March 19, 1940. V. ELKINGTON 2,194,221

MANHOLE COVER AND FRAME

Filed March 9, 1937 2 Sheets-Sheet 1

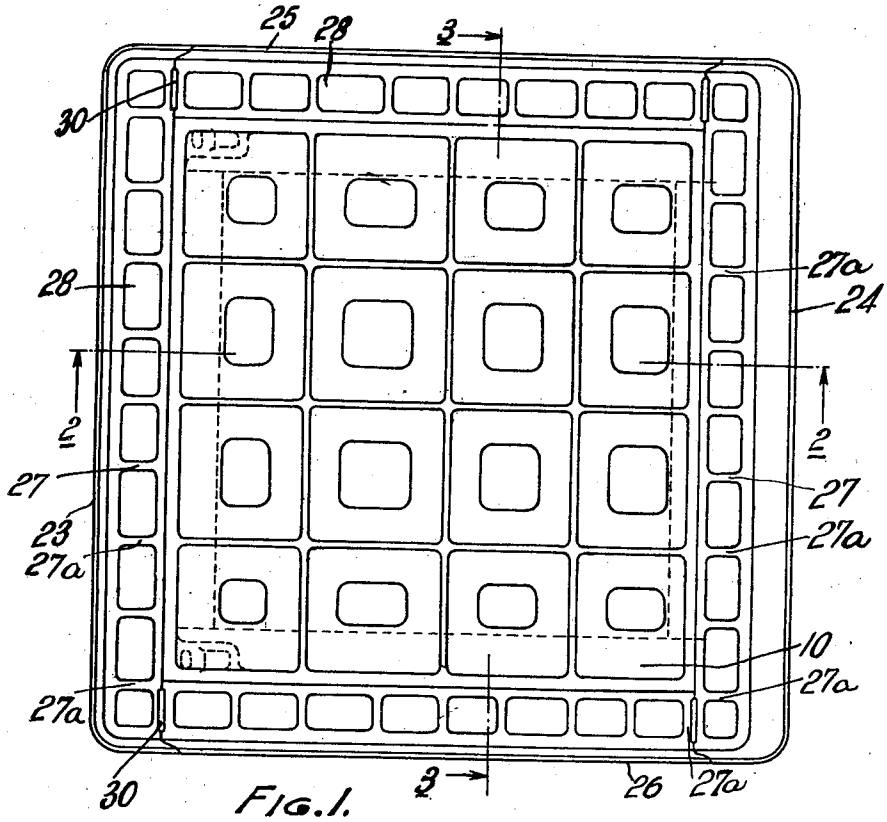


FIG. 1.

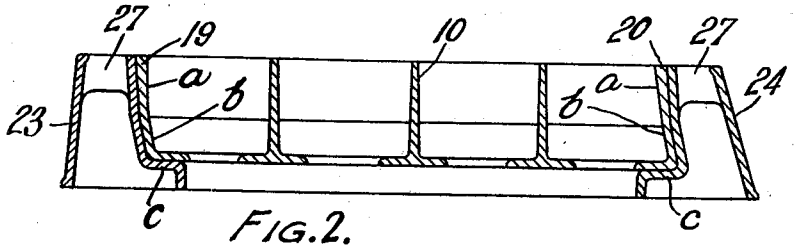


FIG. 2.

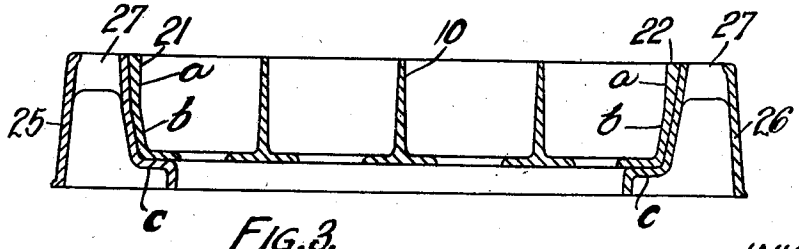


FIG. 3.

