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(54) **Manhole repairs**

(57) A liner for use in repairing brick work holes, comprising a plurality of side plates (1) and an equal number of connector plates (2). The connector plates (2) are adjustably engageable with respect to the side plates (1), so that the outer perimeter of the liner can be adjusted after insertion into the brick work hole. The liner also has one or more support flanges (3) to facilitate fitting. The invention also comprises a method of repairing man holes using a liner.

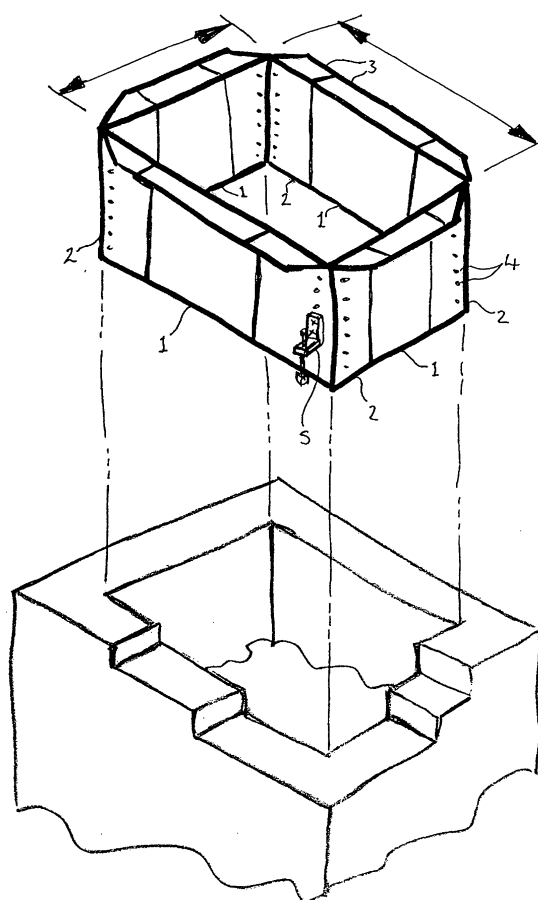


Figure 1.

Description

[0001] The present invention relates to linings for repairing manholes or similar holes for example, access or inspection chambers, and methods of repairing manholes using such linings.

[0002] Heavy vehicles driving over and around manholes can cause substantial damage and cause them to collapse. Manholes are usually constructed in brickwork and the damage is usually limited to the upper courses of brickwork. Manholes that have collapsed due to vehicles usually are located in roads, loading bays, parking lots, etc. The unuseable areas around such damaged manholes cause traffic jams, delays and general inconvenience, as well as presenting a safety hazard.

[0003] Conventionally, collapsed manholes are repaired by cutting out the damaged bricks and mortar, removing dust and debris and rebuilding the brickwork using new bricks and fresh mortar followed by repositioning a manhole cover and frame and repairing the surrounding road surface as necessary, for example by levelling and making good the surrounding, followed by recovering with tarmac. Brickwork repairs require a considerable amount of curing time to achieve sufficient strength to support vehicles. If the manhole area is reopened to traffic or otherwise stressed too soon after the brickwork repairs, the manhole may collapse again. Sometimes a high standard of repair is not achieved due to lack of skills or pressure to complete the works too quickly.

[0004] Collapsed manholes can be very costly to business and the economy. The longer the time that the area around the manhole is out of use, the higher the cost. The need to use skilled labour for the brickwork repairs also increases the high repair costs. Weather conditions can also delay brickwork repairs.

[0005] It is therefore an object of the present invention to provide improvements in the repair of manholes, in order to reduce the repair times, costs and improve reliability of repairs.

[0006] According to a first aspect of the invention, there is provided a liner for use in repairing brickwork holes, comprising a plurality of side plates and an equal number of connector plates, wherein the connector plates are adjustably engageable with respect to the side plates thereby allowing adjustment of the outer perimeter of the liner, the liner further comprising one or more support flanges. The adjustability of the outer perimeter of the liner has the advantage that the liner can be inserted into a manhole and then expanded to the right size to line the manhole walls as appropriate.

