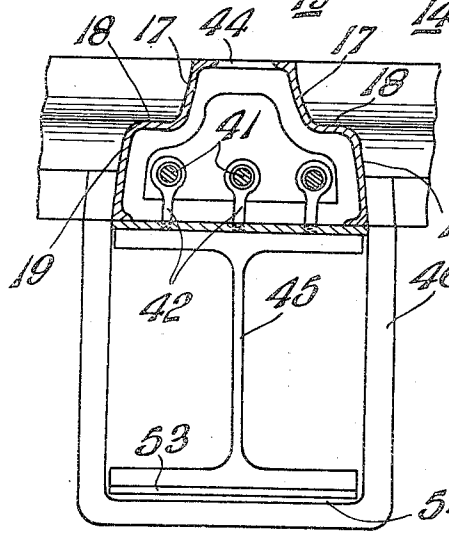


FIG. 13.

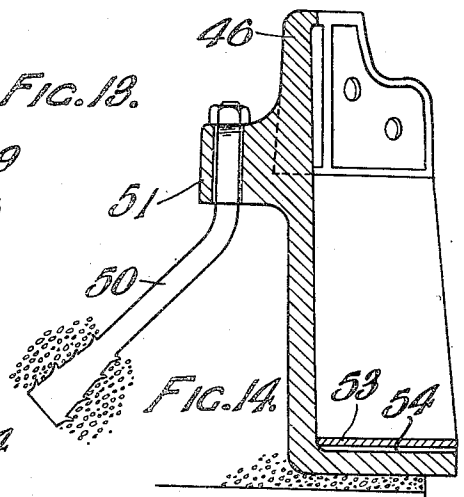


FIG. 14.

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UNITED STATES PATENT OFFICE

2,109,287

MANHOLE COVER AND FRAME

Vivian Elkington, Dover, England

Application November 1, 1935, Serial No. 47,857
In Great Britain November 9, 1934

9 Claims. (Cl. 94—34)

This invention relates to manhole covers and frames and the like such as pathway, roadway and like covers, ventilated gratings, gratings for gas, water, electricity or sewage or analogous installations or cable or pipe line trench covers and the like, hereinafter termed manhole covers.

The primary object of the invention is to provide a manhole cover in which the frame is of extremely light construction and yet which will be of adequate strength and rigidity when laid on the site. A further object is to provide a construction of frame which will cast so as to be initially stress-free and which will be substantially fool-proof in setting without the possibility of deformation or "winding" of the frame occurring, thereby allowing of a machine-tool fit between cover and frame to render the manhole construction water- or gas-tight without the use of liquid seals or the like. A still further object is to provide a construction of frame which may be easily lifted and reset if and when the surface level of a road, pavement or yard in which the frame is set has to be altered.

According to the invention the frame of a manhole cover is of channel section open at the bottom, the inner side wall of the channel which constitutes the seating surface for the cover being inclined over at least a part of its depth and the upper part of the frame section being provided with apertures through which concrete can be filled into the space enclosed by the channel section, for instance on the site.

The said seating surface may be curved, a part of the said curved seating surface being capable of producing reaction to a force exerted on the cover and having a large vertical component, the composite curved seating surface operating over the whole area to support the cover.

The aforesaid inner side wall may comprise an inclined part and a substantially horizontal part and preferably consists of two upper and lower inclined parts separated by the substantially horizontal part. The lower inclined part may advantageously be formed as a radiused abutment for the cover preventing development of any cover movement when traffic is passing over it, whilst permitting free opening and closing of the cover.

Embodiments of the invention will now be more particularly described by way of example with reference to the accompanying drawings, wherein:—

Figure 1 is a plan view of a manhole cover according to the invention with the cover in the closed position,

Figure 2 is a section on the line 2—2 of Figure 1,

Figures 3 and 4 are similar views to Figures 1 and 2 showing details of a fixing screw which may be employed when it is desired to have the cover positively attached to the frame,

Figures 5, 6, and 7 are details drawn to an enlarged scale of three forms of corner joint which may be formed between the frame sections,

Figures 8 is a view of the section face on the line 8—8 of Figure 5 or 6.

Figure 9 is a perspective view of the section face across the joint in Figure 7,

Figure 10 is a plan view of part of a trench cover and frame,

Figure 11 is a sectional elevation on the line 11—11 of Figure 10,

Figure 12 is a plan view of one of a series of removable cross bars which may be employed in conjunction with the frame of medium and large span trench covers,

Figure 13 is a cross section substantially on the line 13—13 of Figure 12, and

Figure 14 is a section substantially on the line 14—14 of Figure 12.