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MANHOLE COVER AND FRAME

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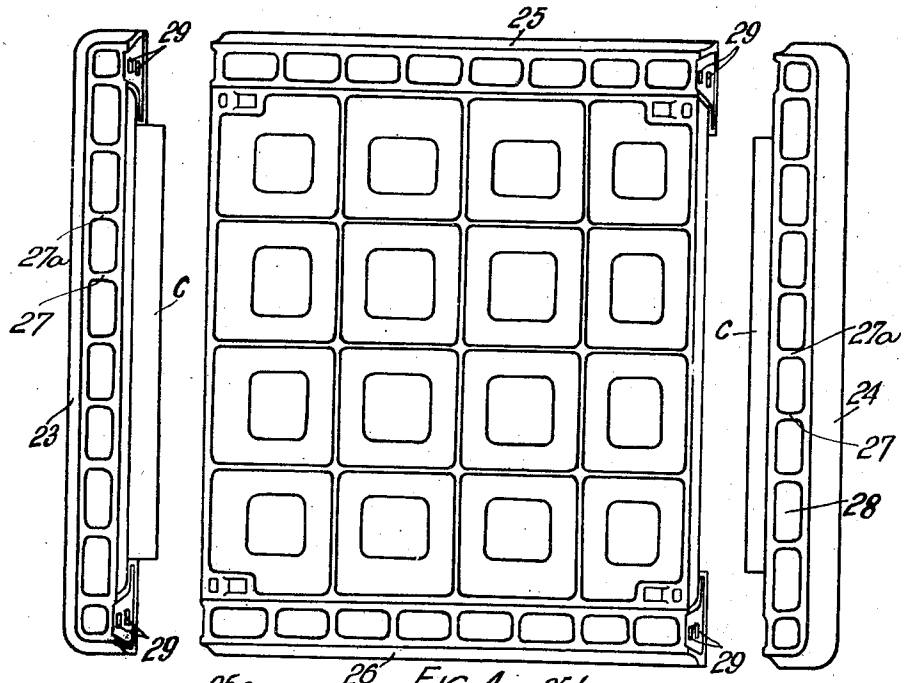


FIG. 4

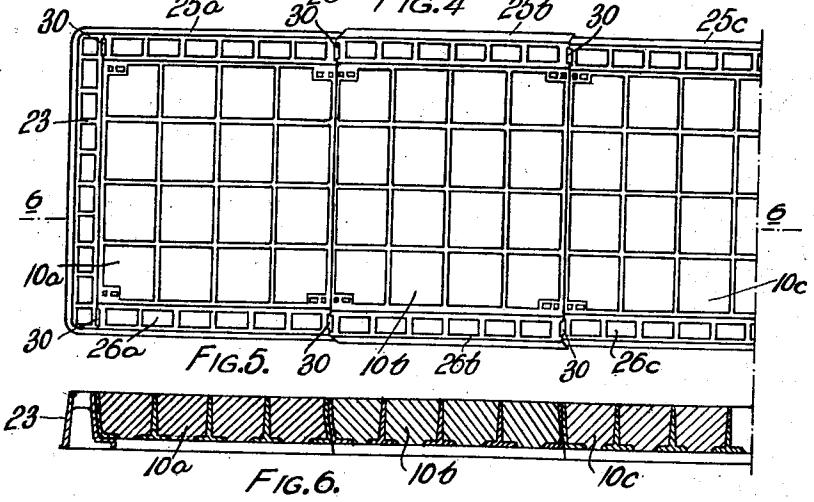


FIG. 5.

FIG. 6.

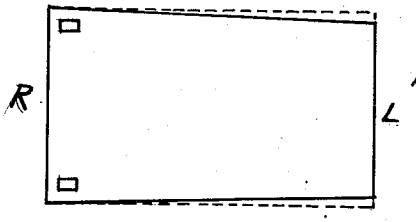


FIG. 7.

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MANHOLE COVER AND FRAME

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Application March 9, 1937, Serial No. 129,941
In Great Britain March 27, 1936

7 Claims. (Cl. 94—34)

This invention relates to covers and frames for manholes and the like in general of the kind in which the cover closely fits the frame.

The invention has for its primary object to provide a construction of manhole cover and frame with which rebound under fast-moving wheel loads is definitely eliminated. Further objects are to provide a construction which is eminently suited to multiple covers and trench cover constructions and to obviate the necessity that all the cover parts in such a multiple or trench cover and frame construction should be of identical size. Hitherto it has been necessary when casting the cover parts of a multiple or trench cover and frame to cast a large number of covers, select the smallest to which jigs are then made and then finally grind all the other larger covers to the jigs.

The invention comprises a closely fitting cover and frame construction for manholes and the like wherein the cover seats upon horizontally projecting parts of the frame and has a part which projects or co-operates beneath a part of the frame whereby undesired rocking or lifting of the cover is prevented.

The cover may be formed with inclined sides, one pair of opposite sides at least of said cover and frame being inclined in a similar sense so that a section through the cover perpendicular to said opposite sides is roughly in the form of a parallelogram, the angles of which are not right angles.

Each of the said pair of opposite sides of the cover preferably consists of two meeting plane surfaces, the lower of which has a greater inclination to the vertical than the upper.

