May 8, 1951 A. MacDOUGALL, JR 2,551,751

AIR CONDITIONING CONDUIT AND PROCEDURE FOR INSTALLING SAME

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Fig. 1

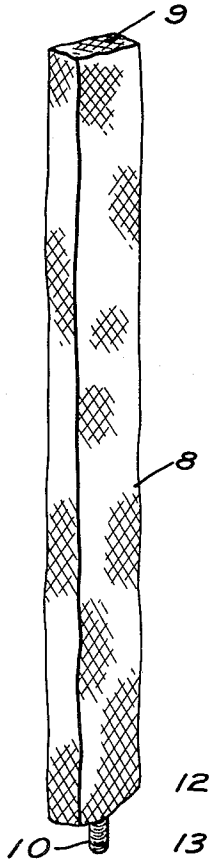


Fig. 2

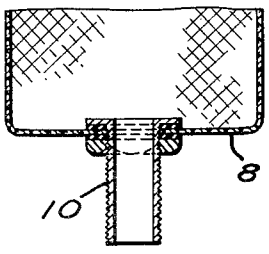


Fig. 3

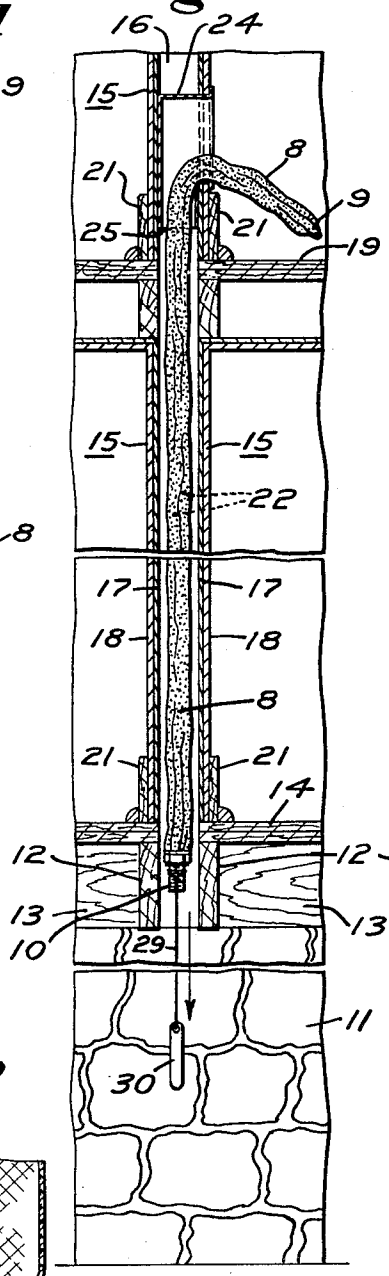
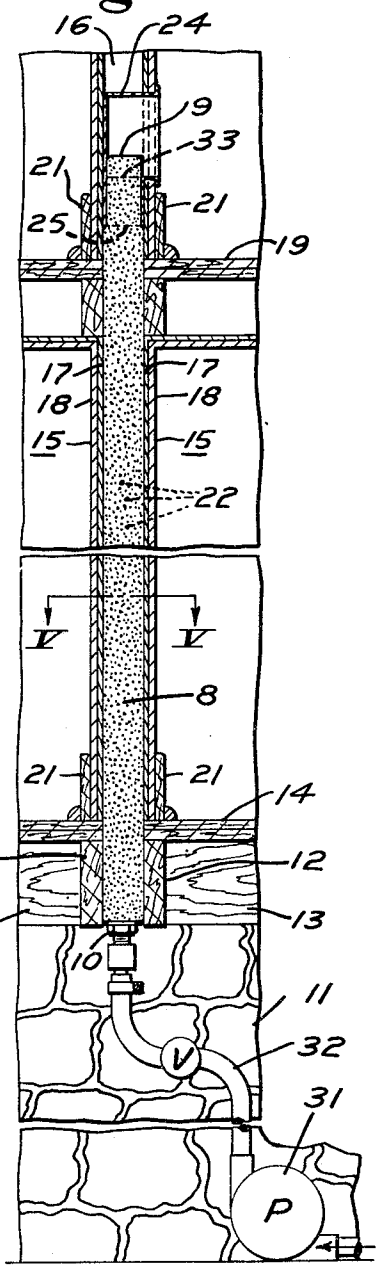


