

June 30, 1970

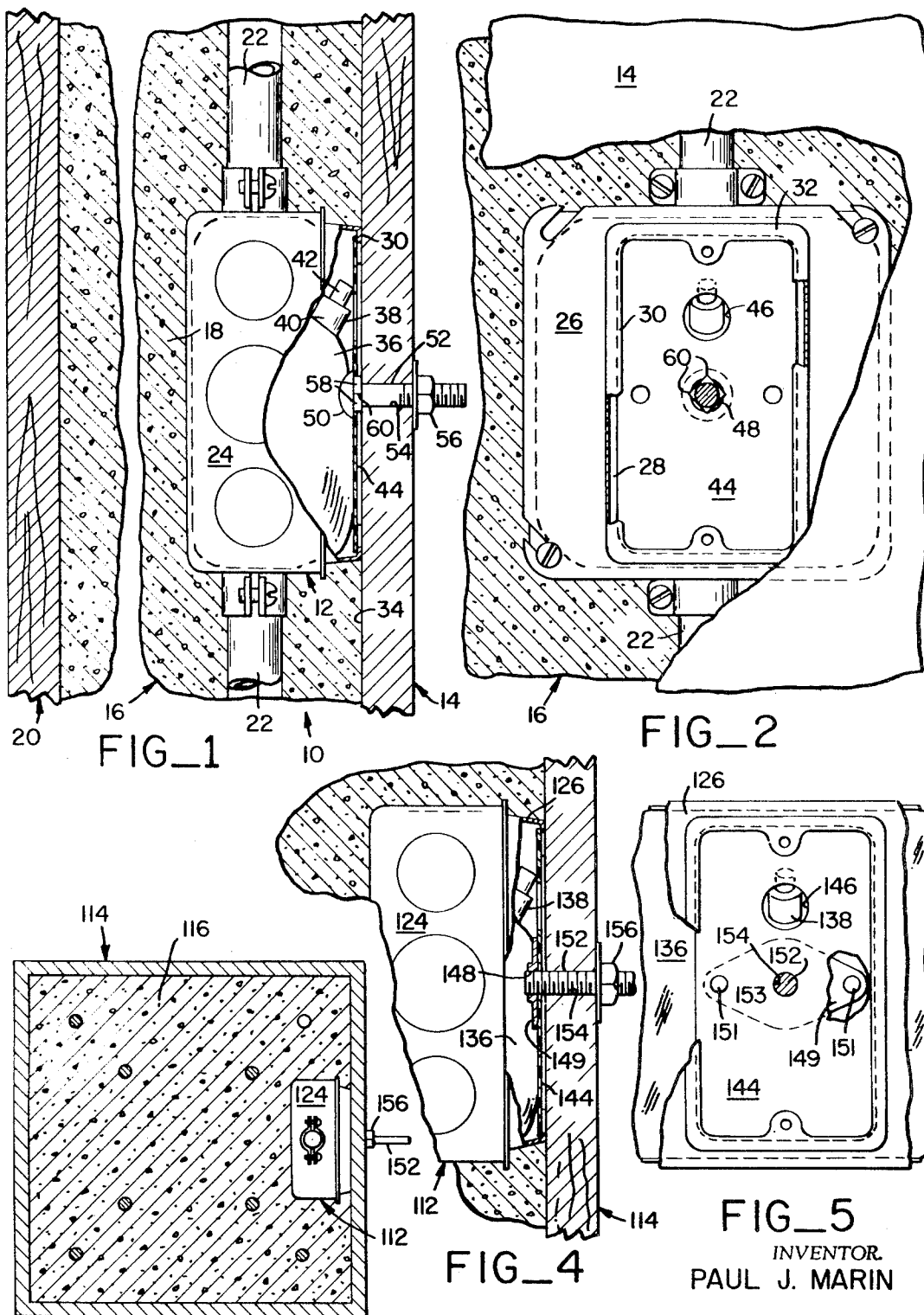
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3,518,331

