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(54) An access assembly

(57) An access assembly comprises:
a frame including an upstanding wall defining a boundary having an aperture formed therein;
one or more seatings, that are secured in the aperture, for supporting one or more cover plates; and
one or more cover plates that are receivable in the aperture supported on one or more said seatings so as at least partially to close off the aperture.

The access assembly includes one or more shaft supports supporting a moveable shaft, the moveable shaft including one or more shaft formations and at least a first said cover plate including one or more cover or frame formations, respective said shaft and cover or frame formations being mutually engageable, when the shaft occupies a first position to which it is moveable, so as to retain at least a first said cover plate relative to the frame; and being disengaged from one another when the shaft occupies a second position to which it is moveable so as to permit removal of at least the first cover plate from the frame.

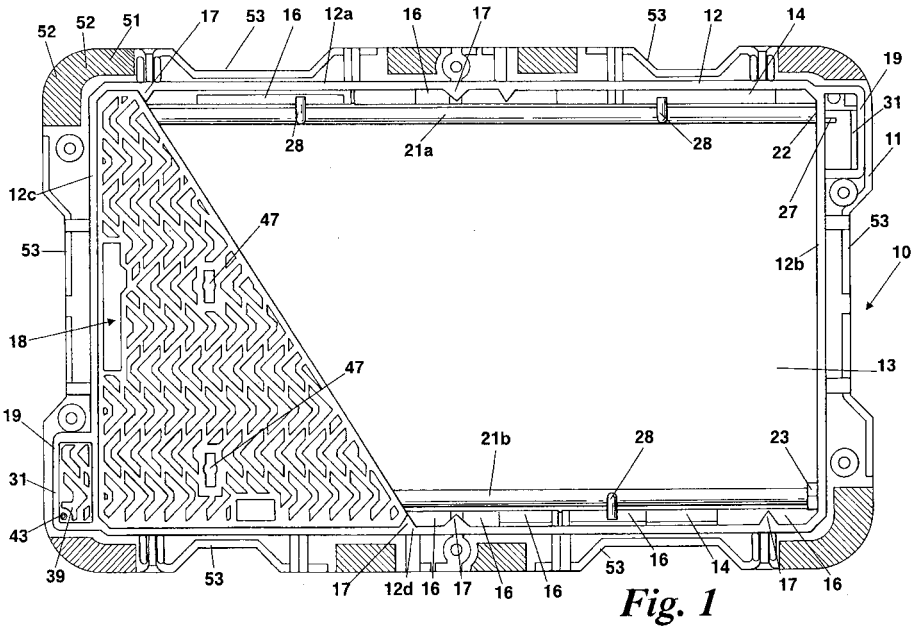

Fig. 1

EP 1 808 535 A2

Description

[0001] This invention relates to an access assembly. In particular, but not exclusively, the invention concerns an access assembly in the form of a manhole assembly comprising a frame defining an aperture and one or more covers that are removably receivable in the frame selectively to open and close the aperture.

[0002] The invention also relates to other access assemblies such as gratings and ventilation cover assemblies.

[0003] In particular in the field of manhole assemblies, numerous designs have been proposed that provide releasable securing of one or more cover plates in an aperture defined by a frame including an upstanding wall.

[0004] In one well known arrangement the upstanding wall is rectangular when viewed in plan. Secured to the upstanding wall projecting into the aperture that it defines are several seatings, on which a plurality of rigid, generally imperforate cover plates are supported so as to close off the aperture.

[0005] In such an arrangement the cover plates usually are generally triangular, triangular plates being associated with well known advantages in use. It is possible to close off a square aperture using two right angled, triangular cover plates juxtaposed along their hypotenuses. It is also known to provide four of the right angled triangular cover plates arranged seriatim with pairs of the cover plates juxtaposed along their hypotenuses, for the purpose of closing off a rectangular aperture defined by the upstanding wall. Such an arrangement is sometimes known in the art as a "double". It is also known to provide a so-called triple, for the purpose of closing off a longer rectangle than that forming the frame of a double. As the name implies, in a "triple" there are six of the cover plates (ie. three pairs) arranged seriatim. The invention relates to all such types of access assembly.

[0006] Various means have in the past been proposed for securing the cover plates in place.

[0007] Securing the cover plates is desirable firstly in order to discourage their theft.

[0008] In this regard, the cover plates and the frame typically are cast from iron or are occasionally made from steel and therefore have a scrap value.

[0009] It is further desirable to secure the cover plates in order to discourage vandalism and other modes of interfering with the manhole assembly; and (arguably most importantly) to protect items lying in use beneath the cover plates in a subterranean chamber such as an inspection chamber, drain or equipment housing.

[0010] One particular example of this need arises in the case of manhole assemblies used to overlie inspection and/or equipment chambers containing telecommunications cables and equipment. Such items are of high value and in some cases are easily damaged.

[0011] It has therefore been proposed in the past for the upstanding wall of the manhole frame to be perforated in various locations at which shoot bolts may, on installation, pass through the upstanding wall for the purpose of securing the covers in place.

[0012] The shoot bolts are inserted via hollow housings formed on the exterior of the upstanding wall. Each of the housings is open on an upper side, is cuboidal in shape and in practice is cast integrally with or welded to the upstanding wall. The latter is perforated in the vicinity of each housing.

[0013] The shank of a generally cylindrical shoot bolt may be passed through each perforation after installation of the covers. The covers each include a downwardly projecting eye through which, on insertion as aforesaid, the shank of such a shoot bolt may pass. This causes retention of the cover in question relative to the frame.

[0014] Part of the shoot bolt remains within the associated hollow housing. This portion of the shoot bolt is perforated so as to receive passing therethrough the hook of a padlock. On locking of the padlock subsequent removal of the shoot bolt is prevented. This is because the padlock is too broad to pass through the aperture in the upstanding wall, thereby preventing removal of the shoot bolt by continuing its movement in its insertion direction; and because the padlock is only a little smaller than the volume of the housing such as to prevent withdrawal of the shoot bolt in the opposite direction. In practice the shoot bolts may be formed with flanges or lugs adjacent their perforated portions. These features prevent the shoot bolts from passing all the way through the perforations even once the padlocks have been removed.

[0015] The open sides of the housings are closable by means of further, small cover plates that typically are fixed in position by means of screws or other fastenings.

[0016] Although such an arrangement provides good security, it suffers from several other disadvantages.

[0017] The existing security arrangement requires at least one padlock for securing each cover plate in position. Since the objective of using the padlocks is to enhance security of the installation, the padlocks must themselves be high security items. Such padlocks are expensive. In the case of a rectangular manhole assembly including four cover plates the need to provide four such padlocks means that the cost of the padlocks typically exceeds the cost of the frame and the covers (which are manufactured comparatively cheaply when cast from iron). This problem is even more acute when the access assembly includes greater numbers of the covers.

[0018] Furthermore on opening or closing such a manhole it is necessary to release each of the small covers (on opening of the manhole) and/or replace them (on closing of the manhole). This is a time-consuming exercise since this may require the opening of four, six or even (in some applications) eight of the small cover plates. Since the small cover plates usually are secured with screws (especially so-called "security" screws) the removal and replacement of the small cover plates is troublesome.

[0019] In addition, the need to use large numbers of

padlocks in turn requires the management of a large number of keys. In the case of high security padlocks, there may be little or no commonality of key patterns from one padlock to the next. Therefore it is necessary for the operator wishing to open the manhole to carry with him a large number of keys. Failure to bring even one correct key to a manhole site can cause very considerable wastage of time.

[0020] Yet a further problem associated with the existing, high security manhole cover designs is simply that the proliferation of components (padlocks, keys, covers for the external housings and screws for securing such covers) increases the risk of loss of components. Aside from the expense that such loss entails, component loss can lead to breaches of regulations, such as those concerning health and safety.

[0021] There is therefore a need for an access assembly, especially a manhole assembly, that eliminates or at least ameliorates one or more of the disadvantages of the prior art arrangements.

[0022] According to a first aspect of the invention there is provided an access assembly comprising:

a frame including an upstanding wall defining at least part of a boundary having an aperture formed therein;

one or more seatings, that are secured in the aperture, for supporting one or more cover plates; and

one or more cover plates that are receivable in the aperture supported on one or more said seatings so as at least partially to close off the aperture, wherein the access assembly includes one or more shaft supports supporting one or more moveable shafts, the or each moveable shaft including one or more shaft formations and at least a first said cover plate including one or more cover formations or the frame including one or more frame formations, respective said shaft and cover or frame formations being mutually engageable, when the or each shaft occupies a first position to which it is moveable, so as to retain at least a first said cover plate relative to the frame; and being disengaged from one another when the shaft occupies a second position to which it is moveable so as to permit removal of at least the first cover plate from the frame, the shaft extending through the upstanding wall in at least one perforation location so as to protrude on both sides of the upstanding wall.

[0023] Such an arrangement advantageously provides good security for manhole covers. Additionally it provides the possibility, described in more detail below, to reduce the numbers of padlocks and other components needed to secure a plurality of covers in place in a manhole frame.

[0024] Preferably the shaft is rotatable relative to the frame; and the first position of the shaft is a first rotational position thereof and the second position of the shaft is a second rotational position thereof.

[0025] The use of a rotatable shaft is advantageous since on moving a rotatable shaft between its first and second positions there is no need for the extent of protrusion of the shaft from the frame to alter to any appreciable extent.

[0026] Conveniently the shaft supports include one or more journal bearings rotatably supporting the shaft relative to the frame. More specifically, the journal bearings preferably are constituted as a pair defined as mutually spaced journal recesses formed in the upstanding wall. The dimensions and locations of the journal recesses preferably are such as rotatably to support the shaft extending generally parallel to a part of the said upstanding wall. Even more preferably the shaft supports are each formed in or secured to the upstanding wall.

[0027] This arrangement advantageously allows use of the material of the upstanding wall for supporting the shaft, thereby economising on material used.

[0028] Other arrangements of journal bearing, especially those which do not result in alignment of the shaft generally parallel to part of the upstanding wall, are possible.

[0029] In a particularly preferred embodiment the upstanding wall of the access assembly is rectangular, when viewed in plan, so as to define four sides. In such an arrangement the journal recesses preferably are formed respectively in opposite said sides of the upstanding wall, whereby the shaft readily is located parallel to one of the sides.

