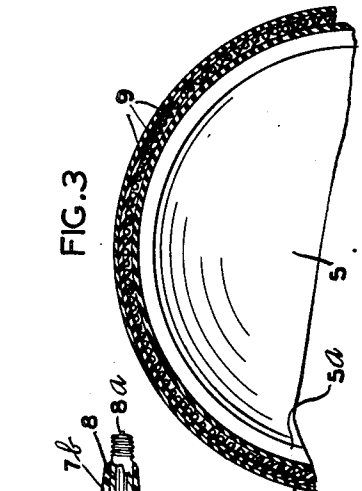
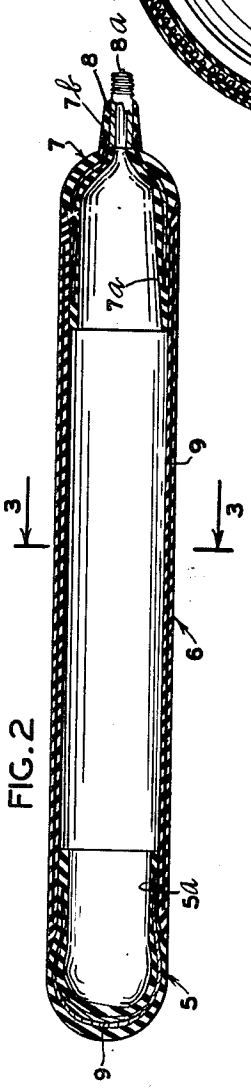
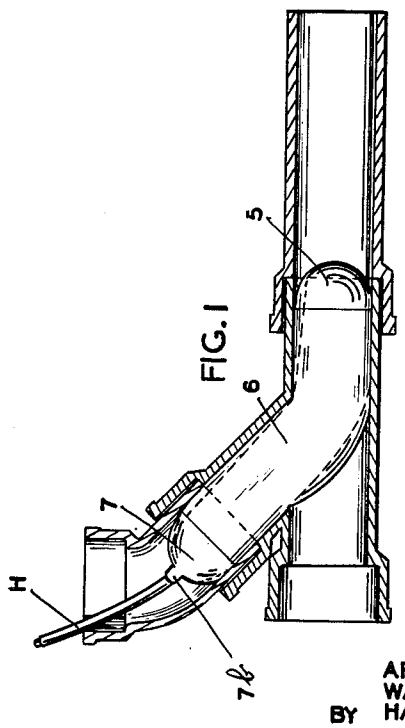
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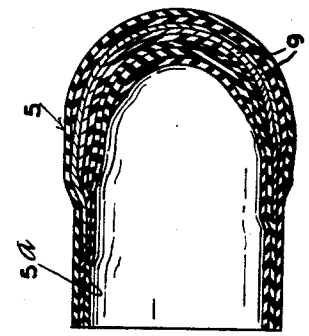
INFLATABLE PLUG BAG FOR TESTING PLUMBING

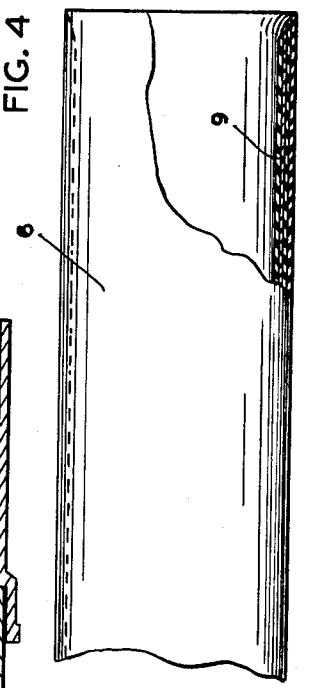
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INFLATABLE PLUG BAG FOR TESTING PLUMBING

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1 Claim. (Cl. 138—93)

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This invention relates to a device for efficiently closing and sealing the Y fittings or other sewerage connection pipes in the basements of buildings between the plumbing system of the building and the communication with the public sewerage facilities. Practically all cities and many urban centers require tests to be made upon installation of plumbing to detect possible leaks in the installed plumbing system and in the connections thereof with the sewer branches. In conducting such tests a series of plugs or sealing closures are installed through the branch or Y fitting for closing off usually the three conduits or passages connected with the branch. Unless the three passages are effectively sealed, the tests will not be successful.

It is an object of our invention to provide a comparatively simple but highly efficient unitary device, expansible by inflation and flexible for turning a corner to simultaneously seal the three passages in communication at the interior of the branch fitting for enabling air pressure tests and water flushing tests to be made in a plumbing system installed, in a building.

A further object is the provision of a flexible and reinforced pneumatic plug of elongated bag formation which may be readily slipped and forced into the communication portion of a Y fitting through the clean-out opening and which thereafter may be inflated to distand portions of the bag to very completely seal each and all of the three passages in communication.

A further object is the provision of a simple and highly efficient method for manufacturing our pneumatic plug-bag with provision of reinforcements and smooth peripheral surface throughout.

