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INSULATED CLOSURE CONSTRUCTIONS AND METHODS OF ASSEMBLY THEREOF

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2 Sheets-Sheet 1

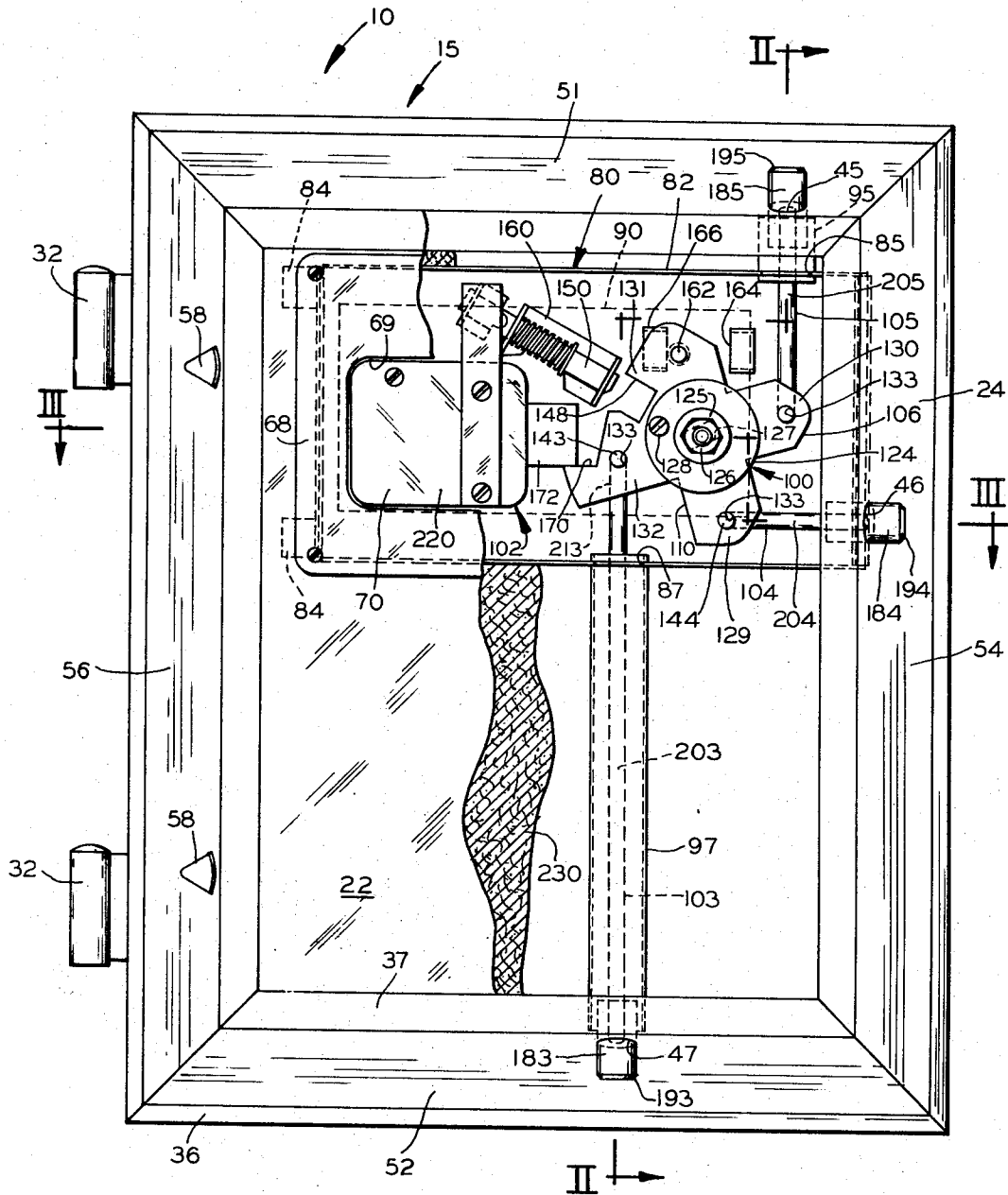


FIG. 1

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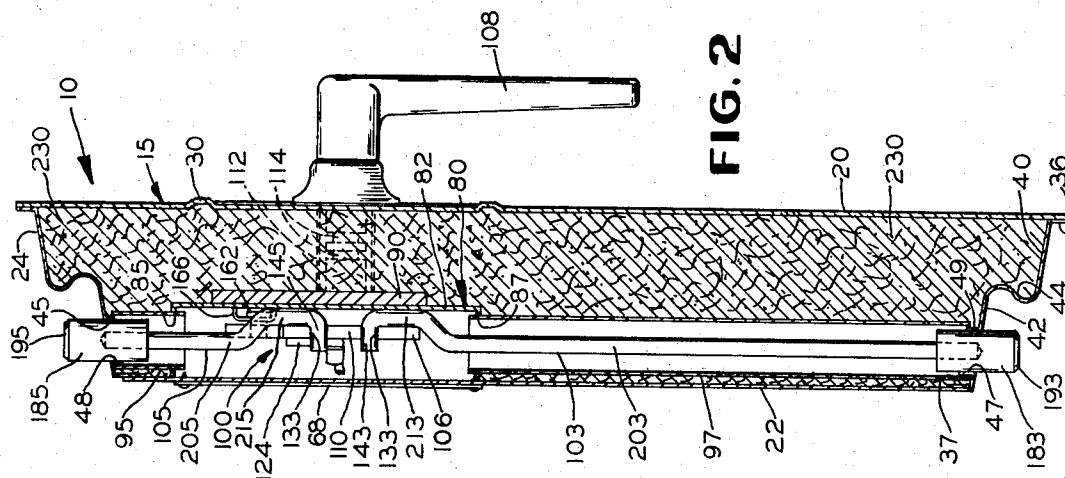
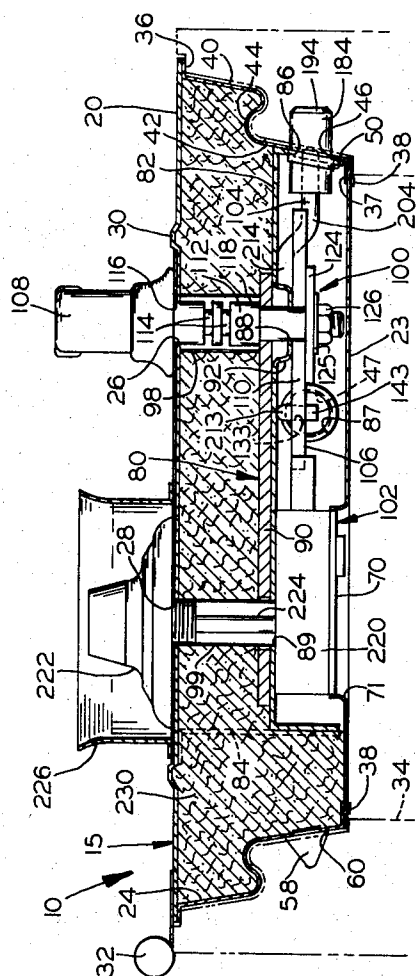
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2 Sheets-Sheet 2



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INSULATED CLOSURE CONSTRUCTIONS AND METHODS OF ASSEMBLY THEREOF

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This invention relates to the construction of protective closures adapted for ease of assembly and having improved security qualities. More particularly, it deals with an insulated and armored closure having a protectively encased locking mechanism such as is used on safe doors and security cabinets.

In the past very little emphasis was placed upon the ease and economy of manufacturing and assembling of these protective closures. These closures were usually filled with an insulative material molded in situ which had recesses in its inner surface for containing the boltwork systems. The structure of these closures did not allow the molding of the insulation to comprise the simple steps of pouring the insulation into the closure cavity and then raking the insulative material level with the flush inner surfaces of the closure, but required the use of additional steps such as the use of removable mold cores or subsequent routing processes to produce the finished recesses.

Also, the boltwork systems of these closures comprised numerous interacting movable parts joined together by individual fastening means which required extensive assembly procedures.

It is the object of this invention to produce an efficient, simple, effective, and economical protective closure for a security cabinet.