[0030] In one optional arrangement according to the invention the shaft is longitudinally moveable relative to the frame; the first position of the shaft is a first position of longitudinal movement of the shaft; and the second position of the shaft is a second position of longitudinal movement of the shaft. This arrangement is a useful alternative to one in which the shaft is rotatable between its first and second positions.

[0031] Conveniently the or each pair of mutually engageable shaft and cover formations includes a hook secured to one of the first cover and the shaft; and a recess, in which the hook is received when the shaft occupies its first position, secured to or formed in the other of the said cover and the first shaft. Such an arrangement is advantageously robust, simple and secure in use.

[0032] In preferred embodiments of the invention the access assembly includes a lock for locking the shaft at least in its first position retaining the first cover relative to the frame.

[0033] In one embodiment of the invention the hook extends in a direction that is skewed (especially perpendicular) relative to the longitudinal axis of the shaft. Such an arrangement is particularly suitable when the shaft is rotatably mounted for movement between its first and second positions.

[0034] In an alternative arrangement (that is more suitable when the shaft is moveable longitudinally between its first and second positions) the hook extends generally

parallel to the shaft.

[0035] The incorporation into the assembly of features allowing rotation of the shaft between its first and second positions does not necessarily preclude the incorporation of features permitting longitudinal movement of the shaft, and vice-versa.

[0036] In another arrangement according to the invention one or more shaft supports is integral with or secured to one of the cover plates.

[0037] Such an arrangement potentially offers the advantage of carrying one or more shafts attached to and supported by a cover plate. This makes it easier to provide the security features of the invention as an easily retroactively-fitted kit. Moreover the ability to carry the shaft and a cover plate together facilitates handling of the components of the invention on site, and also permits ready removal of the shaft, with the cover, from an access aperture. This in turn means that the open area of the access assembly is maximised since the shaft(s) which would otherwise encroach into the open area are removable together with the cover plates.

[0038] When the access assembly is so configured it is preferable that it includes one or more frame formations and the mutually engageable shaft and frame formations include a hook secured to one of the shaft and the frame, and a recess, in which the hook is received when the shaft occupies its first position, secured to or formed in the other of the shaft and the frame.

[0039] The incorporation of frame formations allows engagement of the or each shaft supported in the frame with the frame of the access assembly, thereby securing the cover plate(s) in place.

[0040] In further refinements of the invention one or more members may be secured to respectively the frame and/or the cover member(s) so as to protrude therefrom. Such members may be located so as to be engageable by the shaft(s) on bending thereof, such that bending of the shaft is limited. This in turn makes the access assembly more resistant, than prior art designs, to attack.

[0041] When the access assembly of the invention includes a plurality of housings as aforesaid in accordance with the invention these conveniently may be located on one and the same side of the assembly. Such an arrangement assists a user of the assembly of the invention to operate the mechanisms needed to permit releasing and securing of the cover plates.

[0042] Regardless of the number and location of the housings the or each of them may optionally include formed or secured therein one or more stop members with which the actuator member is engageable so as to limit movement of the shaft.

[0043] Such an arrangement may be advantageously employed to ensure that the actuator member does not drop deep into the housing on removal of any lock from the housing. This in turn assures that the actuator member is always presented at a convenient height for grasping and turning by a user.

[0044] Preferably the or each housing includes removably securable thereto a housing cover member. One or more of the housing cover members may include protruding therefrom one or more housing cover protuberances that are each engageable with the actuator of a said shaft.

[0045] The housing cover protuberances may advantageously act, on securing of one of the housing covers to an associated housing, to retain the actuator member and hence the shaft in a chosen location. Thus the shaft may be secured against unauthorised movement, and the assembly thereby exhibits an acceptable degree of resistance to unauthorised opening, even if inadvertently the lock is not fitted.

[0046] Such a lock is in a preferred embodiment of the invention a removable lock that is securable to a said actuator member and that when installed overlies and at least partially obscures the actuator member within a said housing.

[0047] Additionally or alternatively the lock when installed engages one or more of the housings to prevent or limit movement of the actuator member.

[0048] The foregoing features advantageously make use of the strength and hardness of (high-security) locks, such as certain types of padlock, to protect the actuator member against attack and/or unauthorised use.

[0049] Yet another variant on the principles of the invention involves the use of one or more lengthwise-extendible and retractible shafts.

[0050] Such a shaft when used preferably includes a retainer for retaining the shaft in at least its extended condition.

[0051] The use of an extendible and retractible shaft is beneficial for example when the shaft is supported on one of the cover plates.

[0052] In any of the embodiments of the invention the shaft or shafts may include encircling sleeves at locations corresponding in use to the locations at which each sleeve is supported on the frame or a cover plate.

[0053] The sleeves advantageously act as bearing inserts and thereby aid movement of each shaft between its first and second positions. The sleeves additionally inhibit corrosion of the shaft and supports in their regions of mutual engagement, and help to prevent corrosion products from inhibiting movement of the shafts.

[0054] Preferably the location at which the shaft perforates the upstanding wall generally coincides with that of a first said journal recess, whereby the first journal recess is or includes a through-going aperture perforating the upstanding wall.

[0055] It is also preferable that the housing includes one or more housing walls at least part of at least one of which is defined by the upstanding wall.

[0056] Preferably each journal recess perforates the upstanding wall.

[0057] For reasons explained in more detail below, it is advantageous for a minor part of the shaft to extend through the upstanding wall to protrude on the exterior side thereof, although the major part of the shaft lies with-

in the boundary defined by the upstanding wall in use of the assembly of the invention.

[0058] Conveniently the protruding portion of the shaft includes secured thereto an actuator member for effecting movement of the shaft between its first and second positions.

[0059] The inclusion of such an actuator member, that lies beyond the boundary defined by the upstanding wall, means that it is possible to move the shaft between its first and second positions without having to release, lift or loosen the cover plates of the access assembly.

[0060] Conveniently the lock is capable of acting to limit the movement of the shaft in the vicinity of its protruding portion.

[0061] More specifically, the lock includes one or more parts that are engageable with the actuator member to limit the movement of the shaft.

[0062] Thus for a further reason the provision of a portion of the shaft protruding externally of the upstanding wall is advantageous.

[0063] Preferably the assembly includes a housing secured thereto so as to surround the portion of the shaft protruding from the upstanding wall.

[0064] Such a housing protects the protruding part of the shaft against damage and dirt ingress.

[0065] Conveniently the housing includes an opening in at least one side for providing access to the protruding portion; and the assembly includes an openable cover for selectively closing and unblocking the opening.

[0066] The provision of such a cover advantageously limits contamination of the interior of the housing and the axis assembly by dirt and other contaminants. Additionally it closes off the opening in the housing so as to avoid safety hazards.

[0067] In a particularly preferred embodiment of the invention the access assembly includes a pair of the shafts respectively supported at mutually spaced locations in the assembly such that the shaft formations of the respective shafts are engageable with cover formations of respective cover plates that are receivable in the aperture formed in the boundary.

[0068] Thus it is possible for example to provide two shafts extending along mutually opposite sides of a rectangular upstanding wall, with each of the shafts being engageable to secure a respective set of the cover plates.

[0069] In alternative arrangements, conceivably the shafts could be arranged extending eg. in mutually orthogonal directions.

[0070] Regardless of the precise arrangement of the shafts, preferably the or each shaft includes a plurality of shaft formations for respectively engaging the cover formations of a corresponding plurality of cover plates.

[0071] In such an arrangement it is thus possible for a single shaft to engage and secure a plurality of cover plates.

[0072] In one embodiment of the invention an in use upper surface of the or each cover plate is generally imperforate. This is expected to be the more common embodiment of the invention. It is however within the scope of the invention to include perforations, such as grating apertures, in the upper surface of one or more of the cover plates.

[0073] Conveniently the access assembly includes a flange extending outwardly of the periphery of the upstanding wall. Preferably the width of the flange varies from place to place about the periphery of the upstanding wall.

[0074] In either of the two foregoing cases the flange may preferably include formed thereon one or more protrusions and/or recesses for stiffening the assembly and for aiding keying of the flange in a bedding medium.

[0075] Such protrusions and/or recesses may be formed on an in-use upper surface and/or an in-use lower surface of the flange.

[0076] The foregoing features advantageously allow the flange efficiently to anchor the frame of the assembly in a medium such as the ground, whilst minimising the amount of material needed in construction of the assembly. The protrusions and/or recesses additionally stiffen the frame at the same time as providing a keying function.

[0077] There now follows a description of preferred embodiments of the invention, by way of non-limiting example, with reference being made to the accompanying drawings in which:

Figure 1 is of a plan view from above of one form of access assembly, according to the invention, with certain parts omitted for clarity of illustration;

Figure 2 is a perspective partial view from underneath of part of the Figure 1 assembly;

Figure 3 shows a further part of the Figure 1 assembly, with a housing cover thereof removed;

Figure 4 shows in perspective view some parts of the Figure 3 arrangement, with some other parts removed for clarity;

Figure 5 is a perspective view of part of the Figure 1 arrangement;

Figure 6 shows in perspective view a member protruding from a wall of the frame of an access assembly according to one variant of the invention;

Figure 7 shows in perspective view a member protruding downwardly from the underside of a cover plate forming part of an access assembly according to the invention; and

Figure 8 is a perspective view from above of a housing forming part of an access assembly according to the invention.

[0078] Referring to the drawings there is shown an access assembly according to the invention, in the form of a manhole frame and cover assembly 10, referred to herein as a *"manhole assembly 10"*.

[0079] Manhole assembly 10 includes a frame 11 that in the embodiments shown is generally rectangular in plan view.

[0080] Frame 11 is in the embodiments shown cast

from iron, especially so-called *"ductile iron"*.

[0081] Frame 11 could be manufactured from a range of materials, although metals are preferred by reason of their comparative cheapness for the strength and other physical properties that they exhibit.

[0082] Frame 11 includes an upstanding wall 12 that in the embodiment shown is rectangular when viewed in plan and substantially continuous. The sides of wall 12 extend generally parallel to the rectangular edges of frame 11. Wall 12 is upstanding a short distance from the edge of the frame 11.