METHOD FOR FORMING IMPROVED CONCRETE STRUCTURE

Original Filed May 5, 1966

2 Sheets-Sheet 1



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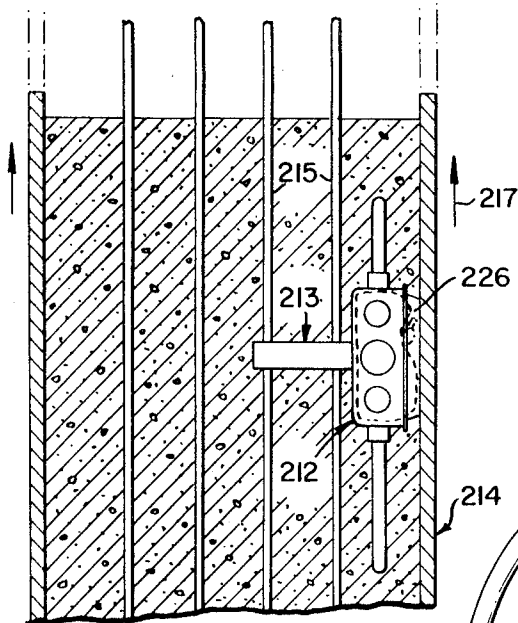


FIG_6

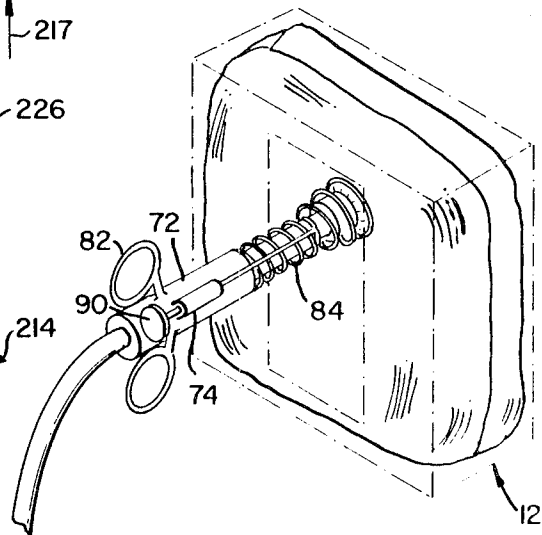


FIG_7

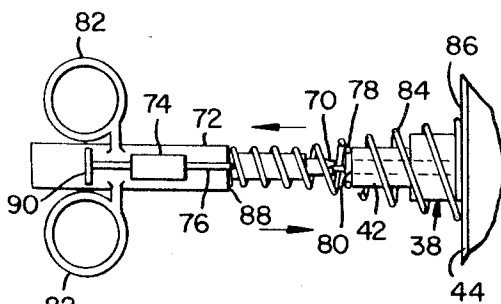
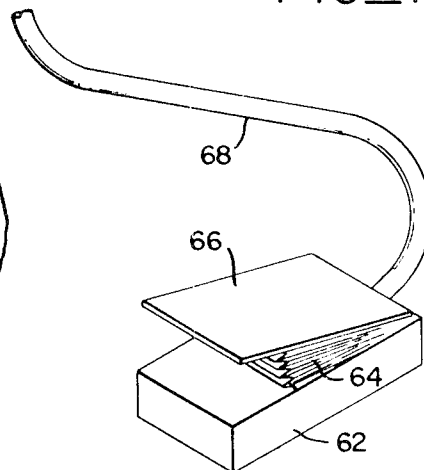


FIG_8



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METHOD FOR FORMING IMPROVED CONCRETE STRUCTURE

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Original application May 5, 1966, Ser. No. 548,007, now
Patent No. 3,453,788, dated July 8, 1969. Divided and
this application July 23, 1968, Ser. No. 764,356
Int. Cl. E04b 1/16; B28b 7/32

U.S. Cl. 264—35

6 Claims

ABSTRACT OF THE DISCLOSURE

A method of forming a concrete structure having a junction box embedded therein wherein an inflatable bag in the junction box is inflated before concrete is poured adjacent to the junction box to form the structure with the junction box embedded in one face thereof. The junction box is held against movement as the concrete is poured and the method is suitable for use with fixed and movable forms.