It will be appreciated that one side of the cover in this construction engages beneath the corresponding side of the frame so that if the cover and frame be laid in a roadway in such a position that the side of the aforesaid pair of opposite sides which makes an acute angle with the top surface of the cover faces the traffic, any tendency of the opposite side of the cover to lift is prevented by reason of the fact that it makes an obtuse angle with the top surface of the cover and engages beneath the frame.

In order that the invention may be better understood and readily carried into effect reference may be had to the accompanying drawings in which:

Figure 1 is a plan view of a rectangular manhole cover and frame in accordance with the invention,

Figure 2 is a section through the cover and frame on the line 2—2 of Figure 1,

Figure 3 is a section through the cover and frame on the line 3—3 of Figure 1,

Figure 4 is a similar view to Figure 1 showing the method of fitting the frame sections to the cover,

Figure 5 is a diagrammatic plan view showing the method of fitting the frame sections to the respective cover parts in a trench cover,

Figure 6 is a section on the line 6—6 of Figure 5, and

Figure 7 is a diagram illustrating an important detail.

Referring to Figures 1 to 4, the rectangular manhole cover 10 consists of a light, hollow, grid-like structure of cast iron. The cast iron frame is composed of four sections 23 to 26 cast separately and bolted and/or otherwise secured together to form the rectangular frame shown in Figure 1. The cover 10 is cast with inclined sides 19 to 22, Figures 2 and 3, the sides 19 and 20 being inclined in a similar sense so that a section through the cover on the line 2—2 of Figure 1 is roughly in the form of a parallelogram, the angles of which are not right angles, as shown in Figure 2. If desired the other sides 21 and 22 may also be inclined in a similar sense, but as shown in Figure 3 they are inclined oppositely more in accordance with normal practice. The sides may be plane or curved but as shown in the example illustrated, each side consists of two parts, an upper part *a* and a lower part *b*, the said lower part having a greater inclination to the vertical than the upper part, so that each side actually consists of two meeting plane surfaces. The frame sections 23 to 26 have inner walls conforming exactly to the sides 19 to 22 respectively of the cover and the latter seats upon horizontally projecting parts or flanges *c* of said inner walls as shown in Figures 2 and 3. With this arrangement of the cover and frame sides the cover fits the frame tightly, its sides being supported along *a* and *b* and its base by the horizontal part *c*. Due to the horizontal seating *c* the cover 10 cannot sink and at the same time there is no bursting pressure acting on the inside of the frame because the resultant force of a load applied to the cover 10 acts vertically downwards and there is no possibility of cover movement sideways within the frame due to the contour of the parts *a* and *b* and to the fact that the cover is closely confined within the frame. Furthermore the cover cannot rock when traffic passes over it due to the fact that the side 20 of

the cover engages beneath the frame section **24** which positively prevents any lift at this end. Nevertheless, the cover does not bind within the frame and may readily be removed, as will be more clearly explained hereafter, as due to the contour of the parts *a b* of the sides slight upward movement, amounting to a few hundredths of an inch only, of the side **19** of the cover frees the cover to permit easy withdrawal. The frame sections **23** to **26** are channeled as shown, the upper wall of the channel consisting merely of cross webs **27** and **27***a* between the inner and outer walls of the frame sections due to the provision of apertures **28** in the said upper wall. These cross webs are partial as shown in Figs. 2 and 3, where they come between the main webs of the cover as at **27** and complete, that is to say they extend over the complete cross section of the frame, where they correspond to or come opposite the main webs of the cover as at **27***a*. The side **20** of the cover **10** engages beneath the corresponding side **24** of the frame so that if the cover and frame be laid in a roadway in such a position that what may be termed the acute angled side **19** of the cover faces the traffic, any tendency of the side 20 of the cover to lift is prevented by reason of the fact that it is obtuse angled and engages beneath the frame section **24**. The frame sections are concrete filled being preferably pushed down into the concrete bed in order to compact the concrete filling in the frame channel to reinforce the latter and the cover may also be filled with concrete or wood blocks.