[0083] Thus wall 12 defines the boundary of a generally rectangular aperture 13.

[0084] In the embodiment of Figure 1 the rectangular aperture is elongate, although this need not necessarily be so and the invention is equally applicable in the case of square or circular apertures, for example.

[0085] In the Figure 1 arrangement a respective ledge 14, defining an upwardly facing shoulder, extends along each major edge 12a, 12b of the thus defined rectangle.

[0086] Each ledge 14 is cast integrally with the remainder of the frame. The upwardly facing shoulder terminates at a level below the top edge of wall 12, which top edge is substantially rectilinear.

[0087] The ledge 14 is as illustrated slightly wider than the width of the wall, so as to protrude a short distant into the interior of aperture 13 when viewed in plan. Each ledge 14 includes defined thereon a series of seatings 16 that are in the embodiments shown spaced from one another by triangular protrusions 17 projecting towards the interior of the aperture 13 from the upstanding wall 12.

[0088] The seatings 16 are for supporting received within the boundary defined by the wall 12 a series of substantially but usually not entirely imperforate cover plates, of which one, 18 is shown in Figure 1 installed in the frame.

[0089] The cover plate 18 is shaped essentially as a right-angled triangle when viewed in plan, although as shown the sharp apices of the triangles have been blunted for reasons associated with the strength and safety of the cover plate 18 in use.

[0090] In practice a series of four of the cover plates would be used to close off the entire aperture 13, with respective pairs of the cover plates juxtaposed along their hypotenuses.

[0091] For this reason, the seatings 16 are of varying lengths that are determined by the parts of the cover plates 18 that are to be received in them.

[0092] In the Figure 1 arrangement three of the four cover plates are absent, in order to assist in illustration of the principles of the invention.

[0093] The depth of each cover plate 18, the height of the upstanding wall 12 and the position relative thereto of the upwardly facing shoulder defining the seatings 16 are such that when the cover plates are installed in the frame as exemplified by Figure 1, so as to be supported on the seatings 16, the upper surface of each cover plate 18 lies generally flush with the top edge of wall 12. Thus when the manhole frame 11 is buried in a medium such as the ground or the material of a roadway, that surrounds the upstanding wall 12, only the topmost edge of the upstanding wall, the cover plates 18 and a pair of housings 19 (described in more detail below) are visible to an observer.

[0094] The assembly 10 includes, in the embodiment shown, a series of four shaft supports of which two, labelled 22, are of a first type; and two, labelled 23, are of a second type.

[0095] One of each type of support is visible in Figure 1.

[0096] Figures 2 and 5 show the respective shaft support types 22, 23 in more detail.

[0097] The first shaft support type 22 is a circular aperture that perforates a shorter wall 12b of the manhole frame 11, adjacent a corner thereof. The nature of the first shaft support type 22 is to permit part of a shaft (indicated in general terms by numeral 21 herein and respectively on the opposite sides of the assembly 10 by numerals 21 a and 21b) to extend therethrough so that a portion of the shaft 21a visible in Figures 2 and 5 protrudes on the exterior of the part 12b of the upstanding wall 12 and the remainder, constituting a major part, of the shaft 21a remains "inboard" of the upstanding wall as shown.

[0098] Aligned with the first shaft support type 22 visible in Figure 1 at the opposite end of the frame 11 is a shaft support 23 of the second type.

[0099] This shaft support 23 is obscured by the cover 18 visible in Figure 1. As is evident from Figure 5, however, second shaft support type 23 is constituted as a collar 24 secured on the face of a shorter portion 12c of upstanding wall 12 opposite wall portion 12b, so as to define a recess 26 in or adjacent the aforesaid face of the wall portion 12c.

[0100] The recess 26 and the aperture defining first shaft support type 22 are of the same diameter and are so located relative to the remainder of frame 11 that shaft 21 a extends between the shaft supports 22, 23 below the top edge of wall 12 and parallel to the wall portion 12a.

[0101] Shaft 21 a is generally cylindrical and of a smaller diameter than either the aperture represented by first shaft support type 22 or the recess 26 formed in collar 24, whereby shaft 21a is rotatably journalled at either end, with a portion protruding through wall portion 12b at one end of the frame 11.

[0102] A similar shaft 21b is journalled at either end in a similar pair of shaft supports 22, 23, so as to extend parallel to the wall portion 12d of upstanding wall 12, on the opposite side of frame 11 to that adjacent which shaft 21 a lies.

[0103] As is apparent from Figure 1, the second rotatable shaft 21b is journalled adjacent wall portion 12b by a shaft support of the second type 23. At the opposite end of shaft 21b (obscured by cover plate 18 in Figure 1) there is formed a shaft support of the first type (ie. of the same design as shaft support 22), such that a portion of shaft 21b protrudes through upstanding wall portion

12c at the opposite end of frame 11 to that at which visible protruding portion 27 of shaft 21 a protrudes.

[0104] By reason of the shafts 21a, 21b extending along opposite, elongate sides of the interior of aperture 13, the protruding portion of shaft 21b protrudes through wall portion 12c at the diagonally opposite corner of frame 11 to that of protruding portion 27 that is visible in Figure 1.

[0105] Each shaft 21a, 21b has formed protruding from its exterior surface at intervals along its length a series of shaft formations in the form of hooks 28, the free ends of which extend perpendicular to the longitudinal axis of the adjacent shaft 21a, 21b or at another angle thereto.

[0106] As best seen in Figure 2, each hook 28 is secured to the exterior of the associated shaft 21 a or 21b (eg. by welding) such that on rotation of the associated shaft 21 a, 21b in its journals represented by supports 22, 23 the hook rotates about the same axis as that of the associated shaft 21 a, 21b.

[0107] Thus the shaft is moveable from a first position, as illustrated in the drawings, in which the stem of each hook secured to the shaft extends initially vertically, and the free end of the hook 28 (that is cranked relative to the stem) extends horizontally; to a second position in which the stem extends horizontally and the free end extends substantially vertically.

[0108] The underside of each cover plate 18 includes a downwardly extending eye 29 (Figure 2) secured to or formed integrally with the cover plate underside.

[0109] The location and dimensions of the eye 29 and the aperture formed therein are such that when the cover plate 18 is supported in the frame 11 on the appropriate seatings 16, the locus of the free end of a said hook 28 moving between the second and first positions of the associated shafts 21a, 21b intersects approximately the centre of the aperture in the eye.

[0110] Thus it is possible on rotating a said shaft 21a, 21b from its second to its first position to cause a said hook to enter into the aperture defined in an eye 29, as best shown in Figure 2.

[0111] When the cover 18 and a shaft 21a, 21b are so configured, it is not possible to lift the cover upwardly out of the frame since the lifting force is reacted via the eye 29 through the inserted hook 28 to the shaft 21a / 21b. The latter is journalled at either end in the shaft supports 22, 23 such that the frame 11 then reacts the lifting force to prevent lifting of the cover 18.

[0112] The spacings of the hooks 28 along the length of each shaft 21 a, 21b are such as to permit locking by rotation of a single said shaft 21a, 21b of two (or more) of the cover plates received in the frame 11 on the seatings 16 in the aforesaid manner. Thus the eye 29 of each cover plate 18 defines a cover formation that is mutually engageable with a shaft formation in the form of a hook 28 when the shaft occupies its first position of movement, so as to prevent unwanted removal of the cover plate 18 from the frame 11. However, when it is desired to release the cover plates from the frame it is possible to rotate the shaft 21a / 21b to its second position of movement, at which the hooks 28 disengage from the eyes (cover formations) 29 to allow free lifting of the cover plates 18 from the frame 11.

[0113] As an alternative to using rotatable shafts 21a, 21b as shown, it is possible to employ similar shafts that are instead slideable longitudinally relative to the remainder of the assembly.

[0114] In such an arrangement the free end of each hook (assuming the shaft formations are embodied as hooks, which need not necessarily be so) would extend parallel to the longitudinal axis of the shaft from which it extends, or at a small angle to the axis. In such a case the eyes 29 may require re-locating in the design of the assembly, but this would be a matter within the knowledge of the worker of ordinary skill.

[0115] In this arrangement the shafts, being non-rotatable, could be eg. of square cross-section or otherwise formed with one or more flat portions that promote non-rotative sliding.

[0116] Each housing 19 is defined as a hollow, rectangular prism defined by walls 31 that are formed integrally with the remainder of the frame 11. Each housing 19 is closed on all sides except its uppermost, which omits a permanent cover and therefore is openable.

[0117] The purpose of the openable side of the housing 19 is to provide access, by an operator, to the protruding portion 27 of each shaft 21a, 21b that perforates the upstanding wall 12 at a perforation location, as described hereinabove, that coincides with the location of a journal recess for one end of the shaft.

[0118] The protruding portion 27 of each shaft 21a, 21b includes secured thereto and extending at right angles to the shaft an actuator member 32.

[0119] The nature of the actuator member 32 is best shown in Figure 4. This is a view showing the vicinity of the perforation location represented by the first type of shaft support 22, omitting the walls 31 of the housing 29.

[0120] As is shown in Figure 4, the actuator member is rigidly secured to the protruding portion 27 of a said shaft 21a, 21b.

[0121] In the position shown eg. in Figures 3 and 4, the actuator member 32 extends generally vertically upwardly. This position of the actuator member 32 corresponds to the first position of movement of the shaft (in which the hooks 28 are engageable in the eyes 29 of the cover plates 18).

[0122] The hollow interior of the housing 19 is dimensioned such that the actuator member may be rotated from the position shown, about the longitudinal axis of the shaft 21a, 22b to which it is attached, so that it lies horizontally extending parallel to the major axis of the housing 19, within the interior thereof.

[0123] In another arrangement not visible in the drawings, an interior wall of the housing may include secured thereto (eg. by welding) one or more protuberances. The actuator member 32 is engageable with such protuberances such that the protuberances limit the range of rotational motion of the actuator member 32 and hence the

attached shaft.

[0124] The advantage of such an arrangement is that when during use of an access assembly according to the invention a user lets go of the actuator member it would rotate for only a short distance before engaging one of the protuberances. As a result the actuator member may always be presented with a free end close to the open, upper side of its surrounding housing. Consequently further use of the actuator member is facilitated.