This is a division of application Ser. No. 548,007, filed May 5, 1966.

This invention relates to the formation of cementitious structures and, more particularly, to apparatus and a method for forming a concrete structure having an electrical junction box embedded in one face thereof.

The invention resides in apparatus and a method for constructing the above mentioned structure wherein an internally sealed junction box assembly is suitable for use with any one of the several available types of concrete forms. This junction box assembly has the usual wiring conduits connected to it and also has a removable, internally disposed seal which prevents concrete and moisture from entering the box as a mass of concrete is poured about the assembly and against a concrete form with which the assembly forms a construction unit. As the concrete sets, it forms a rigid structure having the assembly embedded in one face thereof and the conduits extending therethrough. When the form is removed, the assembly is accessible and the seal can be removed from it so that the necessary electrical wiring can be installed such as by threading it through the conduits and into the box.

The internal seal comprises an inflatable bag which is wholly retained by a closure member within the junction box assembly as the latter is fixed with respect to the concrete form. The main access opening of the junction box assembly is in juxtaposition to the inner face of the concrete form to assure that the assembly will be embedded in the corresponding face of the resulting concrete structure and thereby accessible when the form is removed.

The bag has a valve by which it is inflated and deflated and the valve, in a preferred form, has a stem which initially protrudes out of the box when the bag is to be inflated. The stem can also be forced into the box and against the inner surface of the closure member after the bag has been inflated. This avoids any lateral projections from the assembly and allows it to be properly positioned directly against the concrete form while its interior is effectively sealed by the bag.

In the past, tape of various kinds has been used to seal a junction box before concrete is poured about it. Taping the box is not only time-consuming but is expensive if a large number of boxes are involved. Other ways of sealing the box have included the use of paper, such as newspapers or the like, and sponge rubber or foam cubes or blocks. However, these materials are undesirable for this purpose because they absorb the moisture from the

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concrete and become hardened masses upon setting of the concrete, thus requiring time and effort to remove such masses from the junction box.

The use of an inflatable device for sealing a junction box has been disclosed in U.S. Letters Patent No. 2,652,168. However, the structure of this patent uses the valve stem of the inflatable device to mount the box in place against one face of an adjacent concrete form. This type of mounting seriously limits the use to which the seal can be put inasmuch as it cannot be used with a movable concrete form nor can it be used in a form of the type for constructing columns. These forms require that there be no parts projecting laterally from the junction box assembly as the forms are put in place and used. A movable form shifts relative to the assembly as the concrete is setting. A form for constructing a column must be lowered into place and this cannot be done if projections are across the path of the form as it is being lowered. Moreover, the valve stem mounting structure cannot be used with the usual type of form where, in the interests of saving time, the form is literally forced or pulled away from the hardened concrete mass and thereby the box. Such a force applied to the form would rip the inflatable device from the box since the valve is secured to the form. The device would, in all likelihood, be damaged or punctured so as to be no longer usable.

The present invention is adapted for use with all kinds of concrete forms and the inflatable bag which defines the seal of the invention can be used over and over again notwithstanding the rough handling to which it is normally subjected. The seal is not only simple and rugged in construction, but it is inexpensive and can be quickly and easily inserted into and removed from the junction box. The closure member is breakable so that it can be used with the usual type of form and will break when a lateral force is applied to the form to remove it to a new job site. With a form for constructing a column, the closure member may have a threaded bore which threadably receives a fastening member extending through and engageable with the opposite face of the form. With a moving form, the assembly can be fixed in place with the closure member in substantial juxtaposition to the form to allow for shifting of the latter as the concrete sets and the assembly remains in a position which does not interfere with the shifting movement.

It is therefore the primary object of this invention to provide an improved construction unit including an electrical junction box assembly capable of being mounted directly against any one of a number of different types of concrete forms and sealed from within by an internal seal to prevent the entrance therinto of concrete and moisture as concrete is poured about the assembly and against the form.

Another object of the invention is to provide a method of forming a concrete structure including the steps of pouring concrete about an internally sealed, electrical junction box mounted in place against one face of a concrete form wherein the steps of the method can be performed by using any of the various types of concrete form which are commercially available to thereby avoid the time and expense of modifying the forms to accomplish this purpose.