These and other objects and advantages of our invention will be more apparent from the following description made in connection with the accompanying drawings wherein like reference characters refer to similar parts throughout the several views and in which:

Fig. 1 is a vertical section taken longitudinally through a Y pipe in a plumbing and sewerage system for a building having installed therein an embodiment of our invention; the dotted lines indicating the plug-bag prior to inflation;

Fig. 2 is a section taken axially of an embodiment of our invention in deflated condition;

Fig. 3 is a cross section taken on the line 3—3 of Fig. 2 showing the helical winding of the body of the bag and the longitudinally disposed cord reinforcement impregnated in the pliable rubber; and

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Fig. 4 is an exploded, fragmentary view showing a preparation of the body of the bag and one of the plug ends prior to telescopic connection thereof and prior to vulcanization and curing.

As shown in the drawings, our pneumatic test bag or plug is of greatly enlarged, sausage shape having a very smooth, unseamed periphery throughout and presenting a continuous, unbroken surface from the axis at the ends to the center of the body. The bag when manufactured, constitutes an integrated unit constructed from pliable, elastic material such as rubber with ends and preferably body strongly reinforced by cord fabric wherein the individual cords extend generally longitudinally of the body and are circumferentially spaced.

Our bag plug is preferably made up from two separate plug like ends and a body of cylindrical form. The open and inner portions of the ends are telescopically received in the process of manufacture, by the open ends of the cylindrical body and by vulcanizing the entire body in a special mold with application of internal pressure and external pressure at the ends of the bag, the entire external surface (ends and body) is left unbroken and without seams.

The tip or outer plug-like end 5 is completely closed at its extremity and has the somewhat reduced interfitting inner end 5*a* adapted to telescope within one end of the uncured (preferably helically wound) cylindrical body 6. The opposite plug-like end 7 of our bag is similarly formed to the closed end 5 but is provided with an axially disposed nipple 7*b* having communication with the interior of the bag in which is mounted and permanently sealed therewith, the valve tube 8 of conventional, tire valve structure having the usual valve therein and valve seat and provided with the usual stem 8*a*.

When our structure is assembled, vulcanized and molded, the diameter of the completed bag is preferably uniform throughout with the exception of the rounded or tapering extremities of the plug-like ends.

The body of the bag in its inherent structure, has embedded therein, cord fabric throughout the mean circumference thereof, with the actual cords 9 extending in circumferentially spaced relation longitudinally of the bag.

Likewise, the plug ends 5 and 7 have embedded in the medial circumference thereof, cord fabric extending longitudinally and circumferentially spaced in the plug ends and cylindrical interfitting portion 5*a* and having the ends of the fabric folded over each other to give two or more plies

of cord material at the rounded extremities or heads.

The method of manufacturing our test plug bag for plumbers is an important part and factor of our over-all invention and may be briefly described as follows:

The plug ends 5 and 7 are made up in raw form upon a suitable cylindrical form which has one end thereof rounded. On this rounded end of the form, two or more plies of relatively thin sheet rubber (for example, one sixteenth inch in thickness) are placed, fitted and carefully stitched, one at a time, so that no air is trapped between the plies of rubber. Thereafter, at least one ply of rubberized cord material with the cords running longitudinally of the cylindrical portion of the plug ends are applied and carefully stitched together, the ends of the cord material being folded inwardly with tabs thereof overlying to give two or more plies of cord material at the rounded head, said folded portions being of course, carefully stitched together. Then at least one ply of thin pliable sheet rubber is superimposed over the cord material with the ends thereof folded and overlapped to form the rounded head and all plies are carefully stitched together and in the case of the plug end 7, a rubber valve nipple is cemented on top of the two plies of rubber prior to application of the rubberized cord layers with the ends of the cord carefully folded around the base of the valve nipple to reinforce and strengthen this end.

The body of our plug bag is helically rolled from preferably an integral sheet upon a cylindrical form and preferably the rolling or winding is continued to form three complete convolutions although more may be successfully utilized. A rubber sheet of proper width and length and of a thickness approximating one sixteenth inch, has been found entirely satisfactory. In cutting and laying out the sheet, while lying flat, a piece of rubberized cord material is laid and fastened in a zone on the sheet so that when the sheet is rolled on the cylinder in helical form, the body 6 will have one ply or convolution of rubber on the inside and two plies of rubber on the outside of this cord material. The cord material is positioned with the cords 9 extending in circumferentially spaced relation longitudinally of the body form, as shown in Fig. 3. The cord material is preferably from an inch to two inches shorter than the rubber sheet, first so that the cord ends may be sealed by folding over the rubber thereon to prevent leaking and secondly, so that the expansion of the bag throughout the body portion is substantially uniform.

The cord fabric or other reinforcing material utilizing in sheet form both in the plug ends 5 and 7 and in the body 6 is always positioned with reference to the rubber plies of the part or parts so that the longitudinal edges of the reinforcing material never overlap but substantially abut in approximate side by side relation. Any overlap of said edges which would produce a thickened seam, preventing the body and plug ends from stretching uniformly during inflation. It will of course be understood that the pliable rubber in sheet form is in the raw or uncured state and subsequently, in our method, is vulcanized and molded to some extent.

