

May 19, 1964

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PNEUMATIC CLOSURE FOR MULTICOMPARTMENT RECEPTACLE

Filed June 19, 1963

2 Sheets-Sheet 1

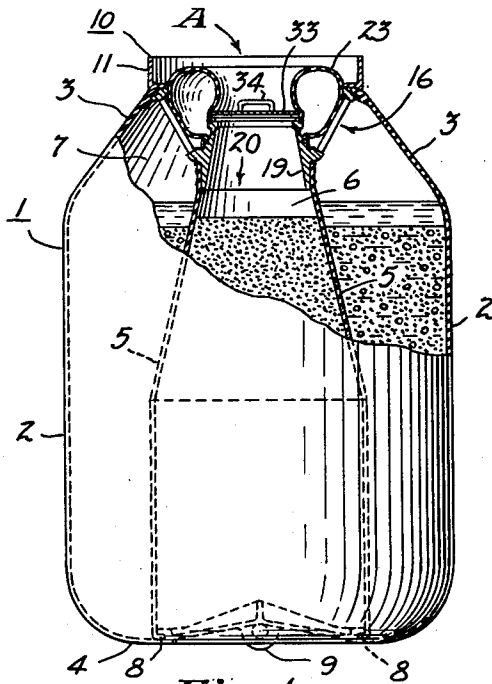