Referring to Figure 4, the frame sections 23 to 26 are fitted to the cover **10** in the manner indicated. It will be noted that the sections 23 and **24** each consist of a straight side piece of the frame and corners, the horizontally projecting parts *c* being cut away adjacent the corner parts as shown. In assembling the frame the sections **25** and **26** are fitted up to the cover **10** as shown and then the sections **23** and **24** are offered up against the end faces of the sections 25 and 26. If either of the sections **25** and **26** are slightly too long it is merely necessary to grind one of the end faces of the channel, which operation may be readily performed with a portable grinding machine. The sections **23** and **24** are then secured to the sections **25** and **26** by bolts passed through the elongated bolt holes **29** in cross webs near the ends of each of the sections **23** to **26**. If either of the sections **23** and **24** are slightly too long or too short they may still be accurately fitted to the cover due to the fact that the holes **29** are elongated to permit such accurate fitting. The frame sections are finally secured in their bolted positions by running hard lead or other keying metal into the chambers **30**, Figure 1, formed between the various frame sections such final securing also providing for accurate fitting of the frame sections to the cover in the case of either of the sections **25** or **26** being slightly too short. This method of fitting the frame sections to the cover is of particular advantage in the case of multiple or trench covers. Figures 5 and 6 show the method applied to a trench cover in which the separate cover parts **10***a*, **10***b*, **10***c* . . . vary in size within a few thousandths of an inch, the variation being shown greatly exaggerated. In laying this trench cover and frame the frame sections **23**, **25***a* and **26***a* are fitted to the first cover part **10***a* as described with reference to Figure 4, the fourth section being omitted as the second cover part **10***b* seats directly on the cover part **10***a* as shown in Figure 6. The side frame sections **25***b*, **26***b* are then, together with their cover part **10***b*, brought up to the ends of the frame sections **25***a*, **26***a*, and cover part **10***a* respectively the frame sections **25***a* and **25***b* and **26***a* and **26***b* being adapted to their respective cover parts and at the same time to each other by virtue of the bolt and elongated bolt-hole connection already described with reference to Figure 4. The same procedure is adopted in fitting the frame sections **25***c* and **26***c* and subsequent sections, the frame sections always being ground off to the exact length of their cover parts or made up to that length by the hard lead or other keying metal poured into the chambers **30**. It will be noted that in effect the frame sections are built up around their respective cover parts and need not be precisely accurately in line with each other. The final end frame section is of the same form as the section **24** shown in Figures 2 and 4.

In the drawings the covers appear to be precisely rectangular, but in fact, they are not, as it is essential, in order to facilitate easy removal, that one end of the cover is fractionally wider than the other. This is illustrated diagrammatically in Figure 7 where it will be observed the end R of the cover, which has to be raised slightly to break the joint when it is desired to move the cover, is fractionally wider than the other end L so that when once the cover has been freed from its frame it can be lifted and drawn off longitudinally over the end of the frame. The difference in width is of course only slight and in practice it has been found that in a cover 30 inches long a difference of only $\frac{1}{32}$ of an inch suffices.

A suitable tool or accessory device may be employed for raising the end of the cover to break the joint between it and the frame.

I claim:

1. A cast metal cover and frame construction for manholes, comprising a rectangular frame having horizontally projecting parts forming a cover-seating surface and a rectangular cover seating upon said horizontally projecting parts and having at one end an integral part projecting downwardly and outwardly from the cover surface beneath a corresponding downwardly and inwardly recessed part of the frame whereby undesired rocking or lifting of the cover is prevented.

2. A cast metal cover and frame construction for manholes, comprising a frame having horizontally projecting parts forming a cover-seating surface and a cover seating upon said horizontally projecting parts, one pair of opposite sides at least of said cover and frame being inclined in a similar sense so that a section through the cover perpendicular to said opposite sides is roughly in the form of a parallelogram, the angles of which are not right angles.

3. A cast metal cover and frame construction for manholes, comprising a frame having horizontally projecting parts forming a cover-seating surface and a cover seating upon said horizontally projecting parts, one pair of opposite sides at least of said cover and frame being inclined in a similar sense and each side of said pair consisting of two meeting plane surfaces disposed at different inclinations, the lower of which has a greater inclination to the vertical than the upper, so that a section through the cover perpendicular to said opposite sides is roughly in the form of a parallelogram, the angles of which are not right angles.

4. A cast metal cover and frame construction for manholes, comprising a frame of substantially inverted U section having horizontally projecting parts constituting part of the inverted U and forming a cover-seating surface and a cover seating upon said horizontally projecting parts and having a part projecting beneath a part of the frame whereby undesired rocking or lifting of the cover is prevented.

5. A cast metal cover and frame construction for manholes according to claim 1 and having the frame constructed in sections secured together adjacent the corners of the frame, comprising means to modify the alignment of the sections of the frame, one relative to the other, upon assembly.

6. A cast metal cover and frame construction for manholes according to claim 1 and having the frame constructed in sections, each of channel section with cross webs near its ends having elongated bolt holes therein, and bolts passing through said elongated bolt holes to secure the sections together while enabling them to be fitted up to the cover.

7. A cast metal cover and frame construction for manholes, comprising a frame having horizontally projecting parts forming a cover-seating surface and a cover seating upon said horizontally projecting parts, one end of said frame and cover being fractionally wider than the other.

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