[0007] In one embodiment, the connector plates are slideably engageable with the side plates, thereby allowing initial assembly of the liner, and adjustment of the outer perimeter of the liner. For example, the connector plates may be formed so as to be capable of sliding in and out of guide channels of the side plates, or vice versa. Such guide channels can be of any kind capable of allowing

sliding engagement between the plates, and may for example be formed by bending back all or part of an edge of a plate to form a narrow channel. Alternatively, a plate may be formed with an elongated slot or slots, to which another plate is attachable by means of a shouldered pin or similar, thereby allowing slideable engagement between plates.

[0008] Alternatively, the connector plates and side plates may be engageable by any other means permitting adjustment of the outer perimeter of the layer, for example hinges allowing relative movement between plates, moveable bolts, etc.

[0009] In one embodiment, the liner is rectangular and comprises four flat rectangular side plates, connected by four right-angled connector plates, wherein the side plates comprise flat rectangular plates and the connector plates comprise right-angled corner plates, thereby forming a rectangular outer perimeter of the liner.

[0010] After the manhole walls are lined, concrete, e.g. quick-setting concrete, can be poured behind the liner, into the void or voids above the remaining sound brickwork, in order to replace the defective masonry removed previously. If the liner is to be used with concrete, the side plates and connector plates must be suitable to retain concrete behind the liner and prevent leaks into the chamber. Gaps at edges or joints of the liner can be sealed, e.g. with foam tape, before the concrete is applied.

[0011] The liner has facilities to attach support jacks, as required, to act as adjustable support flanges and thereby facilitate levelling of the lining and to give sufficient strength to support the manhole cover and frame prior to the concrete setting. The liner plates may also have integral support flanges, for example, lip flanges at an edge.

[0012] The liner of the present invention has sufficient strength to support a repositioned manhole cover and frame and thus allow finish tarmac to be applied before the concrete is fully set. This reduces the length of time for which traffic must be stopped and consequently reduces costs. The material costs and labour costs may also be reduced, compared to the cost of repairing the brickwork itself.

[0013] A further advantage is that the repair can be carried out by semi-skilled operatives as a bricklayer is no longer required. There is also less likelihood of poor workmanship and premature re-collapse of the manhole, when using the liner according to the present invention.

[0014] The invention also comprises a method of repairing manholes comprising, inserting a liner as described above into the manhole, adjusting the liner to fit the manhole, optionally fitting and adjusting one or more jacks to rest on existing brickwork, and pouring concrete behind the liner into voids above the existing brickwork.

[0015] The present invention may be put into practice in a number of ways and some of these will be described here in further detail with reference to the following figures, in which:

Figure 1 shows an isometric view of a liner according to the present invention, before insertion into a partially collapsed manhole.

Figure 2 shows a plan view (i.e. a view of a plane perpendicular to the axis of the manhole) of a liner according to the present invention, after insertion into a manhole, secured temporarily by diagonal struts.

Figure 3 shows an isometric view of one side plate and one connector plate, before engagement.

[0016] Referring to figure 1, the liner consists of four preformed side plates (1) and four preformed connector plates (2) having lip flanges (3) to support the manhole cover and frame (not shown). The connector plates are provided with rows of holes (4) adjacent to the bend for securing screw jacks (5) in various positions. Simple screw jacks (5) are proposed to support the liner and could be metal angles with a threaded hole to take an adjusting screw as shown. The side plates and connector plates are shown with lip flanges (3) which can support the liner by resting on the top of sound brickwork.

[0017] The holes (4) could be square holes to allow the jacks to be secured with coach screws and wing nuts which removes the need for spanners on site. The holes could be pre-covered with tape to prevent concrete leaking from the redundant holes and only the holes used for securing bolts opened out.