Fig. 1

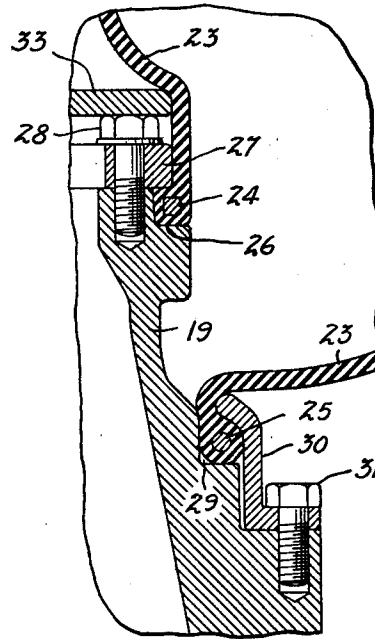


Fig. 3

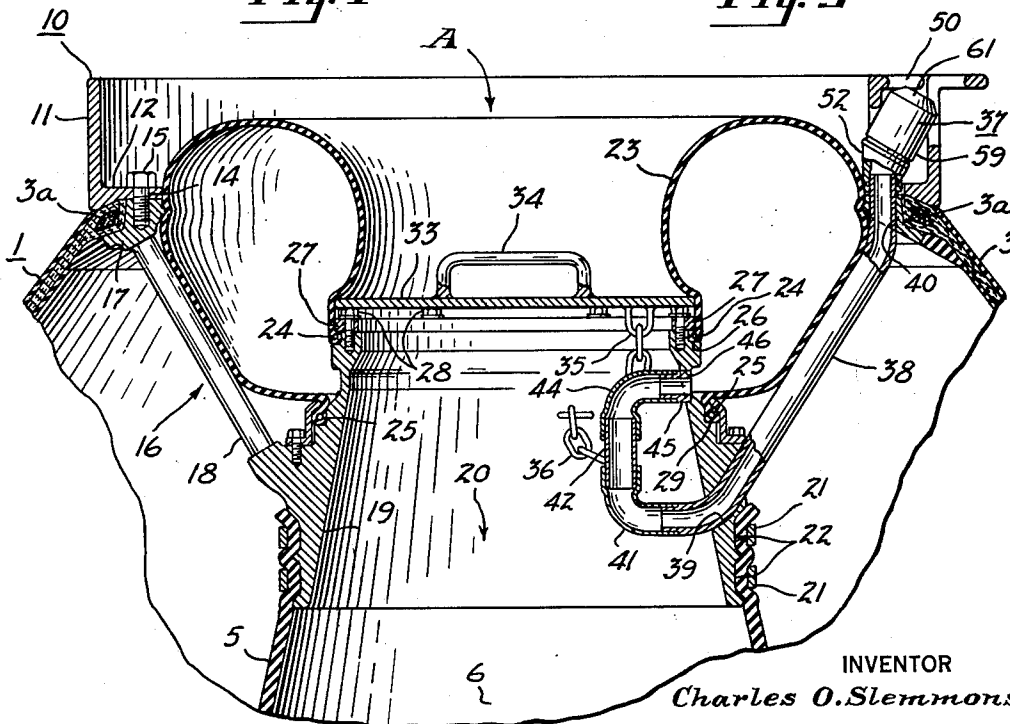


Fig. 2

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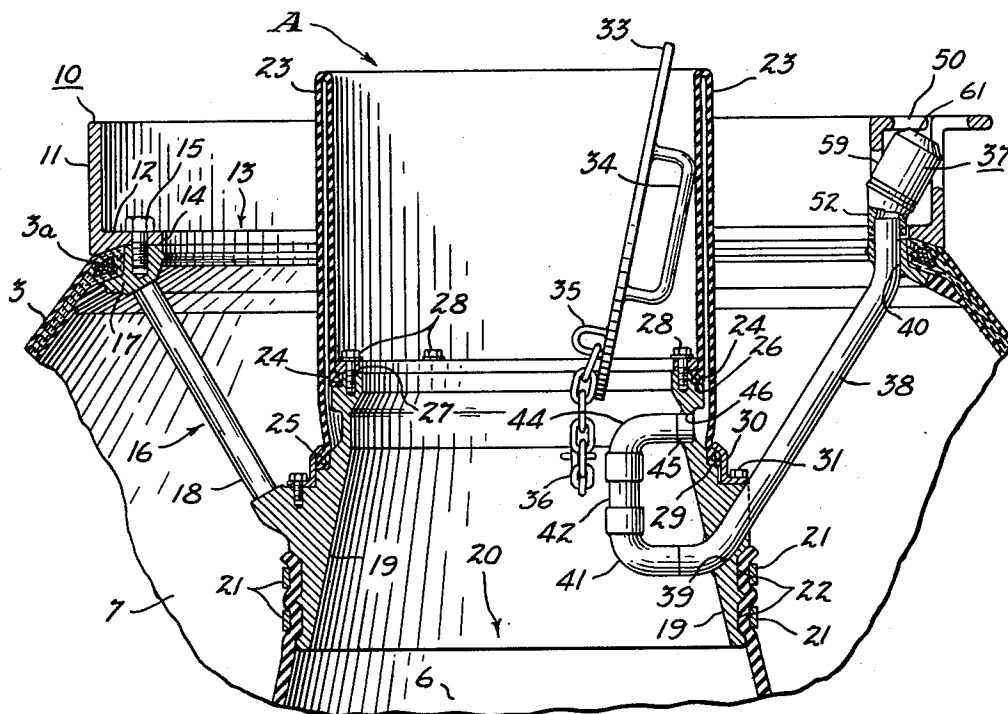