It is another object of this invention to produce a protective closure which is easily manufactured, assembled, and maintained.

It is another object of this invention to produce a protective closure with improved resistance to heat and destructive entry.

It is another object of this invention to produce an insulated closure with a completely self-coring labyrinthian housing for excluding the insulation from the boltwork system.

It is another object of this invention to produce an insulated closure construction which permits insertion of the bolts into insulatively encased passageways from the outside ends of the passageways.

It is still another object to produce a lockable closure which has tamper proof features.

Generally speaking, the protective closure includes an armored case or shell having symmetrical outer and inner plates spaced substantially from each other and connected to a frame which spans the space between the margins of each plate. The armored case surrounds a labyrinth for a locking mechanism, which labyrinth includes a central compartment with one open side flush with the inside surface of the closure and a plurality of tubes forming passageways spaced from this inside surface and extending outwardly from the compartment to the frame edges or the outer surface. Support means are provided to hold these labyrinth members in position during assembly.

When a moldable insulative material is poured into the closure for filling the space between the labyrinth and the shell, the labyrinth functions as a mold core and the case or shell functions as a mold. This structure permits leveling of the insulative material even with the flush inner surfaces of the closure members, and since the labyrinth remains in the insulative material, no later

removal of the material or cores therein for the locking mechanism is necessary, and assembly of the balance of the closure may be made, even though the insulative material has not set.

The locking mechanism in the labyrinth may include a boltwork system and a latch means for locking the boltwork system. The boltwork system may comprise a plurality of bolt rod assemblies which may be inserted into the outer end of each passageway that terminates at a frame edge and extend therefrom to the open compartment where they may be pivotally attached to a cam operator for moving them into and out of locking position. An external lever means may be connected to the cam operator by a shaft located in a tubular passageway between the outer plate and the labyrinth compartment. The cam operator, the bolt rod assemblies and their associated structures are constructed so that the hooked inner ends of the bolt rod assemblies are jointly retained by dropping the cam operator into position in the compartment and then anchoring the cam operator in place.

The latch means for locking and unlocking the boltwork system may be controlled by a combination lock in the compartment of the labyrinth having an operating dial connected through a tubular passageway to the outer plate.

The above mentioned and other features and objects of this invention and the manner of attaining them will become more apparent and the invention itself will be understood best by reference to the following description of embodiments of the invention taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a view from the inner side of one embodiment of this invention with a portion of the inner plate and insulation broken away to show interior details;

FIG. 2 is a sectional view taken along line II—II of FIG. 1 showing details of the labyrinth and bolt assembly; and

FIG. 3 is a sectional view of another embodiment, similar to a section taken along line III—III of FIG. 1, but with an entirely removable inner plate on the closure, and also showing the jamb for the closure and a lock mechanism for the bolt assembly.

I. The closure shell

The drawings show a protective closure 10 having an armored shell or case 15 comprising an outer plate 20, an inner plate 22 (or 23 in FIG. 3) which may be symmetrical with outer plate 20 and parallelly spaced therefrom, and a frame 24 spanning the space between the marginal edges of the two plates 20 and 22. The outer plate 20 may be a generally flat, relatively thick plate made from steel. Although only a rectangular closure is shown in the drawings, the principles of this invention may be practiced upon square, round or various other shapes of closures. Two holes 26 and 28 (see FIG. 3) may be provided centrally in the outer plate 20 through which encased locking mechanisms may be operated by external means. A small raised ridge 30 may surround the general area adjacent the two holes 26 and 28 to add stiffness to the outer plate 20. The closure 10 may be attached to a sliding drawer such as for a file cabinet, or a pair of hinges 32 (see FIGS. 1 and 3) may be provided along one edge of the outer plate 20 for attaching the protective closure 10 to a cabinet 34, such as a safe.