[0018] Side plates would be manufactured in various lengths to suit various manhole sizes. They are formed in such a way as to allow the connector plates to slide horizontally when fitted to cater for various sizes of manhole i.e. fine adjustments as indicated by arrows in Figure 1. It is proposed that all corner sections are identical to reduce inventories, but need not be so.

[0019] The side plates and connector plates should be rust proof and could be made of stainless steel, although any rigid material suitable for use in the environment of the manhole could be used, for example, other metals, or plastics, etc. If screw jack supports are to be encased in concrete they do not need to be rust proof.

[0020] Figure 2 shows a plan view of the liner of Figure 1 directly after fitting into a manhole. Reusable adjustable struts (11) can be used to secure the lining in place directly after fitting, and could be removed after concrete has set sufficiently. Struts having wedge shaped heads which can be applied diagonally across the manhole, as shown in Figure 2, are desirable if the manhole is rectangular, but any strut arrangement which secures the lining in place against the remaining walls of the manhole would be suitable.

[0021] Figure 3 shows one example of a side plate (1) which is slideably engageable with connector plate (2), by means of guide channels of the side plate (21). The guide channels are formed by bending back the top and bottom edged of the side plate to form narrow channels, into which the connector plates can slide.

[0022] The method for fitting a liner may comprise the following steps:

1) Prepare manhole - inspect cover and frame. If satisfactory, set aside for reuse. Remove loose bricks and debris etc and clean up manhole.

2) Assemble the liner as figure 1. Adjust length and width to suit. Fit screw jack supports in suitable positions. Fit foam strips to top of flanges and around sides/ends of shutters to prevent concrete leaks. Place in position and adjust for levels. Fit diagonal struts to secure. Fit a cover and frame, which may be either new or salvaged from (1) above. Secure with clips/ties.

3) Infill void with rapid set concrete (either mixed on site or from premixed bags). Allow to set for the minimum required time, which may be as little as 20 minutes, depending on the type of concrete used.

4) Remove struts, re-tarmac road surface.

[0023] The liner of the invention can have different shapes and sizes when assembled, to fit different shapes and sizes of manholes or other utility access holes which may suffer from the problems mentioned above. For example, the liner may consist of four straight side plates and four right-angled connector plates, the assembled liner thereby being rectangular or square in plan view, as shown in figure 1. Alternatively, the liner may consist of three straight side plates and three connector plates, the assembled liner thereby being triangular in plan view. In a further alternative arrangement, the liner may consist of curved side plates and connector plates of a suitable shape (for example, short and straight, or short and angled, or curved) to enable the liner to fit holes which are circular or otherwise curved in plan view.

[0024] The liner of the present invention can be easily used in manholes or access holes of any size. For example, an assembled liner may be of a size suitable for use in a 150mm by 150mm inspection chamber. Alternatively, an assembled liner may be of a size suitable for use in a manhole. Some standard manhole sizes are 450mm by 450mm, 1200mm by 600mm and 4000mm by 4000mm. An assembled liner may alternatively be of a size suitable for use in inspection chambers, manholes, etc, which are larger or smaller than any of these example sizes. Due to the adjustability of the outer perimeter of the liner according to the invention, any one liner may be suitable for use in a range of manhole sizes, including non-standard sizes.

[0025] Large numbers of identical right-angled connector plates and side plates suitable for standard manhole side lengths can be manufactured and stored until required for use. The cost per plate can thereby be minimised. When a manhole requires lining, side plates of approximately suitable length can be selected, and the liner can be assembled on site and then adjusted to fit the manhole. A kit comprising additional items (screw jacks, bags of ready-mixed concrete, etc) and tools (struts, etc) can be stored until required for use.

[0026] The liner of the invention can also be used to repair any collapsed hole, for example, drainage or in-

spection chambers. The liner of the invention is particularly useful for repairing collapsed brickwork, but can also be used for collapsed holes lined with other materials.