Fig. 4

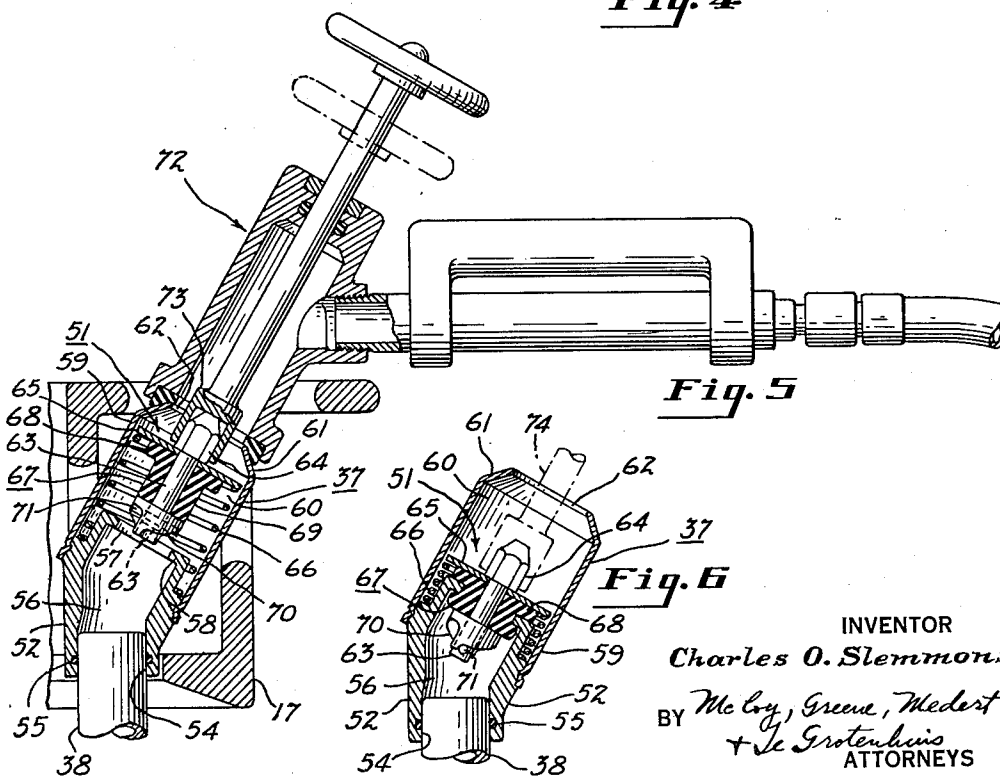


Fig. 5

Fig. 6

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PNEUMATIC CLOSURE FOR MULTICOMPARTMENT RECEPTACLE

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This invention relates to pneumatic closure devices and more particularly to a pneumatic closure for sealing the access end of a multicompartment concrete mix receptacle for transporting the ingredients of the concrete mix to the location where the charge is to be mixed and poured.

It is desirable in multicompartment concrete mix receptacles of the type having a water-proof inner compartment for receiving dry cement and a water-proof outer compartment for receiving water and aggregate such as that shown in U.S. patent application of Darling et al., Serial No. 153,024, filed November 17, 1961, that the access end of each compartment have a means for providing an air-tight seal. This is essential in order to prevent evaporation of water in the compartment containing the water and aggregate, and to prevent moisture from contacting the dry cement in the cement compartment.

Heretofore, closure devices on multicompartment concrete mix receptacles have been of the sleeve type wherein a flexible fabric sleeve is attached to the opening of each compartment to provide a guide channel for charging the compartment with mix. After the compartments were charged, the sleeves were folded back against the access end of the receptacle.

An improvement over this arrangement is shown in the U.S. patent application of Beck, Serial No. 262,032, filed March 1, 1963, wherein an inflatable sealing device is used to close the access to each compartment and provide a greatly improved sealing of the receptacle.

The closure of the present invention is an improvement over the structure shown in application Serial No. 262,032, and provides for a more convenient operation of the closure and a lower cost construction. The closure utilizes a flat metal plate that cooperates with an annular pneumatic bag which expands both inwardly and outwardly when inflated to seal the outer compartment and also to seal the flat metal plate over the access to the inner compartment. Thus, when sufficient air pressure is introduced into the bag, the walls of the bag will engage both the surfaces defining the access or throat to the outer compartment and the edges of the circular plate which seals the access or throat to the inner compartment.

It is an object of the present invention to provide a closure for a multicompartment concrete mix receptacle which may be used to provide an air-tight seal for the compartments of the receptacle once the receptacle has received its charge and which may be easily opened to permit the contents of the receptacle to be dumped.

Another object of the present invention is to provide a closure for a multicompartment concrete mix receptacle which is of simple, low cost construction and which requires special equipment to operate so as to prevent accidental or inadvertent opening of the compartments.

It is a further object of the present invention to provide a pneumatic closure for a multicompartment concrete mix receptacle which may be installed in the access to the receptacle and which may be easily inflated to seal the compartments once the receptacle is charged, and deflated when it is desired to dump the charge for mixing.

It is a further object of the present invention to provide a pneumatic closure for a multicompartment concrete mix receptacle of the type having an annular outer compartment and a circular inner compartment located

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within said outer compartment, which is arranged to seal the compartments independently of one another to prevent evaporation of water in the compartment containing water and aggregate, and to prevent the entry of moisture into the compartment containing the dry cement.

The multicompartment concrete mix receptacle of the type for which the closure of the present invention is designed generally has an outer tubular wall which is composed of rubber reinforced with a plurality of plies of tire fabric and which has inwardly extending ends, terminating in inextensible beads to which end closures may be connected. The receptacle is divided into inner and outer compartments by an inner tubular wall of rubber which is sealed from the outer wall by connection at its opposite ends to such end closures.

Reference should be had to the accompanying drawings forming part of this specification in which:

FIGURE 1 is a front elevation with parts broken away, of a multicompartment receptacle having a pneumatic closure embodying the invention;

FIGURE 2 is a longitudinal central section on an enlarged scale of a pneumatic closure embodying the present invention showing the pneumatic bag in its inflated condition;

FIGURE 3 is a fragmentary longitudinal central section showing the arrangement for clamping the flexible pneumatic bag material to the inner ring of the frame;

FIGURE 4 is a longitudinal central section of a pneumatic closure embodying the present invention, showing the pneumatic bag in its collapsed or deflated condition;

FIGURE 5 is a fragmentary longitudinal section of the device of the present invention showing the inflation valve being engaged by an inflating tool;

FIGURE 6 is a fragmentary longitudinal central section showing the inflation valve located in the outer ring of the closure being engaged by a hexagonal socket wrench for deflation of the pneumatic bag.