A further object of this invention is to provide structure for mounting the aforesaid junction box assembly on a concrete form to allow the form to be forced away from the assembly without having to disconnect the fastenings means to thereby simplify the removal of the form from the concrete structure in which the junction box is embedded.

Yet another object of the invention is to provide a junction box assembly which can be quickly and easily mounted on a concrete form of the type which is used to construct

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columns so that no basic modification of the form is necessary to thereby minimize construction costs.

Still another object of the present invention is to provide a junction box assembly which has no outwardly projecting components so that it is suitable for use with a movable concrete form if the need arises.

Other objects of this invention will become apparent as the specification progresses, reference being had to the accompanying drawings wherein:

FIG. 1 is a side elevational view, partly in section, of one embodiment of the invention showing a junction box assembly adjacent to one type of concrete form;

FIG. 2 is a front elevational view of the combination of FIG. 1, parts being broken away and in section to illustrate details of construction;

FIG. 3 is a top plan view of a second form of the invention, parts being in section, illustrating a junction box assembly in combination with a concrete form for constructing a column;

FIG. 4 is a view similar to FIG. 1 but relating to the structure of FIG. 3;

FIG. 5 is a view similar to FIG. 2 but relating to the structure of FIGS. 3 and 4;

FIG. 6 is a side elevational view of a third embodiment of the invention illustrating a junction box assembly with a movable concrete form;

FIG. 7 is a perspective view of an inflating device for use with the inflatable bag forming a part of the junction box assembly; and

FIG. 8 is a side elevational view of a portion of the inflating device and illustrating its use with the valve of the inflatable bag.

A building unit 10 forming one embodiment of this invention comprises a junction box assembly 12 and a concrete form 14 against which assembly 12 is disposed so that the assembly will be embedded in one face of a concrete structure 16 formed by the setting of a mass 18 of concrete poured about assembly 12 and into a space between form 14 and a second form 20. Forms 14 and 20 are of the conventional type, generally being of wood or metal and erected in place at the boundaries of the space in which structure 16 is to occupy. Assembly 12 is installed in this space before the forms are erected. Conventional wiring conduits 22 are coupled with assembly 12 and extend outwardly therefrom. These conduits extend through structure 16 and allow electrical wiring to be directed into and out of assembly 12.

Assembly 12 includes a junction box 24 of conventional construction having a main access opening in one side. Box 24 may have any configuration but, for purposes of illustration, it is substantially square and has a removable cover plate 26 provided with a central opening 28 therethrough permitting access to the box. A continuous flange 30 is integral with plate 26 and extends partially into opening 28 thereof as shown in FIGS. 1 and 2. Flange 30 also defines an outer surface 32 which engages the inner face 34 of form 14 when assembly 12 is in the operative position shown in FIG. 1.

An inflatable bag 36 is removably disposed within box 24 and has a valve 38 which permits it to be inflated and deflated. Valve 38 may be of any configuration so long as it can be disposed or put into a position wholly within assembly 12, i.e., within the boundaries defined by box 24 and cover plate 26 especially the side boundary defined by flange 30. For purposes of illustration, valve 38 includes a pair of relatively shiftable, telescoped stems 40 and 42, valve 38 being closed when stem 42 is at its innermost extremity with respect to stem 40 and valve 38 being open when stem 42 is at its outermost extremity with respect to stem 40. The lengths of stems 40 and 42 are such that valve 38 can be forced into assembly 12 after bag 36 has been inflated. Thus, valve 38 may project through opening 28 and outwardly of flange 30 to permit bag 36 to be inflated whereupon the valve is closed and then forced inwardly into the position shown in FIG. 1.

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A secondary closure plate 44 is provided to retain bag 36 within assembly 12 and is formed of breakable material for the reason set forth hereinabove. Plate 44 has a pair of spaced holes 46 and 48 therethrough and is normally disposed against the inner surface of flange 30 in substantial closing relationship to opening 28. Thus, the effective area of plate 44 is substantially equal to that of opening 28.