Fig. 4



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Fig. 5

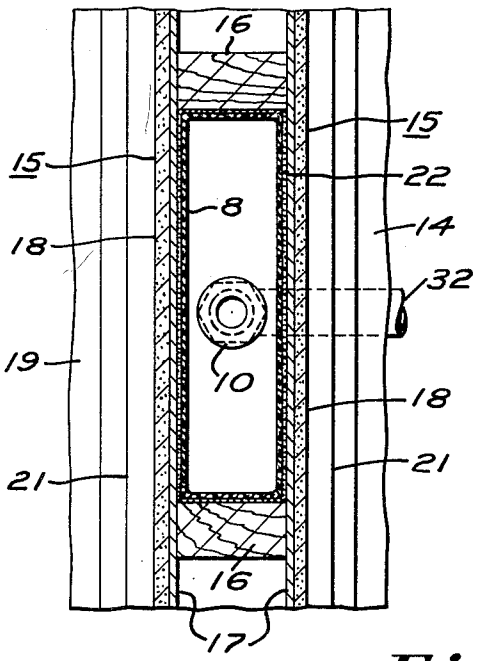


Fig. 6

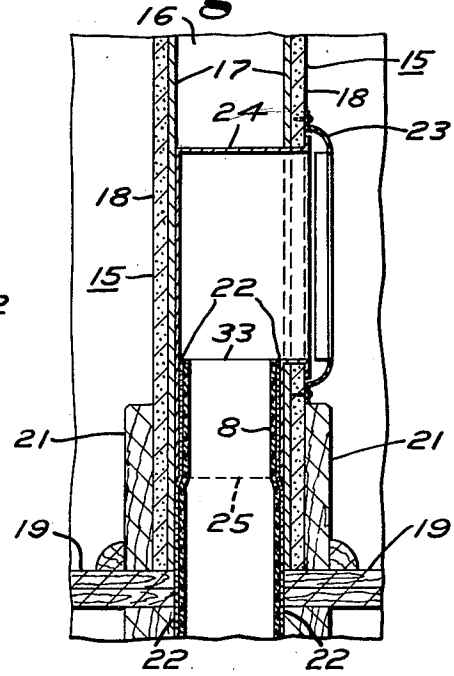
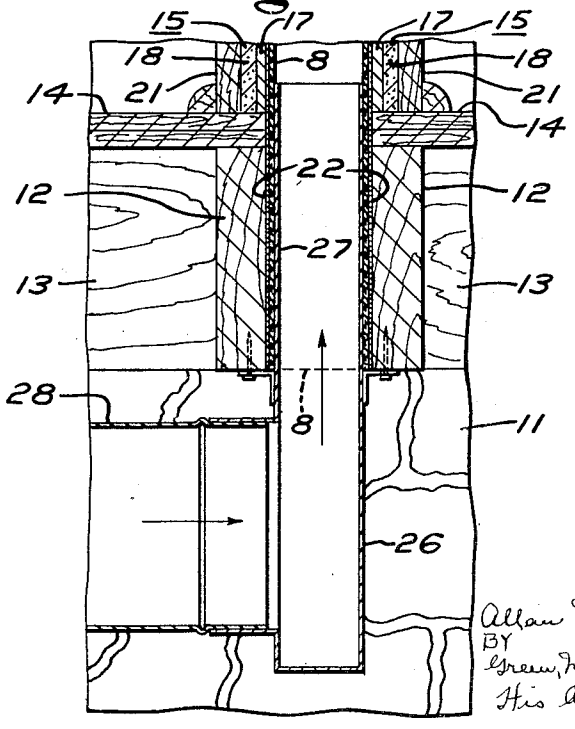


Fig. 7



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AIR-CONDITIONING CONDUIT AND PROCEDURE FOR INSTALLING SAME

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4 Claims. (Cl. 98—31)

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This invention relates to procedure and apparatus for equipping completed buildings with air-conditioning conduits and has for an object to produce simple and effective means whereby an old building such as a residence or office building may be readily and cheaply equipped with conduits capable of being used effectively in air conditioning the interior of such building.