Referring more particularly to the drawings, there is shown a multicompartment receptacle of the general type for which the pneumatic closure of the present invention is designed. The receptacle generally comprises an outer flexible tubular wall 1 formed of fabric reinforced rubber, the wall 1 having an elongated body portion 2 of substantially cylindrical form and end portions 3 and 4 extending radially inwardly from the body portion. The end portions 3 and 4 terminate in beads which define central openings at the ends of the receptacle, the beads being reinforced with inextensible bead rings 3a such as those used in beads of pneumatic tires as disclosed in copending application Serial No. 153,024, referred to above.

The receptacle has an inner flexible tubular wall 5 of elastic rubber that extends axially of the receptacle to divide the same into an inner compartment 6 and an outer compartment 7 that surrounds the compartment 6. The inner wall 5 has a cylindrical body portion with an inward turned end portion 8 clamped to a closure plate at the end of the receptacle opposite the access opening, throughout its circumference. Normally, water and aggregate, in a measured quantity to provide a desired concrete mix, are poured into the outer compartment 7, and dry cement, also of a measured quantity to provide a desired concrete mix, is poured into the inner compartment 6.

When it is desired to empty the compartments for mixing the dry cement, water and aggregate, the receptacle may be carried by an eye 9 at the bottom of the receptacle and supported in an inverted position while the ingredients are dumped into a concrete mixer.

Located at the access end of the receptacle is a closure A embodying the present invention as best shown in FIGURES 2 and 4. The closure comprises a frame assembly broadly indicated by the numeral 10 for mounting

the closure members. The frame assembly 10 includes an outer annular ring 11 to which the outer wall 1 of the receptacle is attached. The frame ring 11 has an inwardly flanged portion 12 which defines a circular opening forming a throat 13 (FIGURE 4) for the outer compartment 7. Located in the flanged portion 12 are circular openings 14 for receiving bolts 15 which engage a spider member 16. The spider member 16 includes an outer ring 17 which engages the flange 12 of the frame ring 11 and which serves to clamp the end portion 3 of the outer tubular wall to the frame ring, a series of downwardly and inwardly extending radiating bars or rods 18, and an inner ring 19 supported by said bars or rods 18. The inner ring 19 forms an inner wall for the throat 13 of the outer compartment 7 as shown in FIGURE 4, and the outer wall of the throat 20 of the inner compartment 6. The wall of the inner compartment 6 is attached to the outer portion of the inner spider ring 19 by circular bands 21 which compress a portion of the rubber material into annular grooves 22 in the ring 19.

Attached to the inner spider ring 19 is a flexible annular pneumatic bag 23 preferably formed of a rubber coated fabric material. The bag is preferably formed from a continuous rubber sleeve having circular beads 24 and 25 suitably reinforced with bead wires embedded therein.

In assembled relation, the beads 24 and 25 fit tightly against the outer wall of the inner spider ring 19, forming an air-tight seal. The bead 24 fits in an annular groove 26 at the upper end portion of the inner spider ring 19. A circular retaining ring 27 holds the beaded portion of the bag 23 tightly in the groove 26. The retaining ring 27 is bolted to the inner spider ring 19 by machine screws 28 which engage threaded openings in the ring 19.

The bead 25 fits in an annular groove 29 in the inner spider ring 19 as best shown in FIGURE 3, and is retained in position by a circular retaining ring 30. The retaining ring 30 is bolted to the inner spider ring 19 by machine screws 31 which engage threaded openings in the ring 19.

A closure plate 33, preferably formed of metal, fits over the access end of the inner throat 20. In closed position the peripheral edge portions of the plate 33 engage the upper ends of the machine screws 28 as best shown in FIGURES 2 and 3. A U-shaped handle 34 is welded to the plate 33 to provide a convenient hand grip for positioning or removing the plate. An eye 35 is welded to the bottom surface of the plate and is attached to a chain 36 which is welded to the wall of the inner spider ring as shown in FIGURES 2 and 4. The chain provides a convenient means for anchoring the plate 33 to the receptacle when the pneumatic bag 23 is deflated and the receptacle is inverted for dumping.

