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2,702,199

FLEXIBLE AND EXPANSIBLE THREADED JOINT

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Application June 16, 1951, Serial No. 231,985

3 Claims. (Cl. 285—71)

This invention relates generally to apparatus for forming ducts in concrete walls or like structures.

In the construction of concrete buildings it is common practice to provide metal piping or conduit for receiving the necessary electrical wiring. The conduit must be placed in the walls before the concrete is poured, and thereafter becomes a permanent part of the structure. Such metal conduit adds considerably to the cost of the structure, due not only to the material required, but also to the relatively large amount of labor involved in positioning the conduit before the concrete is poured.

It is an object of the present invention to provide practical apparatus which can be used to provide ducts for wiring and the like, in concrete structures, without the use of conventional metal conduit or piping.

Another object of the invention is to provide apparatus of the above character which can be readily removed from the hardened concrete and reused as required.

Another object of the invention is to provide apparatus of the above character making use of an inflated resilient tube or hose, which provides improved means for engaging one end of the tube or hose for removing it from the concrete structure.

Additional objects of the invention will appear from the following description in which the preferred embodiment has been set forth in detail in conjunction with the accompanying drawing.

Referring to the drawing:

Figure 1 is a side-elevational view in section, schematically illustrating a concrete wall with my apparatus applied to the same.

Figure 2 is a cross-sectional detail showing the conduit formed by use of my apparatus.

Figure 3 is a large cross-sectional view illustrating the device which is applied to one end of the hose, for facilitating removal of the same.

Figure 4 is a side elevational view of the device illustrated in Figure 3.

Figure 5 is a cross-sectional view illustrating a type of coupling which I can use for joining two or more hose sections together.

Figure 6 is an enlarged cross-sectional detail illustrating the construction of the coupling illustrated in Figure 5.

In Figure 1 of the drawing I have illustrated a concrete wall 10 which is being cast between the side forms 11 and 12. It is assumed in this instance that one desires to provide a duct for electrical wiring between the two spaced outlet boxes 13 and 14.

Instead of providing conventional metal conduit or piping between the boxes 13 and 14, I provide a tube 16 of suitable resilient material, such as resilient synthetic rubber. This tube is extended between the outlet boxes 13 and 14 before the concrete is poured, and end portions may extend a convenient distance from the boxes as illustrated. A closure 17 is shown applied to one end of the tube, and to the other end of the tube there is applied a special device 18.

It may be mentioned at this point that after the resilient tube has been installed in the concrete form, it is inflated by air under pressure, to cause it to increase in diameter. The increase may not be great, as for example from two to five percent. Thus assuming that one desires to form a duct of about one inch in diameter, a tube having a normal external diameter of one inch can be inflated to a diameter ranging from say $1\frac{1}{32}$ to $1\frac{1}{16}$ inches. The

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tubing employed should be such that it can be readily increased in diameter by applied internal pressure. Thus a tubing should be used that does not include metal, fabric or cord reinforcing tending to prevent an increase in diameter. With certain types of synthetic rubber, reinforcement can be omitted in entirety or, if employed, it should be such that it does not interfere with a limited amount of circumferential stretch.

After the concrete has been poured and has hardened, the tube is deflated and then pulled lengthwise from the duct. The decrease in diameter accompanying deflation of the tube serves to break any adhesion between the smooth exterior surface of the tube and the concrete, and provides sufficient clearance for pulling the tube lengthwise from the duct. The special device 18 illustrated in Figure 1 facilitates the operation of pulling the tube from the duct, and in addition, as will be presently explained, it may be provided with a fitting for introducing or venting air from the tube.

Referring now to Figures 3 and 4, the device consists of a tubular shell 21 which is adapted to fit within and around the end portion 22 of the tube 16. Surrounding the tube portion 22 there is a contractible wire mesh assembly 23. One end portion of the wire mesh assembly is shown attached to the clamping ring 24, which can be contracted upon the tube by tightening the screw or bolt 26. The other end portion of the wire mesh assembly is shown embracing the spherically contoured member 27, which is carried by the rod 28. The rod 28 forms in effect a pull member, and is shown provided with the eye 29, for engagement with supplemental means, such as a pull cable, rope, or the like. The rod 28 is preferably movably attached to the shell 21. Thus the shell is shown provided with an end wall 31 which has an opening to slidably accommodate the rod 28. The fit between these parts is preferably sealed as by means of a resilient rubber O ring 32. A helical spring 33 acts against a collar or washer 34 which is attached to the inner end of the rod 28, and serves to yieldably urge the rod 28 toward the left as viewed in Figure 3. A suitable fitting 36 is shown attached to the rod 28 for introducing or venting air from the tube. This fitting is in communication with the interior of the shell 21 by way of duct 37 in the rod 28.