Referring to Figures 1 and 2, the frame is composed of four sections 15 cast separately and bolted or otherwise secured together to form the substantially rectangular frame shown in Figure 1. The frame sections 15 are of channel section open at the bottom as shown in Figure 2 and the inner side wall of the channel constitutes a seating surface for the cover 16 which seating surface is curved, and a part of which is capable of producing reaction to a force exerted on the cover and having a large vertical component, the composite curved seating surface operating over its whole area to support the cover. As shown, the inner side wall is inclined at 17 and 19, the inclined surfaces 17 and 19 being connected by a substantially horizontal intermediate surface 18. The whole surface comprising the surfaces 17, 18, 19, being in actual metal to metal contact with similarly formed surfaces 28, 29, 30 on the cover referred to hereinafter constitutes therefore a continuous seating surface, the whole of which mutually supports the cover and therefore the loads imposed on its top surface. The horizontal intermediate surface 18 prevents the cover when heavily loaded from acting as a wedge and exerting a bursting force inside the frame. The frame sections are cast with main webs 22 and subsidiary webs 23 (see also Figures 3 and 5 to 7) between the collateral parts of the channel section which impart a more or less box or open

grid formation to the frame sections. In like manner the cover 16 has main webs 24 and subsidiary webs 25 running between the main webs. The cover is cast with apertures 26 between the subsidiary webs 25 and the upper part of each frame section 15 is cast with apertures 20 therein.

If the frame is cast in sections 15 as described, the sections may be secured together on the site and when the complete frame has been set on a cement composition bed as usual, grouting is filled into the apertures 20 and sets in the cavities 21 to provide a solid reinforced construction of great strength. Alternatively the frame can be filled with concrete from the bottom and then set in position. In setting the frame in the cement composition bed, the frame may be pressed down through the composition directly on to packings provided for its reception so that the displaced composition rises internally into the hollow cavities 21. Grouting is then filled into the cavities through the apertures 20 as before, unless the cavities are completely filled by the displaced cement composition. The cover 16 may be filled with concrete, wood-blocks or the like 52 and if concrete is employed as the filling, a board is placed beneath the cover to close the apertures 26 during filling. In like manner, if the frame is assembled and filled with concrete at the depot, for example, instead of on the site, it is placed upon a board during filling. Carborundum grains may be incorporated into the top surface of the concrete of the cover and in the apertures 20 of the frame in order to obtain a "non-skid" surface.

The cover 16 may be lifted out vertically by inserting lifting keys in the keyholes 27 or is easily slid out in a more or less horizontal direction along the curved surfaces between 18 and 19 with each of which curved surfaces it makes a substantially line contact when being slid out. As previously stated the edges of the cover 16 are formed by surfaces 28, 29, 30 which are the exact counter-part of the surfaces 17, 18, 19 of the frame and the lower inclined surface 19 of the frame forms a radiused abutment for the surface part 30 of the cover which is similarly radiused thereby rendering any other form of stop unnecessary. When one end of the cover is lifted the surface 30 turns easily upon the surface part 19 of the frame at the other end and a narrow strip of the surface between the surface parts 28 and 29 of the cover near the last mentioned end contacts with a narrow surface between the surfaces 18 and 19 of the side frame sections along which narrow strips, almost line contacts, the cover slides. Also the upper surfaces 17 form almost vertical abutments for the cover whereby the possibility of a rectangular cover, opening on the longer way, that is to say across its shorter dimension, being carelessly handled and falling into the pit is definitely avoided. The surfaces 19 and 30 need only be radiused on two sides of the cover and frame but for convenience the radius is employed on all four sides.

Referring to Figures 3 and 4, which show means for securing the cover positively in its frame when the cover is required to withstand gas or liquid pressure therebeneath in a manhole cover of lighter construction than that shown in Figures 1 and 2, the frame is cut away at each end usually on the centre line of the frame to receive and house a malleable casting 31, vertical webs 32 of which project upwardly and fit inside the channel of the frame between the main webs 22. The casting 31 is held in position by a soft iron rivet 33 and a stainless steel or gunmetal screw 34 provided with a leather washer 35 passes through apertures in the cover casting into the casting 31 whereby the cover is positively secured thereto.

Figures 5 to 9 show three arrangements of corner joint for the frame. In Figures 5 and 8 each frame section is as shown in Figure 1, that is to say each section consists of a straight side piece of the frame and a corner, all the seating surfaces and the top surface of the frame sections being radiused at the corners. In Figures 6 and 8 also each frame section consists of a straight side piece and a corner piece but the lower seating surface is square ended. In Figures 7 and 9 the frame sections are cast with mitred ends and all the seating surfaces and the top surface of the frame sections are substantially square ended at the corners. In all cases the sections may be secured together in known manner by bolts passed through the bolt holes 36, hard white metal being run into the chambers 37 after the sections have been bolted together to key the joint.