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Claims

1. A liner for use in repairing brickwork holes, comprising a plurality of side plates and an equal number of connector plates; 10
 wherein the connector plates are adjustably engageable with respect to the side plates thereby allowing adjustment of the outer perimeter of the liner;
 the liner further comprising one or more support flanges. 15
2. A liner according to claim 1, wherein the connector plates are slideably engageable with respect to the side plates. 20
3. A liner according to claim 1 or 2 wherein one or more of the support flanges are movable in relation to the liner.
4. A liner according to any preceding claim, wherein the one or more support flanges comprise a lip flange on the perimeter of the liner. 25
5. A liner according to any preceding claim, having four side plates and four connector plates, wherein the side plates comprise flat rectangular plates and the connector plates comprise right-angled corner plates, thereby forming a rectangular outer perimeter of the liner. 30
6. A liner according to any preceding claim, wherein the side plates and connector plates comprise metal, for example iron or steel. 35
7. A liner according to any preceding claim, wherein the side plates and connector plates comprise plastic or fibre glass. 40
8. A method of repairing manholes comprising;
 inserting a liner according to any preceding claim into the manhole; 45
 adjusting the liner to fit the manhole;
 optionally moving one or more support flange to rest on existing brickwork; and
 pouring concrete behind the liner into voids above the existing brickwork. 50

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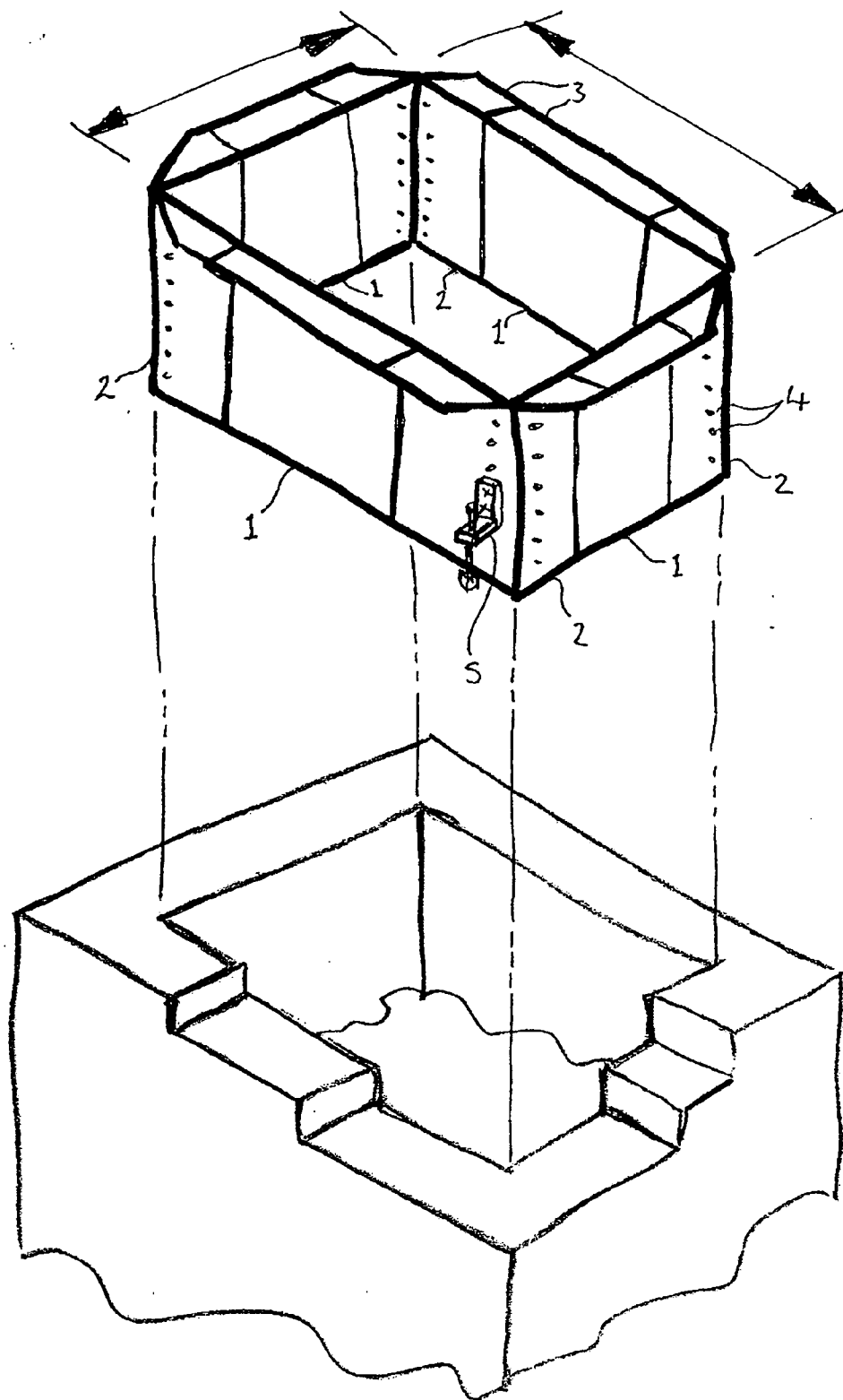