The closure frame 24 is formed to provide a substantial space between the outer 20 and inner 22 or 23 plates of the closure 10 and may have an outwardly extending marginal flange 36 coincident with the marginal edge of the outer plate 20 and an inwardly extending marginal flange 37 coincident with the marginal edge of the inner plate 22 or 23, whereby the plates 20 and 22 may be permanently anchored to the frame 24 such as by weld-

ing (see FIGS. 1 and 2), or plate 23 may be anchored by threaded means as screws 38 shown in FIG. 3. The frame section intermediate the flanges 36 and 37 may include a first inwardly inclined surface 40 beginning at the inside edge of the marginal flange 36 and a second inwardly inclined surface 42 terminating at the marginal flange 37 and offset from the first inclined surface 40 by a corrugation 44 or groove. Boltwork holes 45, 46, and 47, with inwardly extending annular flanges 48, 49, and 50, may be strategically located on one or more sides of the frame 24, preferably in the innermost or second inclined surface 42, such as in the top frame section 51 adjacent the unhinged side of the closure 10, in the bottom frame section 52, and in the unhinged side section 54. The hinged side section 56 of the frame 24 may have rigidly affixed conically shaped bolts 58 protruding therefrom for cooperation with holes 60 in the frame of the cabinet 34 (see FIG. 3) for which the closure 10 is to be used.

An inner plate 22 may have a relatively large access opening covered by a removable access plate 68 (see FIGS. 1 and 2) to permit access for the assembly and maintenance of locking mechanisms contained within the protective closure 10. This large access plate 68 may contain a small access hole 69 to expose the access plate 70 of a combination lock of the locking mechanism. When the removable inner surface plate 23 is used, as shown in FIG. 3, only a small access hole 71 similar to the access hole 69 in plate 68 is required.

II. Labyrinth

An armored labyrinth 80 is contained within the armoring shell 15. The labyrinth 80 may include a shallow tray-like metal boltwork box or compartment 82 corresponding in area and position with the large access plate 68 and having an open side toward the inner surface plate 22 or 23. Preferably the edges adjacent the open side of the compartment 82 are flush with the inner surface of the inner plate 22 or 23. In order to maintain this relationship during assembly of the closure, support legs 84 (see FIG. 3) may be attached to the compartment 82 and extend to the inner surface of the outer plate 20 where they may be firmly attached such as by tack welding. The compartment 82 may have apertures 85, 86 and 87, aligned with holes 45, 46 and 47, in the frame and apertures 88 and 89 aligned with holes 26 and 28 in the outer plate 20. The compartment 82 may abut the frame 24 on the unhinged side 54 of the closure so that the aperture 86 and the annular flange 50 of the aligned hole 46 interconnect (see FIG. 3). An additional armoring plate or lock shield plate 90 may be attached to the outer surface of compartment 82 in the general area around the two apertures 88 and 89. The compartment section around aperture 88 may have an annular projection called a cam plate spacer 92 (see FIG. 3) which protrudes into the compartment 82.

The remainder of the labyrinth 80 comprises tube means 95, 97, 98, and 99 such as metal tubes which may extend between each aperture 85, 87, 88 and 89 in the compartment 82 and the corresponding aligned holes 45 and 47 in the frame 24, and 26 and 28 in the outer surface plate 22. The ends of the tube means 95 and 97 which interconnect with the frame 24 may be supported by the annular flanges 48, 49, and the other ends may be supported by containment within the apertures 85 and 87 of the compartment 82. The tube means may be tack welded to the frame 24 and the compartment 82 to hold them in position during assembly. The tube means 95 and 97 may be disposed in a plane parallel to the plane of the closure and offset from each other in this plane to provide a degree of counterbalancing to the subsequently described boltwork system partially contained therein.

III. Locking mechanism

A locking mechanism comprising a boltwork system 100 and a latching system 102 is provided for closing and