Many buildings such as those used for office or residential purposes are now equipped with heating facilities which cannot be effectively employed in carrying out modern air conditioning procedures. They are fitted with piping and associated equipment for heating the interiors thereof with steam or hot water. As a result the operation of equipping such a building with conduits for the delivery of either heated or cooled air to various locations within the interior thereof, is difficult and extremely expensive where metal conduits are employed. A specific object of my invention is to provide relatively simple and relatively inexpensive procedure for providing air passages within the wall structures of completed buildings and which may be employed for air conditioning purposes including heating, cooling and dust removal from the interior of the building.

The specific object of my invention is to provide conduits which may be effectively employed as a part of an air-conditioning unit and to also provide simple and inexpensive procedure for equipping a completed building with air-conditioning conduits.

In the drawings accompanying and forming a part hereof I have illustrated apparatus such as may be employed in equipping a completed building with air conditioning conduits and I have to some extent indicated steps in the procedure of so equipping such a building. Figure 1 of the drawings is a somewhat diagrammatic perspective view of a pliable conduit which forms a detail of my invention.

Figure 2 is a fragmental sectional view of a conduit such as is illustrated in Figure 1.

Figure 3 is a fragmental sectional view taken at right angles through a partition wall of a completed building and illustrates a step in the operation or procedure of installing an air conditioning conduit within such partition wall.

Figure 4 is a fragmental sectional view corresponding to Figure 3 and illustrates a further step of such procedure.

Figure 5 is a sectional view on an enlarged scale taken along the line V—V of Figure 4 and illustrates a conduit embodying my invention in place

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within the wall structure of a completed building.

Figure 6 is a view which is similar in part to Figure 4 but on an enlarged scale, and discloses the upper or outlet end of a conduit embodying my invention after it has been installed in a completed building, and equipped with means for delivering a flow of air from it.

Figure 7 is a view which is also similar in part to Figure 4 but on an enlarged scale, and illustrates the inlet end of a conduit embodying my invention, equipped with apparatus for delivering a flow of air to it.

Little or no difficulty is encountered in installing air conditioning conduits for delivering conditioned air to the first story of a completed building. It, however, is a difficult and expensive undertaking to install metal or similar conduits for delivering conditioned air to the upper stories of such buildings. Ordinarily it is desirable to install such conduits so that they are not visible within the building. This necessitates threading such conduits through available space within the wall structure of the building and involves considerable expense where metallic or similar conduits are employed. My invention contemplates employing pliable conduits, that is conduits which are formed from fabric or similar pliant material. A feature of my invention is that such conduits may be formed in long lengths, may be delivered in rolls so that portions of the desired length may be cut from such rolls as a preliminary to installing them in the wall structure of a building.

Another feature of my invention is that the exterior of the pliable conduit, no matter how formed, is coated with a slow setting adhesive and is then threaded through an available passageway within the wall structure of a building while in a collapsed state and while the adhesive coating on the outer surface thereof is still in a plastic, i. e., unset condition. After the conduit is in place within the wall structure with its opposed ends accessible, it is expanded by closing one such end and delivering air under pressure to the interior thereof through the other end. The air pressure is so delivered and the expansion of the conduit is accomplished under conditions such that the coated outer surface of the conduit is forced into adhesive engagement with at least two opposite surfaces of the passage in which it is located. The air pressure is then maintained within the conduit for a sufficient time to insure that the conduit adheres to walls of the passageway. After the conduit is so installed its ends are trimmed or otherwise con-

ditioned and fitted with or permanently connected to fluid delivery equipment for the purpose of delivering conditioned air to and from the conduit.

Thus my invention contemplates pliant conduits and procedure for installing such conduits in the wall structure of completed buildings. The procedure for installing each such conduit involves applying an adhesive coating to the outer surface of the conduit, threading the conduit through a passage within the wall structure of a building while it is collapsed or partially collapsed and while the coating thereon is in a sticky plastic condition, then expanding the conduit so that its outer coated surface is forced into adhesive engagement with opposed walls of such passage and then conditioning the ends of the conduit so that they may be fitted with air delivery equipment.