Hole 46 is provided to permit valve 38 to extend therethrough so that the valve can first be inflated and then forced inwardly of assembly 12 and against the inner surface of plate 44 as shown in FIG. 1. The plate thus retains the valve within the boundary defined by flange 30.

Hole 48 is adapted to receive head 50 of a bolt 52 which also extends through a hole 54 in form 14. A nut 56 is threaded on bolt 54 and secures the same to form 14.

Plate 44 is preferably formed from a suitable, breakable plastic material and head 50 has flats 58 which define corners 60. These corners are pressed into the material surrounding opening 48 so as to retain bolt 54 in a fixed position relative to plate 44 and thereby prevent rotation of bolt 54 relative to the plate when nut 56 is tightened. The relationship between corners 60 and plate 44 is shown in FIG. 2.

Bag 36 may be of any configuration so long as it effectively seals the interior of assembly 12. Box 24 generally has one or more small secondary openings therethrough, such as screw holes or the like. Moreover, the junctions between box 24 and conduits 22 present cracks if a tight fit is not achieved. These holes and cracks must be sealed before concrete is poured about assembly 12; otherwise the concrete and moisture seeps into the box and, after hardening, form deposits which are difficult to remove.

Bag 36 plugs these holes and cracks as well as blocks the openings of conduits 22. Thus, the concrete and moisture is kept out of box 24 and conduits 22. Bag 36 is preferably formed from a rugged material such as neoprene or the like which is suitable for having a valve attached thereto, so that the bag can be used over and over again and thereby minimize construction cost. A suitable bag is one formed of two square sheets of neoprene which are bonded by a heat treatment at their outer peripheries, one of the sheets having valve 38 previously secured thereto.

In use, assembly 12 is put into place with conduits 22 secured thereto. Bag 36 is then inserted into the box and plate 44 is disposed across openings 28. Valve 38 extends through openings 46 and bolt 52 extends through hole 48. The bag is then inflated to a sufficient degree to effectively seal the interior of box 24. The valve is then closed and forced inwardly and into the position shown in FIG. 1. Form 14 is then placed adjacent to assembly 12 and bolt 52 extends through hole 54 and nut 56 is threaded onto the bolt to secure assembly 12 to form 14. Form 20 is also put into place.

Concrete is then poured into the space between forms 14 and 20 and about assembly 12. Bag 36 prevents concrete and moisture from entering box 24 and surface 32 of flange 30 engages ends 34 of form 14 to provide a seal at this extremity of assembly 12.

After the concrete has set, structure 18 is formed and form 14 is removed therefrom by applying a lateral force thereto. This force is sufficient to cause plate 44 to break, thus providing access to bag 36 which is then deflated and removed from box 24. The interior of assembly 12 is thus accessible at the proximal face of structure 16 so that wiring can be directed through conduits 22 and into the box for the necessary electrical connections.

Bag 36 can be used again as a seal although a new plate 44 is required. Bolt 52 can be used again after it has been removed from form 14. By connecting plate 44 rather than valve 38 to form 14, the bag remains intact within box 24 when form 14 is forced laterally of structure 16. This permits the bag to be used again.

It has been found desirable to inflate bag 36 to a pressure of 3 to 5 pounds per square inch in order to effectively seal box 24. This pressure is ordinarily beyond the capabilities of a workman blowing into the valve. Thus, it is desirable to have an inflating device to inflate the bag. Such a device is illustrated in FIG. 7 wherein a housing 62 has a bellows 64 for pressurizing the interior of the housing when a foot pedal 66 is depressed. A conduit 68 in fluid communication with housing 62 leads from the latter to a tip 70 adapted to be inserted into stem 42. A rigid tube 72 surrounds conduit 68 adjacent to tip 70 and has a sleeve 74 mounted on its sides parallel to its central axis. A rod 76 is shiftably mounted within sleeve 74 and has a ring 78 on its outer end for engaging the end face 80 of stem 42. The purpose of rod 76 and ring 78 is to facilitate the removal of tip 70 from the interior of stem 42 after the bag has been inflated and after valve 38 has been closed. A pair of finger receiving rings 82 are secured to tube 72 to facilitate the handling of tip 70 and the use of rod 76. A coil spring 84 surrounds tip 70 and is engageable at one end thereof with the outer face 86 of plate 44. The opposite end of spring 84 engages a proximal end face 88 of tube 72. Spring 84 is conical to accommodate the increased diameter of stem 40. Tip 70 frictionally engages the inner surface of stem 42, thus requiring the use of rod 76 and ring 78.