locking the closure 10 against unauthorized opening. The components of the boltwork system 100 may include bolt rod assemblies 103, 104, and 105 and a cam operating means 106 therefor. The cam operating means 106 has an external operating means such as a lever 108 disposed on the outer surface 20 of the closure 10, a cooperating cam plate 110 located within the metal compartment 82, and a shaft 112 operatively connecting the lever 108 to the cam plate 110. Since the boltwork assembly 100 is a critical part of the closure 10, against which a destructive attack might be most likely directed, special means are provided to prevent a destructive entry attempted by the use of excessive force on the external lever 108. The connecting shaft 112 may purposely have an inherent weakness such as a pair of annular kerfs 114 intermediate its ends to that upon the application of undue stress on the lever 108, the shaft 112 will break off at one of the kerfs 114. Preferably the kerfs 114 are located well within the interior of the closure 10 so that the stub section which would remain after break-off would not be readily accessible for the subsequent attachment of forcing tools. The shaft 112 may be enclosed in the tube means 98 and may have annular shoulders 116 and 118 for bearing against the outer surface plate 20 and the shield plate 90, respectively, to resist any attempt to drive or otherwise force the shaft 112 inwardly. The shaft 112 may then protrude a sufficient distance beyond the cam spacer 92 to accommodate the cam plate 110, a back-up plate 124, a lock washer 125, and a threaded means or nut 126 for holding these associated members on the shaft 112. To axially position the back-up plate 124 on the shaft 112 and prevent the rotation of one relative to the other, a section of the cylindrical shaft 112 adjacent the back-up plate 124 may have an irregularity in its circumference, such as two opposed flat sections 127, as shown in dashed lines in FIG. 1, which cooperate with a snugly fitted symmetrically irregular central aperture in the back-up plate 124. Thus the external lever 108, shaft 112, and back-up plate 124 may be rotated independently of the cam plate 110 until a desired relative position is reached; then the components may be fixed in this relative position by drilling through and tapping both plates 110 and 124, and joining them by a threaded shear pin 128 (see FIG. 1) which will shear if excessive force is applied to the external lever 108. This assembled structure prevents withdrawal of the shaft 112 from the closure 10 by an outside force.

The cam plate 110 may have its axis of rotation perpendicular to the plane of the closure 10, and may have a plurality of lobes 129, 130, 131, and 132, each containing an aperture 133 with its axis parallel to the axis of rotation of the shaft 112 for rotatably holding the cam engaging transverse ends 143, 144, and 145 of bolt rod assemblies 103, 104, and 105, respectively. An area of the cam plate 110 between the lobes 131 and 132 may contain a square-edged slot 148, as shown in FIG. 1, for cooperation with the movable bolt 150 of a relocking mechanism 160. The rotation of the cam plate 110 may be limited between normal locking and unlocking positions by a stop means comprising a stop lug 162 in lobe 131 of the cam plate 110 which may alternately engage one of two abutments 164 and 166, attached to the bottom surface of the pan forming the compartment 82 adjacent the cam plate 110. The cam plate 110 may also have a latch dog 170 located near the extremity of the lobe 132 for engaging a latch 172 of the boltwork system latching system 102 whereby the cam plate 110 is prevented from rotating in an unlocking direction, while the stop means prevents it from being rotated in the other direction.

The bolt rod assemblies 103, 104, and 105 may include cylindrical bolts 183, 184, and 185, having a diameter size which permits close sliding engagement with the flanged holes 45, 46, and 47 in the frame 24. The bolts 183, 184, and 185 are preferably chamfered at their outer ends 193, 194, and 195 to ease their entry into corresponding holes in the jambs of the cabinet upon which the closure 10 is

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to be attached. Bolt rods 203, 204, and 205 of various lengths may be attached to the other ends of bolts 183, 184, and 185 and extend to the cam plate 110, where their transverse ends 143, 144, and 145 are rotatably contained by the apertures 133 of cam plate 110. The bolt rods 203, 204, and 205 may have an offset portion 213, 214, and 215 adjacent the ends 143, 144, and 145, respectively, which offset portion may be held between the cam plate 110 and the bottom surface of the compartment 82, with a close sliding tolerance being maintained between these members by the cam plate spacer 92. Thus the bolt assemblies 103, 104, and 105 are jointly retained by the cam plate 110, without need for individual retention means, by merely dropping the cam plate 110 over the transverse ends 143, 144, and 145, and anchoring the cam plate in position.

The latching system 102 for the boltwork system 100 includes a movable latch 172 controlled by a latch mechanism 220 which may be a combination type lock mechanism connected to an external operating dial 222 by a shaft 224 disposed in a tube means 99 (see FIG. 3) between the outer surface plate 20 and the compartment 82. The dial 222 may have a surrounding protective annular metal collar 226 (see FIG. 3) attached to the outer plate 20.