[0125] Rotation of the actuator member 32 as described causes rotation of the associated shaft 21a, 21b to its second position (in which the hooks 28 are disengaged from the eyes 29, thereby permitting free removal of the otherwise secured cover plates 18 from the aperture 13).

[0126] Secured rigidly (eg. by welding or integral casting) to the interior of housing 19, adjacent the upper, open side thereof, is a further eye 33 having formed therein a through-going aperture 34.

[0127] As illustrated the further eye 33 is a horizontally extending plate, such that an axis passing through the centre of aperture 34 extends vertically. A further, through-going aperture 36 (Figure 4) is formed adjacent the upper end of actuator member 32.

[0128] As best seen in Figure 4, when actuator member 32 extends vertically as shown an axis passing through the centre of further aperture 36 extends generally horizontally.

[0129] The dimensions of the actuator member 32 and the locations of the apertures 34 and 36 are such that the actuator member 32 may be locked to the further eye 33. by a lock in the form of a padlock 37 the hasp 38 of which passes through the apertures 34 and 36 when they are located as described hereinabove.

[0130] Closing of the padlock therefore locks the actuator member 32 in position adjacent the further eye 33, thereby in turn locking the associated shaft 21a, 21b in its first position of movement.

[0131] Thus it is possible to lock the cover plates 18 in place received in the frame 11, by reason of moving the actuator member 32 to its upright position shown eg. in Figure 4 after insertion of the cover plates, so that the hooks 28 engage the eyes 29; and then using a padlock 37 to secure the actuator member 32 to the further eye 33 as illustrated.

[0132] In the case of a manhole having an elongate, rectangular shape as shown, each of the shafts 21 a, 21b would, when locked by a respective padlock, secure two of the covers in position since (as is apparent from Figure 2) the eye 29 of each cover plate 18 protrudes downwardly from the non-hypotenuse side of the cover plate that lies adjacent one of the longer sides 12a, 12d of the upstanding wall 12.

[0133] Clearly through the use of two of the shafts, only a pair of the padlocks (located in a respective pair of the housings 19) would be needed to secure all four covers. Thus for a four-cover manhole this would represent a 50% reduction in the number of padlocks, keys and housings 19 compared with the prior art arrangement. Furthermore the operation of locking and unlocking the cover plates is made considerably quicker than in the prior art arrangements.

[0134] Each of the housings 19 includes an openable cover 39 for closing the open side when there is no need to gain access to the padlock 37 or other lock for securing the shafts 21a, 21b as appropriate in their first positions of movement.

[0135] The covers 19 are needed to prevent the risk of eg. a bicycle wheel or the heel of a pedestrian's shoe entering or partially entering the interior of the housing 19 and causing an accident.

[0136] A lug 41 cast integrally or otherwise secured to the wall 31 of each housing 19 includes a threaded, through-going bore 42 in which is threadedly receivable a screw 43 that passes through a further aperture in an associated said cover 39, for the purpose of securing the cover in position closing off the top of the housing 19. The housing 19 includes protruding from its walls 31 a short distance below their uppermost edge a series of further members 44, 46 that act in conjunction with the lug 41 as seatings for the associated cover 39.

[0137] As best seen in Figure 8, one way of effecting securing of each housing cover 39 is to provide secured at one end of the housing 19 a plate 56 extending across the housing 19 adjacent the upper free edge of the wall of the housing 19. Plate 56 lies at the opposite end of the housing 19 to that of lug 41.

[0138] The associated housing cover 39 may then include protruding from its underside at one end (that in use lies adjacent plate 56) one or more protuberances. These protuberances (which are not visible in the drawings) may on insertion of the cover 39 into the upper, open end of the housing 19, engage the underside of the plate 56.

[0139] As a result it is necessary to provide a threaded lug 41 at only one location, opposite the plate 56, in order to permit securing of each cover 39 in place.

[0140] It follows that only a single screw is needed, for insertion into the threaded bore in lug 41, for the purpose of securing each housing cover 39. As a result the cost of the assembly is contained and its ease of use maximised.

[0141] As shown in the drawings, each cover plate 18 is in the preferred embodiment of the invention substantially imperforate, save for a pair of *per se* conventional lifting apertures 47. However, it is possible within the scope of the invention to contemplate perforated cover plates, such as but not limited to those including vents or grating apertures of the type typically found in a gully grate.

[0142] A further feature of cover plates generally in the art of manhole assemblies is the provision of strengthening ribs 48 depending downwardly from the underside of each cover plate.

[0143] In the embodiments shown such ribs 48 include arcuate recesses in the vicinity of the adjacent shaft 21a

/ 21b for the purpose of assuring that there is adequate clearance for rotation of the shaft between its first and second positions.

[0144] The frame 11 has protruding from the base of wall 12 an in-use horizontal flange 51 that functions to anchor the assembly 10 in eg. mortar at the top of a drain or inspection chamber. Flange 51 may if desired include features to enhance the strength of the frame structure and/or to improve keying of the flange to the mortar. Such features may include (but are not limited to) ribs 52 or other protrusions or recesses on the top, bottom or edge surfaces of the flange 51. Such ribs may be arranged eg. in patterns of parallel lines as shown, or in other arrangements as desired.

[0145] In the preferred embodiment illustrated the ribs are present at the corners of the flange 51.

[0146] Regardless of whether the flange 51 is present, the ribs 52 or equivalent formations may be present at other locations on the frame 11 as desired.

[0147] The extent of protrusion of flange 51 from the remainder of frame 11 varies from place to place about the periphery of frame 11. This is exemplified by flange recesses 53. The use of such recesses minimises material usage in the flange 51.

[0148] Although the preferred embodiment of the invention as shown includes an elongate, rectangular frame that accommodates four cover plates 18, as noted the aperture defined by the frame, and if desired the frame itself, may be square.

[0149] In that case typically two right-angled triangular cover plates 18 would be used to close off the aperture. Depending on the shape and dimensions of such cover plates it may be possible to utilise only a single shaft, extending along one edge of the frame 11 (or elsewhere within the boundary defined by the frame), for locking both the cover plates in place received in the frame 11.

[0150] Also the principles of the invention may readily be employed in relation to access assemblies including more than four cover plates. Such modification of the components of the assembly, as will be needed to achieve this, will occur readily to those of skill in the art.

[0151] Another possibility, that is also within the scope of the invention as claimed, is for one or more of the cover plates 18 of an assembly 10 to overlie or otherwise engage one or more further such cover plates, with the result that it is necessary only to lock a single cover plate in position in order to secure all the cover plates. In such an arrangement possibly only a single shaft 21 would be needed, and the endmost cover plate of a series would include a formation such as a tongue that is engageable with part of the frame 11 in order to provide a firm anchoring for the cover plates in locations spaced from the shaft.

[0152] Yet another possibility within the scope of the invention is for the shafts to extend eg. at angles to one another (especially perpendicular to one another, extending along adjacent sides of the frame as contrasted with the arrangement illustrated in which the shafts extend along opposite sides). Also it is possible for the aperture defined by the frame, and as desired the frame itself, to be non-polygonal when viewed in plan. An example of such an arrangement would a circular aperture. In that case probably a single shaft 21 would suffice, extending to define a chord to the circle, in order to secure eg. one or two cover plates in place. Other frame shapes are also possible.

[0153] It is a characteristic of the invention that the number of padlocks, housings 19 and covers 39 for the housings 19 equals the number of shafts. In the overwhelming majority of applications, therefore, the use of the invention significantly reduces the inventory of parts needed to secure the covers in place. In particular it reduces the number of padlocks required, with the result that the overall cost of the manhole assembly is significantly reduced.

[0154] As stated a further variant lying within the scope of the invention is to utilise a different form of movement of one or more of the shafts 21a, 21b. Thus as mentioned the shafts could be slideable longitudinally between their first and second positions respectively to cause engagement and disengagement of the shaft formation / cover formation combinations.

[0155] In such an arrangement the dimensions of eg. the pockets 19 and the hooks 28 and eyes 29 may require minor modification to accommodate the alternative mode of shaft movement.

[0156] Figure 6 shows a further, optional feature of the invention, in the form of a cuboidal metal protuberance 57. In Figures 6 and 7 only a single shaft, labelled 21, is shown but the principles illustrated in these figures are applicable to plural shafts as mentioned in connection with Figures 1 to 5.

[0157] Protuberance 57 is cast integrally with or otherwise secured to a wall 12 of the frame 11 so as to extend towards the centre of the opening defined by the frame.

[0158] The protuberance 57 is located so as to at least partly overlie the free end of one of the hooks 28 when the shaft 21 occupies its first position. The protuberance 57 is so located that any attempt eg. to lever one of the cover plates 18 with which the hook is engaged will be resisted by the protuberance 57. This in turn would be because the tendency of the shaft 21 to bend during such an attack will cause the hook 28 to engage the underside of the protuberance 57. In practice there may be provided a respective protuberance 57 arranged to be engageable by each of the hooks 28.

[0159] In another refinement of the invention, as best shown in Figure 7, one or more additional protuberances 58 may be secured so as to depend downwardly from the underside(s) of one or more of the cover plates 18. The purpose of the additional protuberance(s) 58 is to prevent bending of the shaft 21 in a different plane than that resisted by the protuberances 57 (which protuberances may be present in the same embodiment of the invention).

[0160] As noted herein, a plurality of the housings 19 may be provided adjacent one side of the frame 11. As a result it is possible for a user to release a plurality of the shafts 21 so that they can be moved to their second positions, without having to move around the frame 11. This may be advantageous for example when access along one or more edges of the frame 11 is limited or is hazardous.

[0161] The location of each of the housings 19 on the exterior boundary of the frame 11 is advantageous from the viewpoint that this maximises the open area of the access assembly when the cover plates 18 are removed, since the housings 19 do not extend into the openable part. On the other hand the provision of the housings 19 at the indicated locations means that the recess which must be dug in the ground (or any other surface in which such a recess is contemplated) must be non-rectangular in order to accommodate the shape of the frame including the external housings. In some circumstances this may be inconvenient, in which case it is possible to provide the housings 19 at locations on one or more of the inner edges of the frame 19. In such a case the recess needed to accommodate the frame 19 can be a plain rectangle.