Figure 1.

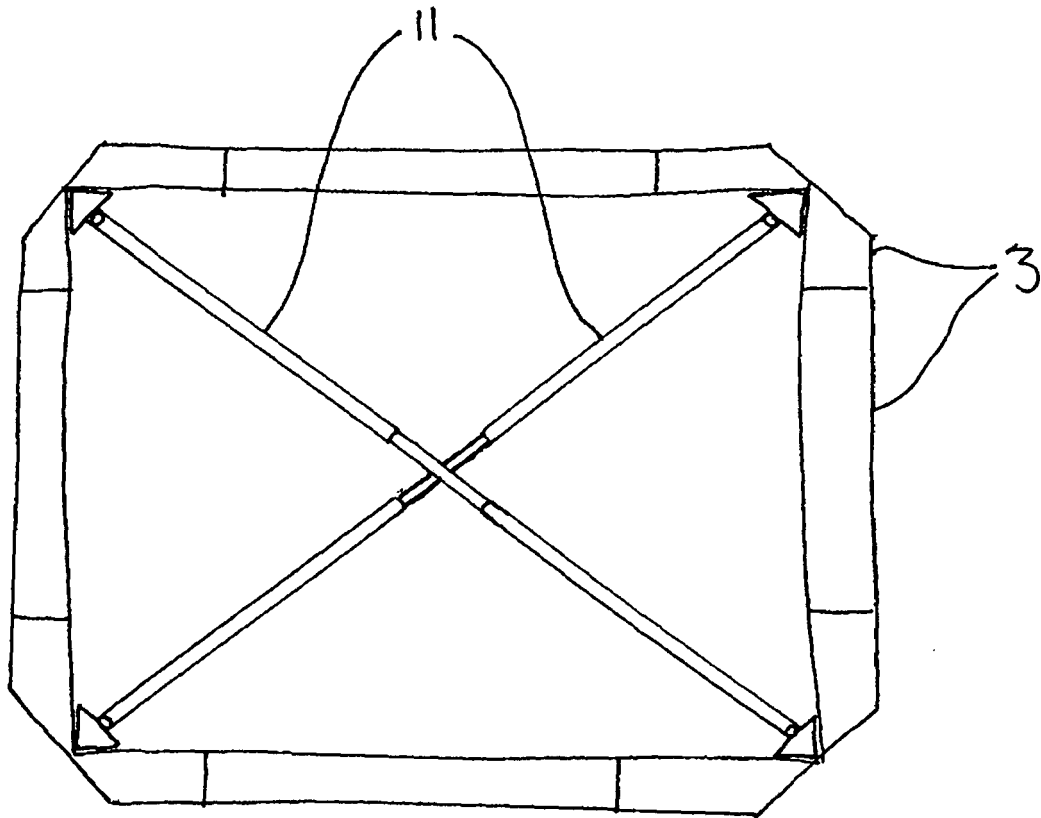


Figure 2.