In use, a workman inserts tip 70 into stem 42 and then pulls outwardly to open valve 38. Thereupon, pedal 66 is depressed to force air through conduit 68 and into bag 36. The valve is then closed by forcing stem 42 inwardly by moving tube 72 toward the valve. This compresses spring 84 and applies an outwardly directed bias force to tube 72. Ring 78 is then forced against end face 80 of stem 42 to hold the latter in the position of FIG. 8 as the workman pulls outwardly on tube 72. This action is facilitated by the bias force of spring 84 and tip 70 is removed from stem 42. Rod 76 has a head 90 which is engaged by the thumb to maintain rod 76 in a fixed position as tube 72 and thereby tip 70 is retracted from valve 38. After removal of tip 70 from stem 42, the inflating device can be moved to a new location for use in the same manner as described.

A second form of the invention is illustrated in FIGS. 3 to 5 and relates to the formation of a column denoted by the numeral 116 through the medium of a concrete form 114 having a number of interconnected sides. The form is initially constructed in a tubular configuration so that, in use, it is lowered into place surrounding the space in which the column is to occupy. This is done, of course, before concrete is poured into the space and if a junction box is to be employed with the column the junction box must be first positioned in the space before form 114 is lowered into its operative position.

Junction box assembly 112 is substantially identical to assembly 12 except for the fact that a closure plate 144 corresponding to plate 44 is provided with an internally threaded bore 148 for receiving an externally threaded bolt or fastener 152 extending through a hole 154 in form 114, hole 154 being aligned with bore 148 as shown in FIG. 4.

Bore 148 may be formed in any suitable manner but, for purposes of illustration, is formed in an adapter element 149 having projections 151 which snap into place through spaced holes 153 provided in plate 144, the latter being identical in construction to plate 44. Another hole 146 in plate 144 permits valve 138 of bag 136 to extend outwardly of assembly 112 so that the bag can be inflated after it has been inserted in the junction box 124. Since plates 44 and 144 can be formed from plastic, such as relatively rigid polyethylene or the like, these components can be stamped to form not only the plate configuration but also the various holes extending there-through. Thus, plates 44 and 144 are identical and are interchangeable. However, plate 44 is broken after a

single use whereas plate 144 can be used over and over again.

In use, assembly 112 is disposed in the space to be occupied by column 116. It is mounted in the space in any suitable manner, but generally it will be so mounted by the use of the various wiring conduits associated therewith. The height of assembly 112 will be predetermined so that, after form 114 is lowered into place, holes 148 and 154 will be aligned with each other.

Bolt 152 is then inserted into hole 154 and threaded into bore 148 and a nut 156 is tightened on bolt 152 to draw assembly 112 against the inner face of form 114. All of the foregoing will follow the steps of placing bag 136 and plate 144 in box 124 and inflating the bag to seal the various openings of assembly 112.

After the form has been lowered into place, concrete is poured into the form and is allowed to set to form a rigid structure. Bolt 152 is then removed from bore 148 and hole 154 to allow form 114 to be raised, thus permitting access to assembly 112 whereupon bag 136 can be deflated and removed after the main closure plate 126 has been temporarily removed from box 124. Also, valve 138 can be manipulated so that it extends through hole 146 to permit the opening of the valve and the deflating of the bag. Plate 144 can be forced inwardly and then tilted so as to permit its removal as well as the removal of the bag from the box.