[0162] When the housings 19 are provided in this fashion "inboard" of the rectangular, main part of the frame 11 a wall of each housing 19 lying inside the outer extent of the frame 11 may be considered as the "upstanding wall" of the frame that is perforated by and acts as a journal for the shaft.

[0163] The housing covers 39 may if needed include one or more members extending downwardly from their undersides.

[0164] The purpose of such members is to retain the actuator members 32 of the shafts 21 in locations corresponding to the first positions of the shafts 21. Thus on securing of the housing covers 39 to close the housings 19 the shafts 21 may be kept in positions securing the cover plates 18 to the frame, even if no padlock or other high security locking mechanism is used inside the housings to secure the actuator members.

[0165] The housing 19 that is visible in Figure 8 illustrates another optional feature, of the invention, which is the omission of the further aperture 36 from the actuator member 32.

[0166] In use of the arrangement of Figure 8 it is possible to secure the actuator member 32 in a position corresponding to the first position of the shaft 21, merely by fastening the hasp of a padlock passing through the aperture 34 in further eye 33. It is necessary only that the body of the padlock is sufficiently large as to occupy most of the interior of the housing 19, such that any attempt at moving the actuator member 32 causes it almost immediately to engage the body of the padlock which therefore prevents further movement of the actuator member 32. During this process any force applied by the actuator to the padlock is (depending on the size of the padlock body and the length of its hook) reacted either by contact of the padlock body with the walls of the housing; or by engagement of the hook with the aperture 34.

[0167] An advantage of the Figure 8 arrangement is that the body of the padlock may easily be swivelled to allow ready access to its key aperture. Such swivelling is however prevented when the appropriate housing cover 39 is secured in place to close off the open side of the housing 19.

[0168] The shafts 21 may in certain embodiments of the invention be extendible and retractible, for instance by reason of comprising two shaft portions that are slideably arranged one inside another such that the shaft length is adjustable. Appropriately located apertures in the shaft portions may be present to allow the insertion of one or more cross-pins or equivalent means that may fix the shaft portions at a certain extension.

[0169] The use of an extendible and retractible shaft 21 is particularly advantageous when the shaft 21 in question is supported (eg. underslung) from one of the cover plates 18.

[0170] The shafts 21 may if desired include one or more encircling sleeves made eg. from a plastics material. Such sleeves may be located so as to coincide with the parts of the shafts 21 that are journalled or otherwise supported such as to permit movement of the shafts 21 as explained above. The sleeves may beneficially inhibit corrosion and wear of the shafts and the journals; and may prevent corrosion products from constraining movement of the shafts 21.

[0171] As will be apparent to anyone of skill in the art, the components of the invention may be readily fitted retroactively to pre-existing access assemblies such as manholes, it being necessary only that the frame of each assembly in question is provided with housings 19, apertures and eyes as described. Thus it is possible within the scope of the invention to provide the shafts, actuator members and padlocks as a conveniently conveyed kit.

Claims

1. An access assembly comprising:

a frame including an upstanding wall defining at least part of a boundary having an aperture formed therein;

one or more seatings, that are secured in the aperture, for supporting one or more cover plates; and

one or more cover plates that are receivable in the aperture supported on one or more said seatings so as at least partially to close off the aperture, wherein the access assembly includes one or more shaft supports supporting one or more moveable shafts, the or each moveable shaft including one or more shaft formations and at least a first said cover plate including one or more cover formations or the frame including one or more frame formations, respective said

shaft and cover or frame formations being mutually engageable when the or each shaft occupies a first position to which it is moveable, so as to retain at least a first said cover plate relative to the frame; and being disengaged from one another when the shaft occupies a second position to which it is moveable so as to permit removal of at least the first cover plate from the frame, the shaft extending through the upstanding wall in at least one perforation location so as to protrude on both sides of the upstanding wall.

2. An access assembly according to Claim 1 wherein the or each shaft is rotatable relative to the frame; and wherein the first position of the shaft is a first rotational position thereof and the second position of the shaft is a second rotational position thereof.

3. An access assembly according to Claim 2 wherein the shaft supports include one or more journal bearings rotatably supporting a said shaft relative to the frame.

4. An access assembly according to any preceding claim wherein the shaft supports are each formed in or secured to the upstanding wall.

5. An access assembly according to Claim 3 or Claim 4 including a pair of journal bearings defined as mutually spaced journal recesses formed in the upstanding wall, the dimensions and locations of the journal recesses being such as rotatably to support a said shaft extending generally parallel to a part of the said upstanding wall.

6. An access assembly according to Claim 5 the upstanding wall of which is rectangular, when viewed in plan, so as to define four sides the journal recesses being formed respectively in opposite said sides of the upstanding wall.

7. An access assembly according to Claim 1, wherein at least one said shaft is longitudinally moveable relative to the frame; wherein the first position of the shaft is a first position of longitudinal movement of the shaft; and wherein the second position of the shaft is a second position of longitudinal movement of the shaft.

8. An access assembly according to any preceding claim wherein the assembly includes cover formations and wherein the mutually engageable shaft and cover formations include a hook secured to one of the first cover and a said shaft; and a recess, in which the hook is received when the shaft occupies its first position, secured to or formed in the other of the said cover and the shaft.

9. An access assembly according to Claim 8, wherein the hook extends in a direction that is skewed relative to the longitudinal axis of the shaft to which it is secured.

10. An access assembly according to Claim 8, wherein the hook extends generally parallel to the shaft to which it is secured.

11. An access assembly according to any preceding claim, wherein one or more of the shaft supports is integral with or secured to a said cover plate.

12. An access assembly according to Claim 11, including one or more frame formations and wherein the mutually engageable shaft and frame formations include a hook secured to one of a said shaft and the frame, and a recess, in which the hook is received when the shaft occupies its first position, secured to or formed in the other of the shaft and the frame.

13. An access assembly according to any preceding claim including a lock for locking a said shaft at least in its first position retaining the first cover relative to the frame.

14. An access assembly according to Claim 5, wherein the perforation location coincides with that of a first said journal recess, whereby the first journal recess is or includes a through-going aperture perforating the upstanding wall.

15. An access assembly according to Claim 5 or any preceding claim depending therefrom wherein each journal recess perforates the upstanding wall.

16. An access assembly according to any preceding claim wherein a protruding portion of a said shaft includes secured thereto an actuator member for effecting movement of the shaft between its first and second positions.

17. An access assembly according to Claim 13 and Claim 16, wherein the lock acts to limit movement of the shaft in the vicinity of the said protruding portion.

18. An access assembly according to Claim 16 and Claim 17 wherein the lock includes one or more parts that are engageable with the actuator member to limit movement of a said shaft.

19. An access assembly according to any preceding claim, including a housing secured to the assembly so as to surround the portion of a said shaft protruding from the upstanding wall.

20. An access assembly according to Claim 19 wherein the housing includes one or more housing walls at

least part of at least one of which is defined by the upstanding wall.

21. An access assembly according to Claim 19 or Claim 20 wherein the housing includes an opening in at least one side for providing access to the protruding portion; and the assembly includes an openable cover for selectively closing and unblocking the opening.

22. An access assembly according to any preceding claim including a pair of the shafts respectively supported at mutually spaced locations in the assembly such that the shaft formations of the respective shafts are engageable with cover formations of respective cover plates that are receivable in the aperture formed in the boundary.

23. An access assembly according to any preceding claim the or each shaft of which includes a plurality of shaft formations for respectively engaging the cover formations of a corresponding plurality of cover plates.

24. An access assembly according to any preceding claim an in-use upper surface of the or each cover plate of which is generally imperforate.

25. An access assembly according to any of Claims 1 to 23, including one or more cover plates each having an in-use upper surface that is perforated.

26. An access assembly according to any preceding claim, including a flange extending outwardly of the periphery of the upstanding wall.

27. An access assembly according to Claim 26 wherein the width of the flange varies from place to place about the periphery of the upstanding wall.

28. An access assembly according to Claim 26 or Claim 27 wherein the flange includes formed thereon one or more protrusions and/or recesses for stiffening the assembly and for aiding keying of the flange in a bedding medium.

29. An access assembly according to Claim 28 wherein the protrusions and/or recesses are formed on an in-use upper surface and/or an in-use lower surface of the flange.

30. An access assembly according to any preceding claim including one or more members secured to and protruding from the frame and located so as to limit deformation of the or each said shaft.

31. An access assembly according to any preceding claim including one or more members secured to and protruding from a said cover plate and located so as to limit deformation of the or each said shaft.

32. An access assembly according to any of Claims 19 to 21 or any preceding claim depending therefrom, wherein the access assembly includes a plurality of the housings each secured to the same side of the assembly.

33. An access assembly according to Claim 16 and Claim 19 or any preceding claim depending from Claim 19, wherein the or each housing includes formed or secured therein one or more stop members with which the actuator member is engageable so as to limit movement of the shaft.

34. An access assembly according to Claim 21 or any preceding claim depending therefrom, wherein the or each openable cover includes a housing cover member that is removably securable to the housing.

35. An access assembly according to Claim 34, wherein the or each housing cover member includes protruding therefrom one or more housing cover protuberances that are each engageable with the actuator member of a said shaft.

36. An access assembly according to Claim 16 and Claim 19 or any preceding claim depending from Claim 19, including a removable lock that is securable to a said actuator member and that when installed overlies and at least partially obscures the actuator member within a said housing.

37. An access assembly according to Claim 16 and Claim 19 or any preceding claim depending from Claim 19, including a removable lock that is securable to a said actuator member and that when installed engages one or more sides of the housing to prevent or limit movement of the actuator member.

38. An access assembly according to any preceding claim, one or more said shafts of which is extendible in length and retractible.

39. An access assembly according to Claim 38, including a retainer for retaining the or each said shaft at least in an extended condition.