The wire mesh assembly 23 is generally tubular in form, and consists of the interwoven spring wires 38 and 39, which extend helicoidally about the axis of the device.

The device in Figures 3 and 4 operates as follows: Before being attached to the end of the resilient tube, the wire mesh assembly 23 is relaxed and therefore can be readily slipped over the end of the tube. In applying the device to the tube, the shell 21 is slipped into the tube while at the same time the wire mesh is guided over the exterior surface of the tube. Thereafter the clamp 24 is tightened to grip the tube. Assuming that the device is applied before the concrete is cast, then air can be applied to the interior of the tube through the fitting 36, to secure the desired degree of inflation. After the concrete has been poured and hardened, air is vented from the tube, closure 17 is removed, and then pulling force is applied to the eye 29. Application of such pulling force is accompanied by movement of the pull member 28 relative to the shell 21, against the compression of spring 33, and longitudinal stretch is applied to the wire mesh assembly 23 to cause the same to tightly contract upon the tube portion 22. The resulting tight grip upon both the outer and inner surfaces of the tube serves to adequately transmit force to the main length of the tube, thus causing the tube to be withdrawn from the concrete duct. After the tube has been withdrawn the device of Figures 3 and 4 can be readily removed from the tube, because when pull is no longer applied to the eye 29, the wire mesh 23 relaxes, and upon loosening the clamp 24, the device slips relatively freely from the tube.

Figure 2 illustrates the type of duct which can be formed by use of my apparatus, and which is particularly suitable for accommodating electrical wiring. In this instance a duct 41 has been formed by removal of

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the tube 16, and this duct is suitable for receiving electrical wiring, the same as conventional metal wiring conduit.

In instances where extended ducts are desired it is possible to use two or more sections of resilient tubing, suitably coupled together. However the coupling means should be such that its diameter is increased when the tube is inflated, thus making it possible to pull the coupling from the duct after a concrete pouring operation. In the coupling construction illustrated in Figure 5, the two tubular sections 16a and 16b are provided with end portions 42a and 42b which are in threaded engagement. As shown particularly in Figure 6, the portion 42a can be tapered, portion 42b can be similarly made divergent to facilitate making quick connection. The threads 43 formed upon the portion 42a can be rounded as illustrated in Figure 6, and can be reinforced by a spirally wound spring metal ribbon 44. The cooperating threads 46 can be similarly rounded, and reinforced by the spring metal ribbon 47. It will be noted that the threads 43 and 46 in Figure 6 are molded from the same resilient rubber material as is employed in making the resilient tubes. The spring metal ribbons 44 and 47 provide sufficient enforcement to prevent the coupled sections from pulling apart, while at the same time permitting some expansion of the coupling when the tube is inflated.

It will be evident that my invention can be used to provide extended ducts for various purposes, as for example to serve as temporary water supply or gas flow passages, as well as for wiring. Such ducts may extend about corners or wall obstructions without interfering with or weakening the basic wall design.

I claim:

1. Radially expansible coupling means for radially expansible tube sections formed of resilient material, comprising tubular end portions formed integral with the

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walls of the tube sections, one of said portions having an interior surface of larger diameter than the interior surfaces of said tube sections and the other of said portions having an exterior surface of smaller diameter than the exterior surfaces of said tube sections, helicoidal threads formed of resilient material on said interior and exterior surfaces of said end portions and adapted to mutually interengage to form a fluid-tight connection, and helicoidal spring metal members embedded in said threads, said spring metal members having radially overlapping portions when said threads are interengaged, said interengaged coupling means having the same external and internal diameters as said tube sections whereby said coupling means may expand radially to substantially the same extent as said tube sections.

2. Radially expansible coupling means as defined in claim 1 wherein said spring metal members are flattened in an axial direction whereby their radial width is substantially greater than their axial thickness.

3. Radially expansible coupling means as defined in claim 1 wherein the mating interior and exterior surfaces of said end portions are generally conical, tapering inwardly from the outer end of said one of said portions.

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