Figures 10 and 11 show part of a pipe line or cable trench cover in which the frame sections 15 are bolted and keyed together at 38 as described above. A series of covers 16 are provided and all the covers with the exception of the first of the series have a projecting part 39 at one end instead of the usual recessed part 30 whereby adjacent covers seat upon one another as shown. Except in very wide span trench covers long spans of clear opening, that is to say without cross members, may be covered satisfactorily in this manner. With wider span trench covers removable bars may be provided between the side frames on to which the covers seat, any desired span of clear opening being obtainable in this manner by removal of the bars. Such an arrangement is shown in Figures 12 to 14 where the meeting ends of adjacent frame sections are cut away to receive the V-shaped end of the bar 40. The latter is of channel section open at the bottom and formed on both sides with seating surfaces 17, 18, 19 of the same form as those on the frame sections. A plurality of reinforcing rods 41 pass from end to end of the bar and are provided with eyebolts 42 which hold a stainless steel plate 43 to close the open bottom of the channel. The upper part of the bar is formed with apertures 44 through which concrete may be filled into the hollow cavity around the reinforcing rods 41. The removable bar is supported by a rolled steel joist 45 and each end of the removable bar and steel joist is carried in a cast iron housing 46 in which they are carried upon a second stainless steel plate 53 with a white metal backing 54. The removable bar 40 is provided with a stainless steel screw 48 which on being screwed down against the cast iron housing causes the removable bar to lift to facilitate its removal. The cast iron housing is secured to the adjacent frame sections by bolts passing through the bolt holes 47 the joint being keyed by running white metal into the cavities 37. Grease grooves 49 are provided to render the joint between the bar 40 and the frame sections 15 gas- and water-tight. The cast iron housing 46 is rigidly held by a Lewis bolt 50 embedded in the concrete surround and passing through the eye 51. In cases where a

construction of such strength is unnecessary the steel joist may be dispensed with.

What I claim and desire to secure by Letters Patent is:—

1. A cast metal cover and frame construction for manholes, comprising a frame of inverted substantially U-shaped channel section adapted to be filled with concrete or the like, said section being also provided with openings at the top whereby the section may be filled either from the bottom or the top, the inner side wall of the channel being formed with a cover-seating surface extending continuously around the frame and from the top to the bottom, said surface being inclined over at least a part of its depth, and a cover having a seat conforming for close face to face contact from top to bottom with said cover-seating surface.

2. A cast metal cover and frame construction for manholes, comprising a frame of inverted substantially U-shaped channel section and having its inner side wall formed with a compositely curved cover-seating surface, and a cover having a seat conforming for close face to face contact with said compositely curved cover-seating surface, the latter operating substantially over its whole area to support said cover and having a part capable of producing reaction to a force having a large vertical component exerted on the cover.

3. A cast metal cover and frame construction for manholes according to claim 2, wherein said compositely curved cover-seating surface comprises an inclined part and a substantially horizontal part.

4. A cast metal cover and frame construction for manholes according to claim 2, wherein said compositely curved cover-seating surface consists of two upper and lower inclined parts separated by a substantially horizontal part.

5. A cast metal cover and frame construction for manholes, comprising a frame of channel section open at the bottom and adapted to be filled with concrete or the like, said section being provided with openings at the top whereby the section may be filled either from the bottom or the top, the inner side wall of the channel being formed with a cover-seating surface consisting of upper and lower inclined portions separated by a substantially horizontal portion, and a cover having a seat conforming for close face to face contact with said cover-seating surface, said lower inclined portion of the latter being formed as a radiused abutment for the cover to permit free opening and closing of the latter.

6. A cast metal cover and frame construction for manholes according to claim 2, wherein cross webs are provided between the collateral parts of said inverted substantially U-shaped channel section which impart a more or less box or open grid formation to the frame.

7. A cast metal cover and frame construction for manholes, comprising a frame composed of a plurality of channel sections open at the bottom and adapted to be filled with concrete or the like, said sections being provided with openings at the top whereby the sections may be filled either from the bottom or the top, the inner side walls of the sections being formed with cover-seating surfaces extending from the top to the bottom and inclined over at least a part of their depth, a cover having a seat conforming for close face to face contact from top to bottom with said cover-seating surfaces, and means for securing said plurality of frame sections together.

8. A cast metal cover and frame construction for manholes according to claim 7, wherein each frame section consists of a straight side piece and a corner piece.

9. A cast metal cover and frame construction for manholes, comprising a frame of inverted substantially U-shaped channel section having its inner side wall formed with a cover-seating surface, cross bars removably located transversely of said frame between opposite sides thereof, said cross bars having side walls formed with similar cover-seating surfaces, and a plurality of covers having seats conforming for close face to face contact with said cover-seating surfaces, whereby large areas may be covered yet with the removal of said cross bars large spans of clear opening are obtainable.

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