40. An access assembly according to any preceding claim, including one or more sleeves encircling the or each shaft.

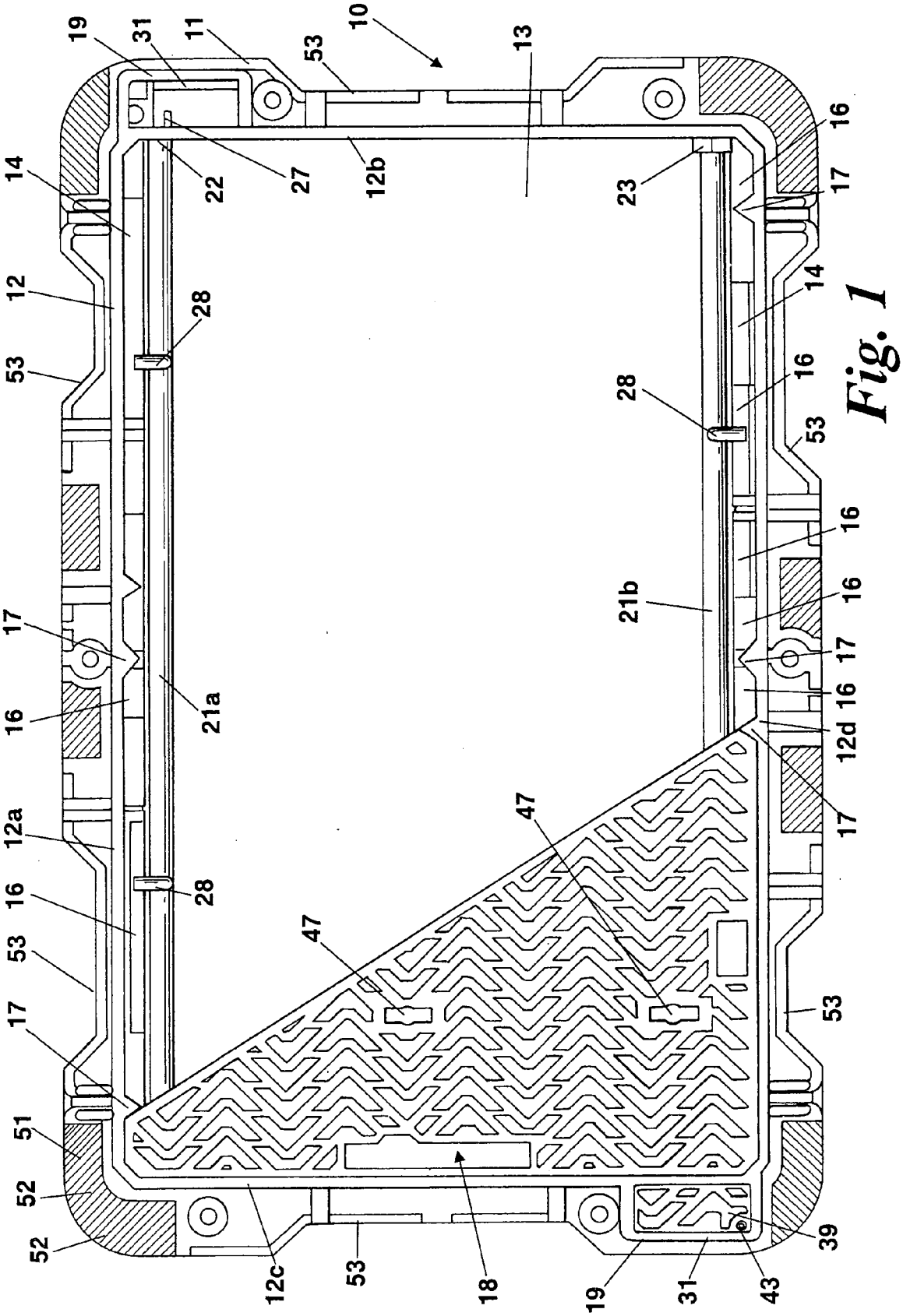
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Fig. 1