The next step in our method is to telescope the open plug ends 5*a* and 7*a* within the cylindrical body member 6. To facilitate telescopic

joining of the said parts, the cylindrical ends 5*a* and 7*a* of the plug elements of the bag are slightly diminished as contrasted with the rounded outer portions thereof and these annular ends 7*a* may be externally moistened with a rubber solvent to facilitate the telescopic action. The bag in uncured but assembled state, is then suspended until the rubber solvent is dry. Then, the ends are stitched or rolled so that the helically wound body and rounded plug ends 5 and 7 are efficiently secured and at least partially bonded together.

The bag so formed, is dusted or painted with a solution such as soapstone or powdered mica which facilitates removal of the bag from the vulcanizing mold after heating and curing is effected.

The thickness of the body 9 is considerably less than the average thickness of the plug ends 5 and 7. Consequently, it is important that sheet rubber or gum for the plugs be of a type which requires for a given thickness, less time in curing than the rubber from which the body 9 is constructed. Otherwise, to adequately cure and vulcanize the plug ends of our device, the body 9 would be over vulcanized and might produce cracking. With gum or rubber sheets of proper characteristics, the entire unitary structure may be integrated, bonded and vulcanized in the same period of time.

It of course, is to be understood that our pneumatic plug bag may be made in different lengths and diameters in accordance with various requirements. Due to the uniform expansion of the body and also the expansion of the plug-like ends, a bag of three inch diameter will very efficiently seal in a pipe or fitting varying from three plus to five inch diameter. The ends of our bag are so constructed that when inflated, the bag will not noticeably elongate or move in either direction in the pipe or fitting during the carrying out of the necessary tests.

In use, our pneumatic bag may be inserted in a pipe, clean-out opening or fitting with an extension hose H threadedly attached to the outer end of the valve tube 8. The extension hose is preferably of relatively small diameter to telescope within a metal pipe. This enables the bag to be forcibly inserted and pushed down the clean-out opening or fitting with the aid of the small diameter rigid metal pipe. The bag will follow the curve of the fitting or sewer pipe but when the straight iron pipe comes to the curve, it abuts and that abutment indicates the location of the pneumatic test bag in the Y fitting. The metal pipe is then removed from the extension hose and the bag is inflated to the proper pressure. Inflation is obtained usually with an ordinary hand pump or compressor to approximately 40 or 50 pounds internal pressure, depending upon the roughness of the fitting or sewer pipe. This pressure is sufficient to withhold in use any standard required tests but our bags are preferably made to withstand 100 pounds of internal pressure, far more than will ever be necessary. The bag, when deflated, of course returns to normal size and therefor may be easily and quickly withdrawn from the fitting. The flexibility of our bag is an important feature permitting in use, the structure to be longitudinally thrust into curved and tortuous passages. The heavily reinforced and rounded extremities of the bag permit thrust to be applied longitudinally but the pliability of the body causes the structure to easily curve and follow the curves and angles in passages.

From the foregoing description, it will be seen that we have provided comparatively inexpensive and highly efficient unitary structure in the form of an inflatable bag for easy insertion into Y fittings, branches and sewer connections and readily removable therefrom after deflation. Our bag when it is inflated, will not creep or expand longitudinally within the fitting. The nature of the reinforcing permits circumferential expansion of all portions of the plug ends to cause not only one of a series of intercommunicating passages to be plugged and perfectly sealed, but in a unitary device, produces when inflated, a complete and effective sealing of all of the passages involved as shown in Fig. 1.

It will of course, be understood that various changes may be made in the form, details, arrangement and proportions of the parts without departing from the scope of our invention.

What we claim is:

A plumber's pneumatic test bag comprising an elongated tubular body having a plurality of elastic plies and a fabric reinforcement between the plies extending circumferentially of the body, the fabric having cords extending longitudinally of the body and spaced from each other circumferentially thereof, a plug closing each end of said body, each plug having a substantially hemispherical outer end portion normally conforming to the external diameter of the body and flush with the outer surface of the body and a reduced sleeve-like inner end portion of less diameter fitting snugly within an end portion of the body, the hemispherical outer end portion of each plug consisting of a plurality of elastic plies certain of which extend from the hemispherical portion and

constitute inner and outer plies of the sleeve-like inner end portion of the plug, fabric reinforcement sheets between certain of the plies of the hemispherical outer portion, the sheets having cords extending radially of the hemispherical portion of the plugs, a portion of one of the sheets extending beyond the other sheets and into the sleeve, the plies of the plugs and the body being integrally united with each other thus forming homogeneous structure of the body and plugs reinforced by the fabric reinforcement sheets, the hemispherical portion of the plugs having a cross-sectional thickness considerably greater than the cross-sectional thickness of the tubular body, whereby the plug structure will resist longitudinal extension and also longitudinal extension of the body yet allowing radial expansion of the body to effect a sealing function, and a valve controlled air inlet member carried by one plug for admission of air to inflate the bag.

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