The aforementioned structure permits the protective closure 10 to be closed on a related cabinet 34 and locked in this closed position by rotating the lever 108 in a locking direction until the stop means 162 strikes the abutment means 166. This causes the bolts 183, 184, and 185 to move outwardly so that portions of the bolts are in locking engagement with the cabinet 34, and also allows the latch 172 of combination controlled latch mechanism 220 to engage the latch dog 170 of the cam plate 110 which thereby prevents the rotation of the boltwork system away from the stop means 166. The closure may be unlocked and opened by reversing this process.

IV. Insulation

An insulative material 230 is contained in the space between the labyrinth 80 and the armored shell 15. The insulative material 230 may be fibrous or granulated, but is preferably an aerated or lightweight concrete mass containing vermiculite, or the like, which may be mixed, then poured into the space between the labyrinth 80 and shell 15, and allowed to set. The structural and insulative properties of the resultant mass may be varied widely by varying the concrete formulation, and by the inclusion of reinforcing materials, such as steel mesh, but such latter is not necessary in view of the reinforcing effect of the labyrinth 80 embedded in and substantially completely surrounding the insulation 230.

V. Assembly

The closure 10 may be assembled by first attaching the frame 24 to the outer plate 20 such as by welding. The assembly of the labyrinth 80 components may begin with the attachment of the lock shield plate 90 and tube means 98 and 99 to the locking mechanism compartment 82 adjacent apertures 88 and 89. The labyrinth support legs 84 may be attached to the unapertured side of the compartment 82, and the tube means 95 and 97 may be inserted through apertures 85 and 87 into the compartment a sufficient distance to allow their outer ends to clear the inner marginal edge of frame 24 and permit the positioning of the labyrinth 80 assembly in the mold shell formed by the frame 24 and outer plate 20. Then the compartment apertures 85, 86, 87, 88, and 89 may be aligned with holes 45, 46, and 47 in the frames 24, 26, and 28 in the outer plate 20. The aperture 86 may be engaged with annular flange 50 to support the adjacent end of the compartment 82. If the aperture 86 is spaced from flange 50 and a tube means spans the space therebetween, an additional support similar to leg 84 may be attached at the adjacent end of the compartment 82. The tube means 95 and 97

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may then be moved outward into engagement with their annular flanges 45 and 47, and the labyrinthian core may be tack welded in position.

Then the insulative material 230 may be poured into the space between the labyrinth 80 and the case 15 and levelled flush with the frame 24 and the inner edge of the compartment 82. If the inner plate 22 is used, which has a large access hole providing full access to the compartment 82, it may be welded to the frame 24 at any time after the insulation 230 is poured in place. The bolt assemblies 103, 104, and 105 may be inserted through holes 45, 46, and 47 in the frame, and at the same time the shaft 112 of the external operating lever 108 may be inserted through the outside end of its associated tube means 98.

Then the tips 143, 144, and 145 of the bolt assemblies may be oriented to allow them to slip into their associated apertures 133 in the cam plate 110 as the cam plate is dropped into position on the operating shaft 112 and followed by the cam back-up plate 124 and lock washer 125 and nut 126. The external lever 108 and back-up plate 124 may be rotated with respect to the cam plate 110 until a desired relative position is reached, whereupon the back-up plate 124 and cam plate 110 may be jointly drilled and tapped, and the threaded shear pin 128 installed therein. The externally operated combination lock mechanism 102 may also be installed at about the same time.

If a removable inner plate 23, having only a small access hole providing access only to the combination locking mechanism 102, is used (see FIG. 3), it must be removably attached to the frame 24 after the boltwork assembly 100 is installed. If inner plate 22 is used and already attached, the access cover 68 may be installed to complete the assembly of the closure.

While there is described above the principles of this invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example, and not as a limitation to the scope of this invention.