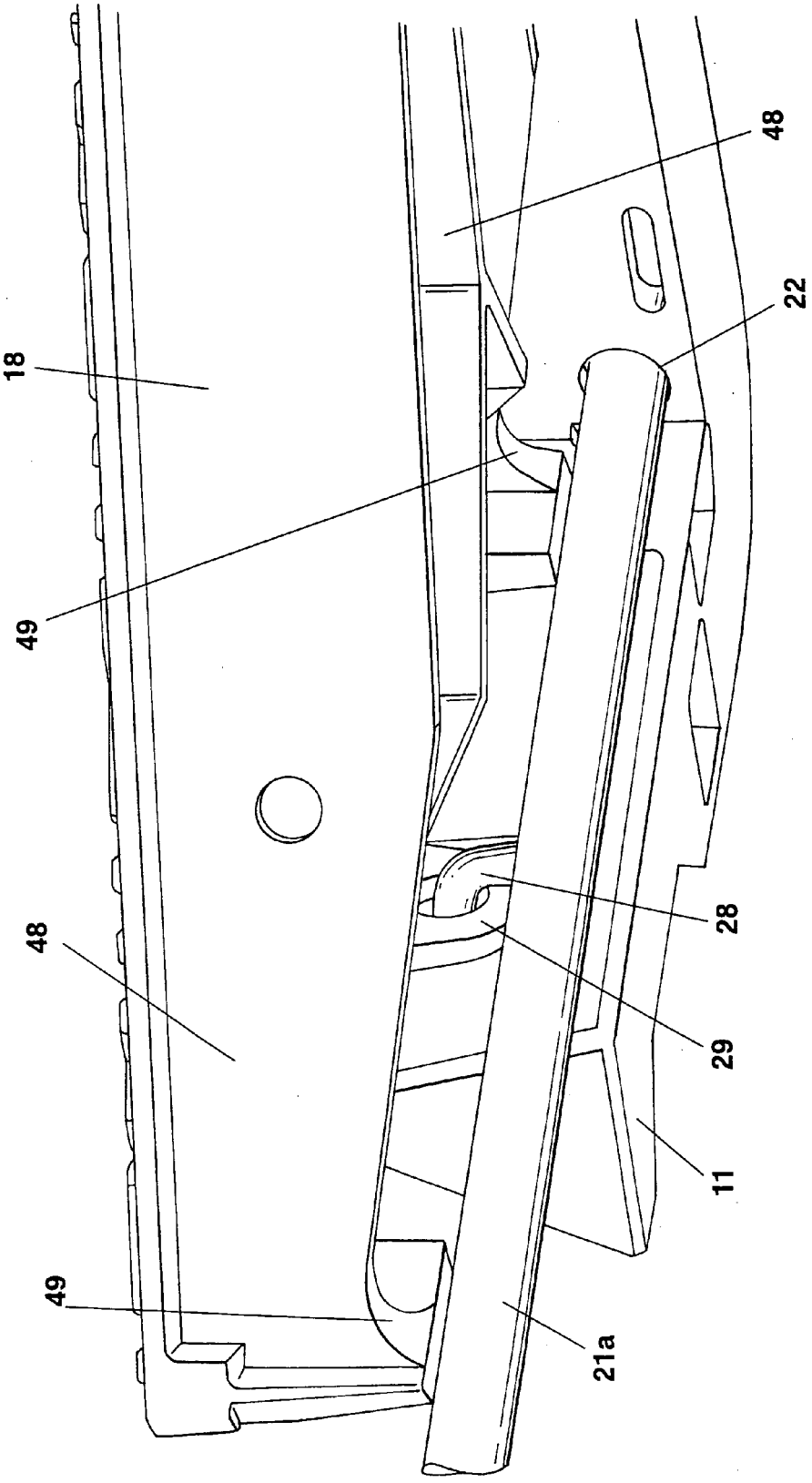


Fig. 2

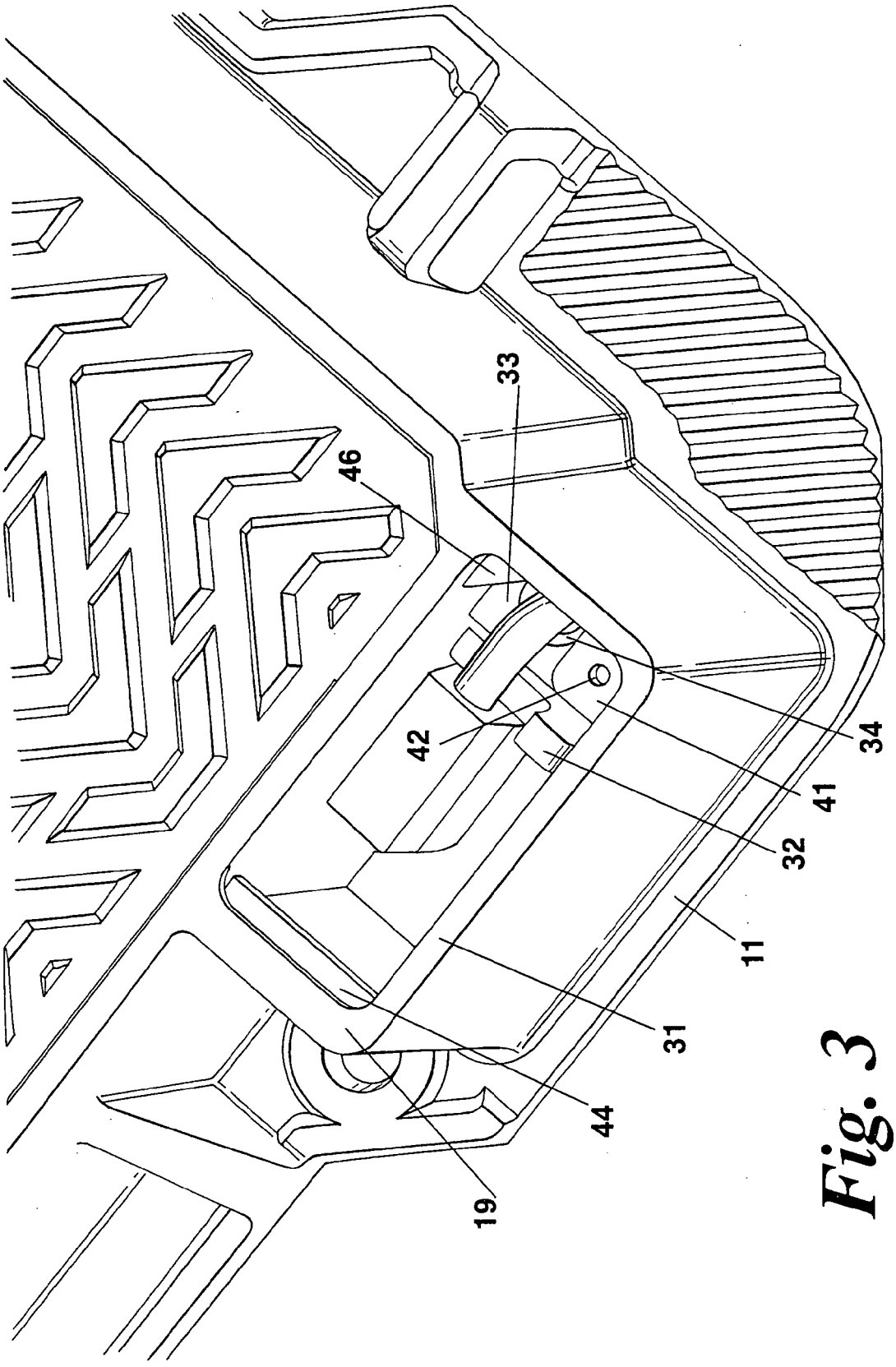


Fig. 3

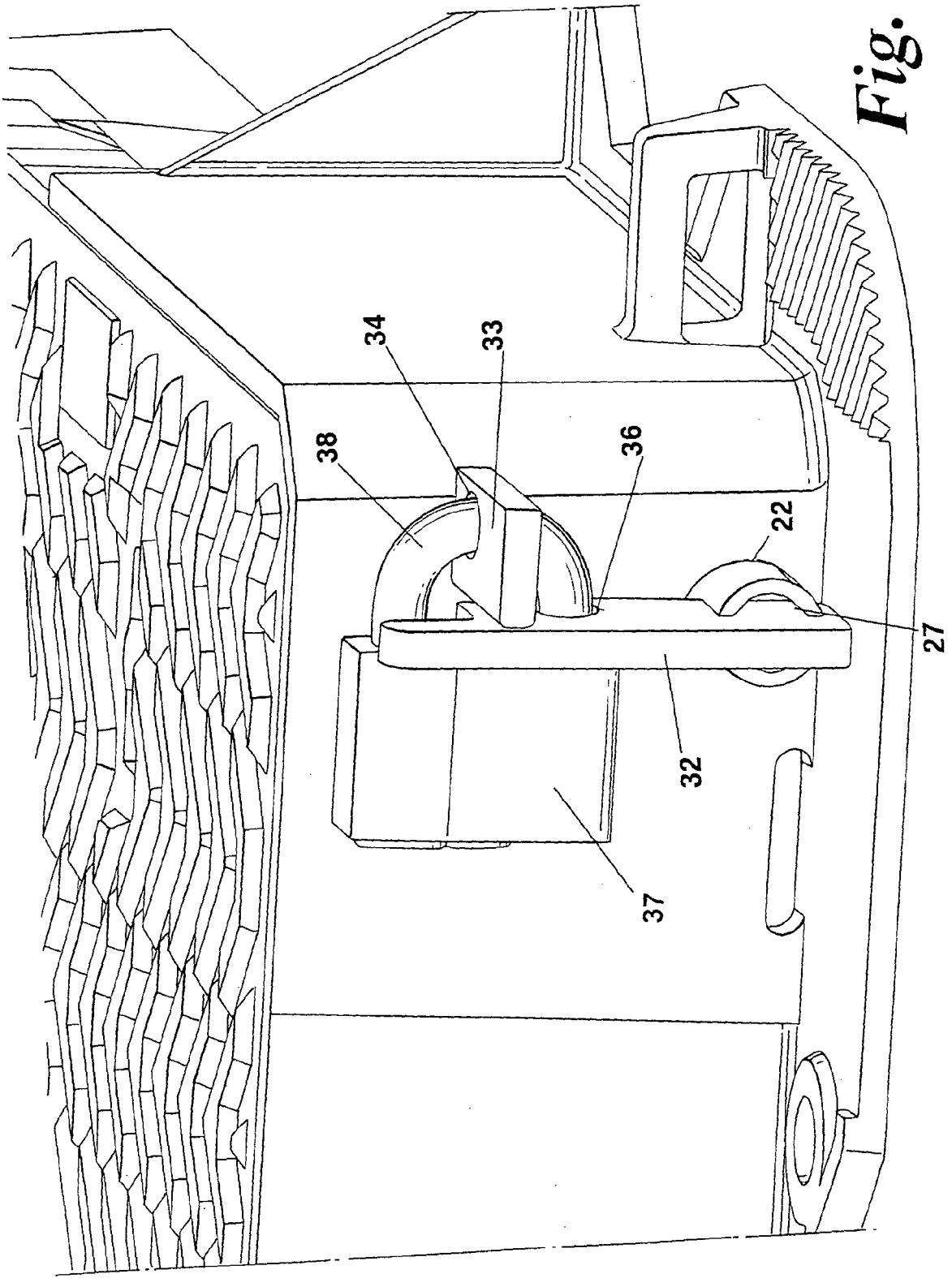


Fig. 4

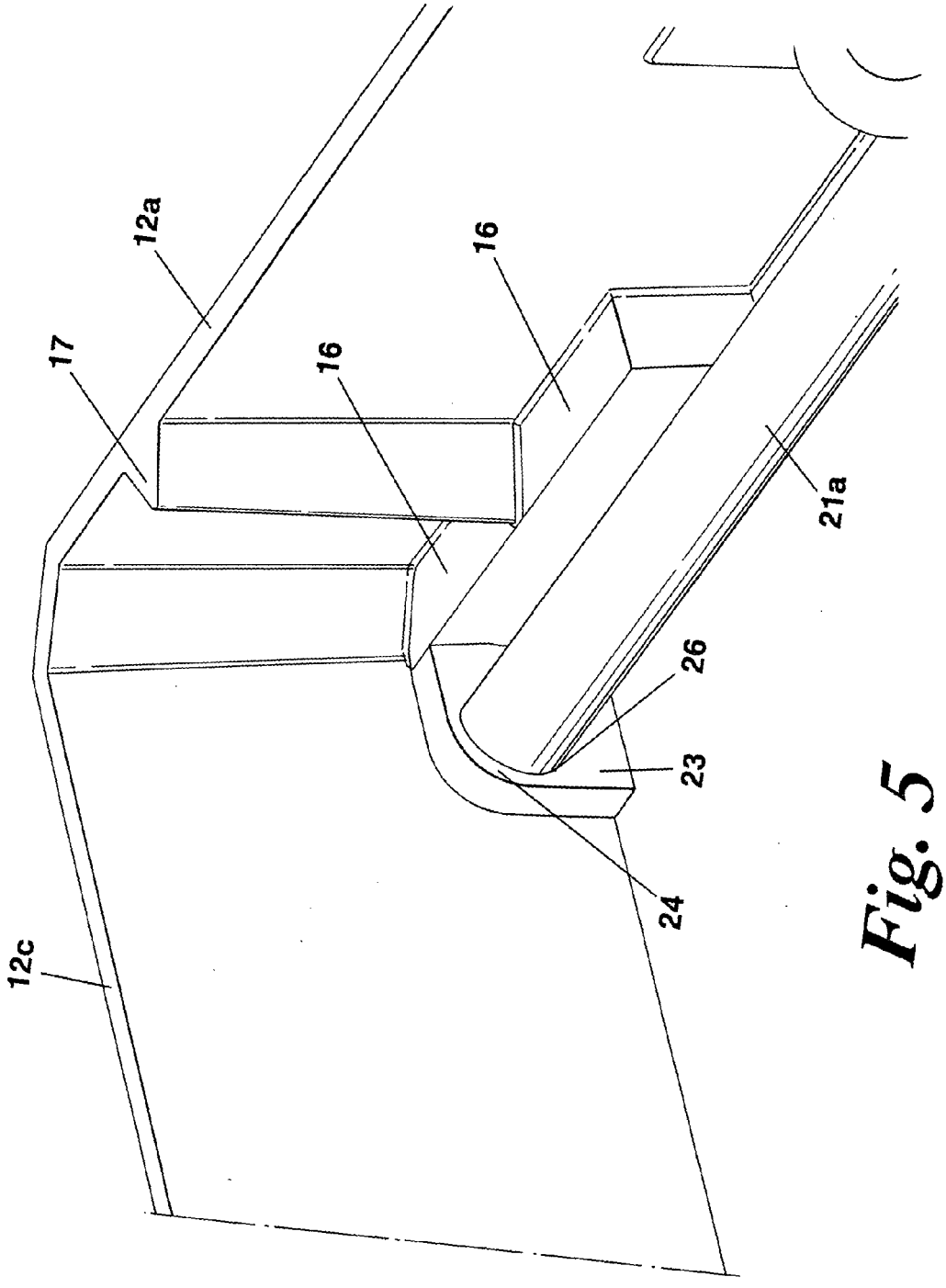
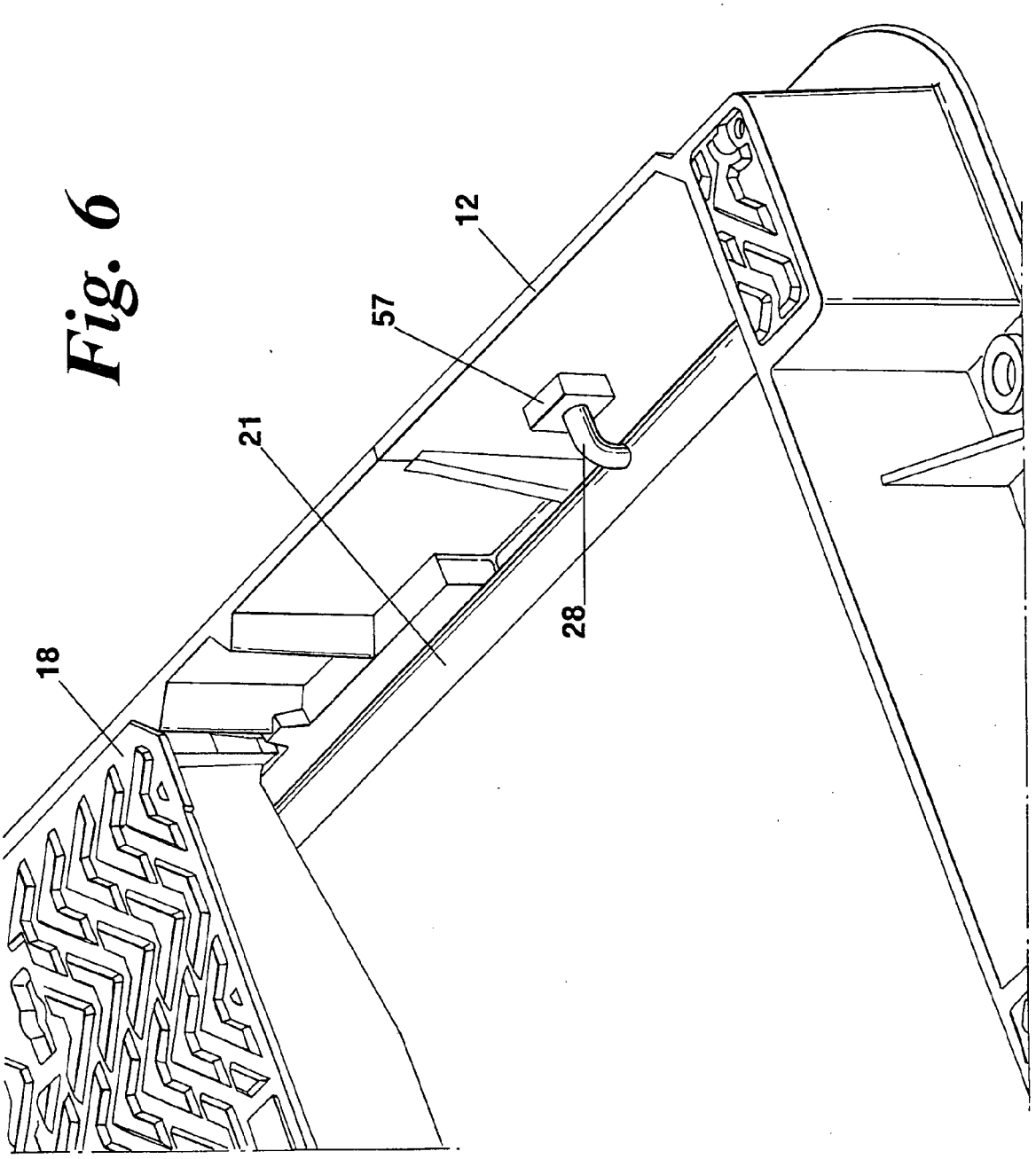