When the pneumatic bag is inflated with the plate in position at the access to the inner throat, the walls of the bag expand outwardly and engage the outer spider ring 17, thus providing an air-tight seal for the outer throat 13 as shown in FIGURE 2. The walls of the bag also expand inwardly to sealingly engage the peripheral edge and the marginal portion of the top face of the closure plate 33, thus firmly holding the closure plate 33 in position over the access to the inner compartment and providing an air-tight seal for the inner throat 20. When deflated, the bag 23 collapses to the position shown in FIGURE 4 and the closure plate 33 may be moved from its throat closing position, thus providing an access to and from both the inner and outer compartments.

Located in the outer frame ring 11 is an inflation valve 37 shown in detail in FIGURES 5 and 6, which may be used to either inflate or deflate the pneumatic bag 23. The internal portion of the valve is connected to a steel tube 38 extending from the frame ring 11, through an opening 39 in the inner spider ring 19 as shown in FIGURES 2 and 4. The tube 38 is welded in the opening 39 to provide a water-tight seal between the inner spider ring 19 and the tube 38. The outer end of the tube 38

is welded in an opening 40 in the outer spider ring 17 to provide a water-tight seal.

An elbow 41 connects the inner end of the tube 38 to another short length of tube 42. Attached to the other end of the tube 42 is a second elbow 44 which in turn is connected to a short length of pipe 45 welded to provide an air-tight seal in an opening 46 in the inner spider ring 19, intermediate the grooves 26 and 29, which receive the circular beads 24 and 25. This arrangement forms an air passage from the valve 37 to the pneumatic bag 23 and provides a convenient means for inflating or deflating the pneumatic bag through the valve 37.

In assembled relation, the valve 37 is recessed below the top of the frame ring 11 and within a protected chamber 50 formed therein to prevent accidental activation of a valve pin assembly 51.

The valve includes a base member 52 which has an opening 54 for receiving the tube 38. A rubber O ring 55 mounted on the tube 38 fits in an annular groove in the opening 54 to seal the base 52 on the tube 38. The opening 54 provides access to an inner cavity 56 formed in the base 52. The base also has a second opening 57 formed by a circular interned flange 58, which is adapted to receive the valve pin assembly 51 when the valve is closed.

Mounted on the base and surrounding the opening 57 is a cylindrical cover 59 which extends upwardly from the base and forms a cylindrical chamber 60. The cover 59 is tightly fitted to the base 52 to provide a tight seal, and has an inwardly coned circular flange 61 at its end opposite the base 52 which forms a circular opening 62.

Mounted within the chamber 60 is the valve pin assembly 51 which is arranged to seal the opening 57 when the valve is closed. The valve pin assembly 51 includes a central shaft 63 having a hexagonal head 64 at one end, adapted to be received in a hexagonal socket of the proper size.

Mounted on the shaft 63 adjacent the head 64 is a flat circular washer 65 adapted to engage, at its outer edge portion, a coil spring 66. The spring 66 bears against the base 52 and is arranged to bias the valve pin assembly to the valve open position. The spring is of a proper size to fit within the chamber 60 and adjacent the walls of the cylindrical cover 59.

Mounted on the shaft 63 adjacent the washer 65 is a circular grommet 67 preferably formed of a resilient sealing material such as rubber or other suitable elastomer. The grommet 67 has an outwardly flanged end portion 68 which bears against the washer 65, and a narrower cylindrical portion 69 of a proper size to fit through the opening 57.

At the end of the shaft 63 adjacent the grommet 67 is a cam member 70 mounted for rotation with the grommet 67 relative to the shaft 63. The cam member 70 is retained on the shaft 63 by a pin 71 extending transversely through the shaft 63 and engaging the cammed surfaces of the cam member 69. The camming surfaces have a helicoidal form whereby turning the hexagonal head 64 clockwise moves the cam member 70 upward on the shaft 63 and squeezes the grommet 67.

To inflate the pneumatic bag 23 through the valve 37, a suitable inflation tool 72 such as that shown in FIGURE 5 is brought into sealing engagement with the flange 61. With the valve in open position, compressed air is then forced through the tool 72, into the cavity 56 and thus, into the pneumatic bag 23 to inflate the bag to its sealing condition.