What is claimed is:

1. An insulated closure comprising:

- (A) an outer plate,
- (B) a frame around the edge of said plate giving thickness to said closure having a first hole therein,
- (C) a bolt work box having an open side flush with the inner edge of said frame, said box being spaced from said outer plate within the thickness of said closure and having a second hole therein aligned with said first hole,
- (D) a tube extending between the peripheral edges of said first and second holes, and
- (E) insulation means filling the space between said plate and said edge of said frame throughout the thickness of said closure including surrounding said tube and filling the space between said plate and said box.

2. An insulated closure according to claim 1 wherein said tube is attached at its ends to the peripheral edges of said holes.

3. An insulated closure according to claim 1 including an inner plate covering said insulation between said free edge of said frame and the edge of the open side of said box.

4. An insulated closure according to claim 3 including a removable cover for the open side of said box.

5. An insulated closure according to claim 4 wherein said cover has an opening permitting access to a combination lock in said box.

6. An insulated closure comprising:

- (A) an outer plate,
- (B) a frame around the edge of said plate giving thickness to said closure having a first hole therein,
- (C) a boltwork box having an open side flush with the inner marginal edge of said frame, said box being spaced from said outer plate within the thickness of

- said closure and having a second hole therein aligned with said first hole,
- (D) a passageway extending between the peripheral edges of said first and second holes,
- (E) insulation means filling the space between said plate and said edge of said frame throughout the thickness of said closure, exclusive of the said boltwork box, and surrounding said passageway,
- (F) an inner plate covering said insulation between said free edge of said box and the edge of the open side of said box, and
- (G) means for permanently anchoring said inner plate to the edges of said box and said frame.
7. An insulated closure comprising:
- (A) an outer plate,
- (B) a frame around the edge of said plate giving thickness to said closure,
- (C) a boltwork box having an open side flush with the inner edge of said frame, said box being spaced from said outer plate within the thickness of said closure,
- (D) at least one tube extending from said box to said frame for a movable connection between a bolt works in said box and a bolt projecting outwardly from said frame, and
- (E) insulation means filling the space between said plate and the edge of said frame throughout the thickness of said closure including surrounding said tube and filling the space between said plate and said box.
8. An insulated closure comprising:
- (A) an outer plate,
- (B) a frame around the edge of said plate giving thickness to said closure and having a first hole therein,
- (C) a box having an open side flush with the inner edge of said frame, said box being spaced from said outer plate within the thickness of said closure and having a second hole therein aligned with said first hole,
- (D) at least one of said holes having a flange around its periphery,
- (E) a tube extending between the peripheral edges of said first and second hole and fitting said flange on said one hole, and
- (F) insulation means filling the space between said plate and the edges of said frame throughout the thickness of said closure including surrounding said tube and filling the space between said plate and said box.
9. A protective closure comprising:
- (A) an outer plate,
- (B) an inner plate parallelly spaced therefrom,
- (C) a frame connected to the marginal edges of said plates giving thickness to said closure,

- (D) an armored labyrinthian core including
- (a) a central metal compartment with one side opening towards and flush with said inner plate, and
- (b) a plurality of enclosed metal passageways extending from said compartment to said frame and outer plate, and
- (E) boltwork system components insertable through the open side of said compartment and the outside ends of said passageways.
10. A protective closure according to claim 9 wherein said boltwork system includes a plurality of bolt means movably retained by a cam means.
11. A method of assembling an insulatively filled closure having an outer shell formed by inner and outer plates and a surrounding frame member therebetween giving thickness to said closure, a labyrinthian core within the shell having a central compartment with an open side flush with the inner surface of said frame and a plurality of tube means extending from said compartment to the outer plate or frame, said labyrinth containing a boltwork system including a plurality of bolt means movably retained by a cam means, said method of assembly thereof comprising the steps of:
- (A) permanently fastening the frame to the outer plate,
- (B) positioning the labyrinthian core within the thickness of the closure and supporting the core in position,
- (C) filling the closure with insulative material and leveling said material flush with the inner edge of the compartment and frame,
- (D) permanently fastening the inner plate to the frame,
- (E) inserting the bolt means through the frame end of the tube means, and securing the bolt means by installing the cam means, and
- (F) fastening a cover plate over a compartment access hole in the inner plate.

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