Fig. 5

Fig. 6



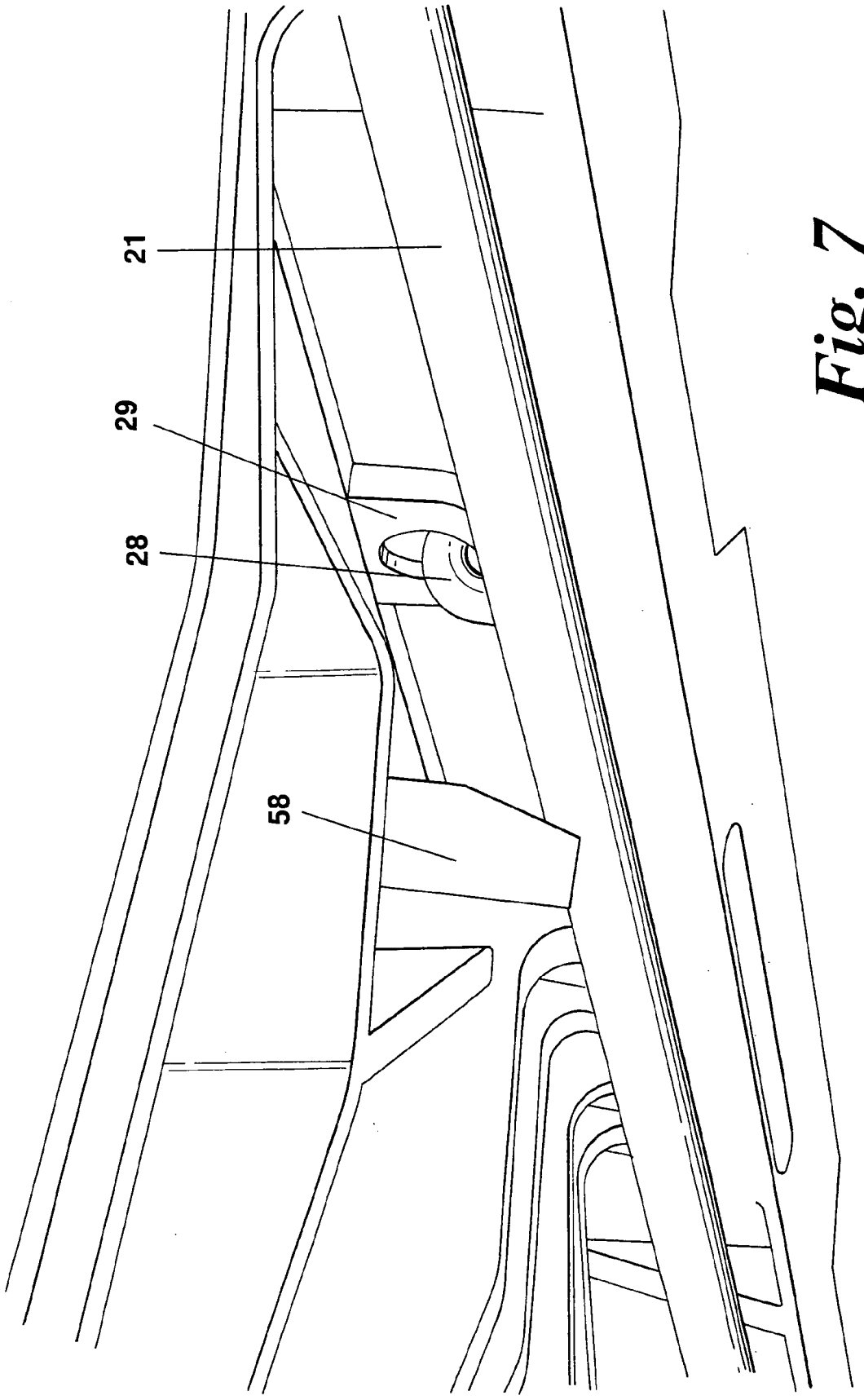


Fig. 7

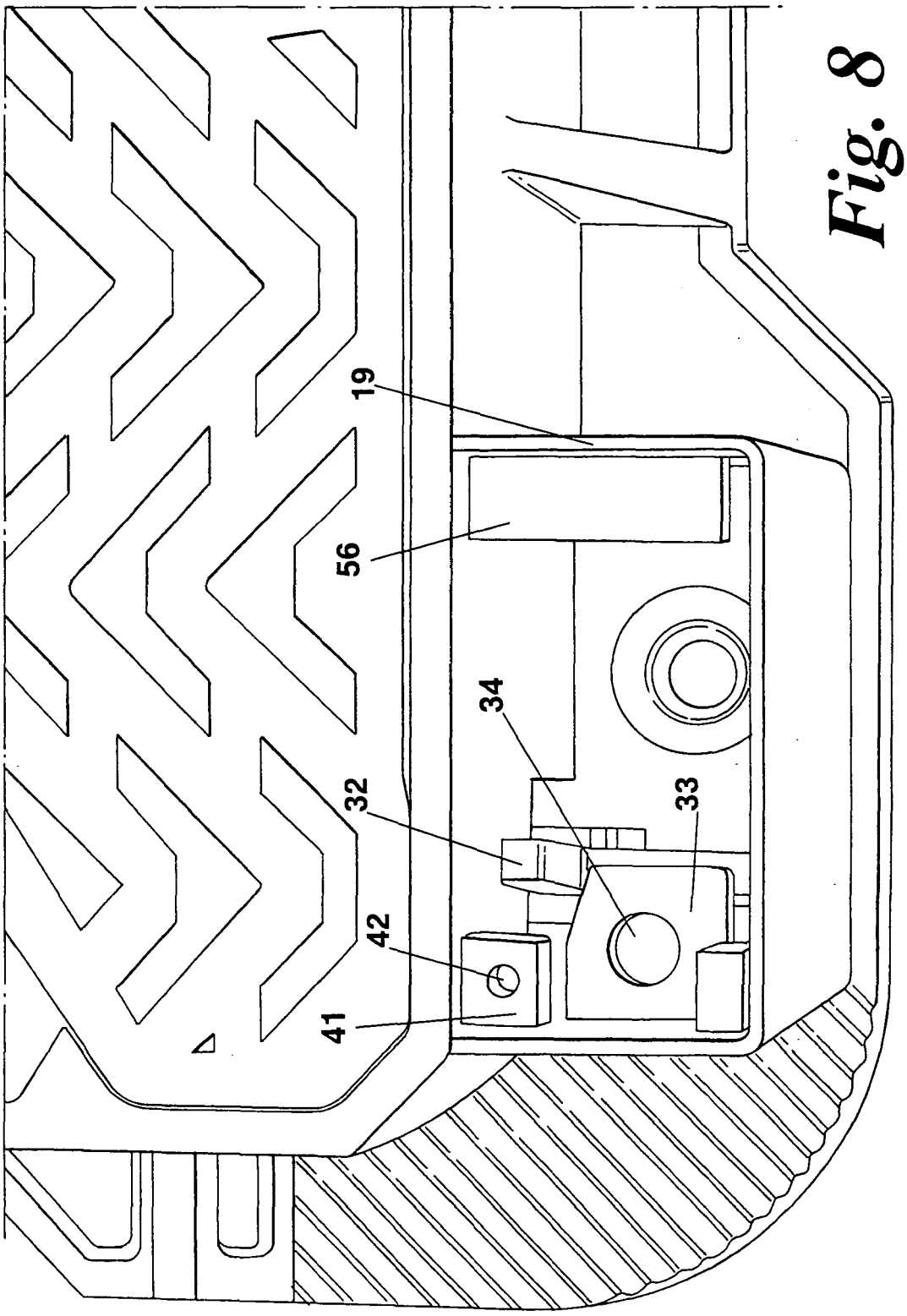


Fig. 8