A hexagonal socket 73 rotatably mounted in the tool 72 is then placed over the hexagonal head 64 and the valve pin assembly 51 depressed to push the cam member 69 and the narrower portion 68 of the grommet 67 through the circular opening 57 in the base 52. In this position the outwardly flanged end portion 68 of the grommet 67 engages the interned flange 58 which forms the circular opening 57.

With the valve pin assembly thus depressed, the socket 73 is rotated clockwise to turn the shaft 63. The cam member 70 is held against rotation with the shaft 63 by friction between the grommet 67 and washer 65, between the washer 65 and spring 66 and between the cam member 70 and the grommet 67, and the cam member 70 is moved upward to expand the grommet radially outwardly by turning movement of the shaft 63 in the grommet 67 and thus seal the grommet 67 in the opening 57 as shown in FIGURE 5.

To deflate the bag 23, a hexagonal socket wrench 74 of the proper size may be placed over the head 64 as shown in FIGURE 6, and turned counterclockwise. This rotates the pin 71 relative to the cam member 70 and moves the cam member 70 toward the end of the shaft 63. With the pressure against the grommet 67 released, the cylindrical portion 69 returns to its normal diameter. The valve pin assembly then moves upward through the circular opening 57 and the compressed air within the closure is released.

It will be understood that the above description is by way of illustration rather than limitation and that variations and modifications of the specific device herein shown and described may be made without departing from the spirit of the invention.

Having thus described my invention, I claim:

1. A pneumatic closure device for a multicompartment concrete mix receptacle with an inner compartment and an outer compartment, comprising a frame assembly forming an outer throat for entry into said outer compartment and an inner throat within said outer throat for entry into said inner compartment; a removable closure plate adapted to close said inner throat and an inflatable pneumatic bag mounted within said outer throat and arranged to expand within said outer throat when inflated to seal said outer compartment and to expand radially inwardly against said closure plate to seal said inner compartment.

2. A pneumatic closure device for a multicompartment concrete mix receptacle with an inner compartment and an outer compartment, comprising a frame assembly forming an outer throat for entry into said outer compartment and an inner throat within said outer throat for entry into said inner compartment; an inflatable pneumatic bag of rubber coated material mounted within said outer throat and arranged to expand when inflated to seal said outer compartment; means cooperating with said inflatable pneumatic bag for sealing said inner compartment, said means comprising a plate adapted to close said inner throat and arranged for sealing engagement with said pneumatic bag when said bag is inflated.

3. A pneumatic closure device for a multicompartment concrete mix receptacle with an inner compartment and an outer compartment comprising a frame assembly having a continuous rigid outer wall forming an outer throat

for entry into said outer compartment and a continuous rigid inner wall forming an inner throat for entry into said inner compartment, said frame assembly having an annular inflatable pneumatic bag mounted within said outer throat and arranged to expand within said outer throat to seal said outer compartment and to collapse when deflated to provide entry into said outer compartment; means for inflating said pneumatic bag and removable means cooperating with said pneumatic bag for closing said inner throat to seal said inner compartment upon inflation of said pneumatic bag.

4. A device as defined in claim 3 wherein said removable means for closing said inner throat comprises a plate adapted to engage said rigid inner wall and arranged for sealing engagement with said inflatable pneumatic bag.

5. A device as defined in claim 4 wherein said inflating means comprises a valve located in said rigid outer wall and an air conduit communicating from said valve to said pneumatic bag for introducing compressed air through said valve into said pneumatic bag.

6. In combination, a multicompartment concrete mix receptacle formed of flexible rubber coated fabric material and having an inner compartment and an outer compartment, and a pneumatic closure for said receptacle comprising a frame assembly forming an outer throat for entry into said outer compartment and an inner throat within said outer throat for entry into said inner compartment, an inflatable pneumatic bag of rubber coated material mounted within said outer throat and arranged to expand within said outer throat when inflated to seal said outer compartment, removable means cooperating with said pneumatic bag for closing said inner throat to seal said inner compartment; and means for inflating said pneumatic bag.

7. A combination as defined in claim 6 wherein said inflating means comprises a valve mounted in said frame, external to said outer throat and an air conduit communicating from said valve to said pneumatic bag.

8. A pneumatic closure device of the type herein described comprising a frame assembly having an outer ring and an inner ring supported within said outer ring, said rings defining an annular outer throat and a central opening, an inflatable pneumatic bag mounted within said outer throat and arranged to expand when inflated to seal said outer throat, means providing a closure for said central opening, said means being adapted for sealing engagement with said pneumatic bag when said bag is inflated.

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