A third embodiment of the invention is illustrated in FIG. 6 and employs a junction box assembly 212 substantially identical in all respects to assemblies 12 and 112, i.e. it has a junction box 224, a main cover plate 226 and an internal seal defined by an inflatable bag and a secondary closure plate identical to bags 36 and 136 and plates 44 and 144 respectively. Assembly 212 is to be used with a movable form 214 of the type which advances a predetermined distance per unit time. In using this form, no projections can exist on assembly 212 since the form moves relative to the junction box. To mount assembly 212 in place, a bracket 213 is secured in any suitable manner to box 224 and connected to reinforcing rods 215 or other structure in the space to be occupied by a mass of concrete poured about assembly 212. Bracket 213 and rods 215 thus position assembly 212 directly adjacent to and in juxtaposition with the inner face of form 214.

In use, assembly 212 is mounted in place before form 214 is erected. The bag and closure plate are placed into box 224 and the bag is inflated following which the stem of the valve is forced inwardly and against the inner surface of the closure plate. The form is then put into place and the concrete is poured and allowed to set. During the setting of the concrete, the form moves in a certain direction such as in the direction of arrow 217. During this time, assembly 212 is maintained in a fixed position and does not interfere with the movement of the form while at the same time the interior of the box is effectively sealed. Upon removal of the form, the bag enclosure plate can be removed from box 224 to permit installation of the necessary wiring.

The inflating device of FIGS. 7 and 8 can be used with the second and third embodiment of the invention as well as the first embodiment. Moreover, both the bag and closure plate of the second and third embodiment can be used over and over again to minimize construction costs.

The present invention provides a means by which a junction box can be quickly and easily positioned so that it will be embedded in one face of a concrete structure. The method of this invention facilitates the construction of a such a structure with the junction box embedded therein. A significant saving in time, effort and material is realized with the use of the invention when compared with conventional materials and method for accomplishing the same purpose.

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While several embodiments of this invention have been shown and described, it will be apparent that other adaptations and modifications can be made without departing from the true spirit and scope of the invention.

What is claimed is:

1. The method of forming a cementitious structure having a junction box embedded therein comprising the steps of: placing a junction box assembly having an access opening into a space adjacent to a region to be occupied by a form; placing an inflatable bag having inflation means into said assembly in a position with said inflation means extending outwardly from the assembly when the bag is inflated and being movable into the assembly after the bag is inflated; inflating the bag while retaining the bag in the assembly to cause said access opening to be closed and thereby sealed against the entrance of concrete into the assembly; moving said inflation means into the assembly; placing a form in said region and in substantial juxtaposition to the access opening of said assembly when said inflation means is wholly positioned within said assembly; holding said assembly against movement relative to said space independently of said inflation means; pouring concrete in said space; allowing the concrete to set to define said structure; removing the form from the structure; and deflating and removing the bag from the assembly.

2. The method as set forth in claim 1, wherein said holding step includes placing a breakable member between said bag and said access opening, and including the step of securing the member to the form, whereby the form can be removed from said structure by applying a force to the form sufficient to break said member.

3. The method as set forth in claim 1, wherein said holding step includes placing a closure member having a threaded bore across said access opening, and including the step of placing a threaded fastener having a lateral projection through said form and into threadably coupled relationship with said bore with said projection in engagement with the side of said form opposite to the side thereof adjacent to said assembly.

4. The method as set forth in claim 1, wherein the

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holding step includes the step of placing reinforcing rods in said space, and coupling the assembly to said rods to maintain the access opening in substantial juxtaposition to said region.

5. The method of forming a cementitious structure having a junction box embedded in one face thereof comprising: placing a junction box assembly having an access opening into a space surrounding a region to be occupied by a form; securing said assembly against movement from within said space with said access opening in substantial juxtaposition to said region; placing an inflatable bag having inflation means into the assembly with the inflation means being wholly positionable within the assembly; inflating the bag while retaining the bag in the assembly to thereby close said access opening against the entrance of concrete thereinto; moving a form into the region when the inflation means is wholly positioned within the assembly; pouring concrete in said space; allowing the concrete to set to define a structure having a face in which the assembly is embedded; moving the form along said face as set concrete sets; and deflating the bag and removing the same from the assembly.

6. The method as set forth in claim 5, wherein said inflating step includes holding the bag against movement out of the assembly through said access opening, and positioning the inflation means wholly within said assembly after the bag has been inflated and before said form is moved into said region.

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