Referring to the drawings, a pliable conduit 8 made from fabric or similar material is so formed that it may be drawn through a narrow passage while collapsed. The conduit may be made from any suitable material which is tough, i. e., highly resistant to tearing, but which is pliant. The conduit may be made in long lengths with the idea of cutting therefrom separate sections of the desired length as such sections are needed. On the other hand, the conduit may be formed as shown in Figure 1, wherein the normal shape of the conduit is such that a cross section thereof is rectangular and wherein one end is closed as shown at 9 in Figure 1, and the other end is fitted with a hose connection 10 as shown in both Figures 1 and 2. It should, however, be understood that the cross sectional shape of the conduit is not highly important nor are specially formed end structures, such as shown in Figures 1 and 2, essential to the effective use of conduits or conduit sections such as are here contemplated.

As a preliminary to the installation of a pliant conduit in a completed building structure, it is a necessity to provide or find a passageway within wall structure of the building through which the conduit may be drawn or threaded. In Figures 3 to 7 inclusive, I have more or less diagrammatically illustrated wall structures of completed buildings and have indicated the possibility of finding or providing passages therein in which air conducting conduits may be installed. In both Figures 3 and 4 I have illustrated wall structures as extending from the floor level of the first floor through the ceiling of the first floor and the flooring of the second floor of a building and as also extending above the floor level of the second floor. In Figures 3 and 4 the masonry wall 11 indicates the location of the basement or cellar of the building, and cross girders 12 and joist 13 constitute the framework to which the flooring 14 is secured. A partition wall 15 is shown in Figures 3, 4 and 5 as consisting of uprights or scantling 16, lath 17 carried by the scantling, and a plaster wall 18 secured to and carried by the lath.

Scantling are generally spaced about 18 inches apart and extend vertically in parallel relationship. As shown in the drawings, the partition wall 15 includes two plaster walls located on opposite sides of the line of scantling 16. As a result the spaced scantling provide vertically extending passageways which are normally open from floor to floor where the building includes more than one story. As shown in Figures 3, 4 and 5 the open passageways between scantling

extend from the flooring 14 of the first floor at least to the flooring 19 of the second floor and, as is often the case, the scantling which constitute the framing for partition walls of the second floor are shown as located immediately above the scantling of the lower partition wall. Where this is the case, an opening is cut through the plaster wall and the adjacent lath at one side of the partition wall within the upper story, so as to give access to a vertical passageway between two adjacent scantling. This opening may be located at any place in the partition wall but by locating it adjacent the baseboard 21, as shown in Figures 3, 4 and 6, easy access is had to such portions of the flooring 19 as may extend beyond the line of the lath on each side of the scantling 16. That is to say, an opening in the partition wall adjacent the baseboard 21 makes it possible to cut away such flooring as may extend into the space between the two plaster walls 18. In this way an open space or passage may be readily provided which extends from an upper story to the basement of the building.

Having provided such a passage the next step is to thread or draw a section of pliable conduit 8 through the passage. This can ordinarily be readily accomplished by dropping a weight secured to a rope or similar line through the passage, thus carrying the rope through the passage and into the basement. The next step is to provide a section of pliable conduit the outer surface of which is coated with a slow setting (slow drying) adhesive. For convenience in handling the coated section of conduit the extreme ends thereof should be free of coating. The rope which extends through the passage within the wall structure is then secured to one end of the conduit and is employed in drawing the conduit through the passage.

This operation is of course accomplished while the conduit is collapsed or partially collapsed, and is most easily accomplished by introducing one end of the conduit into the opening to the passage located in the upper story of the building and then pulling it downwardly through the passage. Whether the conduit is pulled up or down through the passage it is so positioned within the passage that its ends are accessible, i. e., one end is accessible from the basement and the other end is accessible from the upper story of the building. It will of course be understood that the intermediate portion of the section of conduit is located in the passage within the wall structure and is coated with sticky or unset adhesive.

The next step in installing the conduit is to expand it by the application of air or other fluid pressure to the interior thereof. This can be conveniently done by closing one end of the conduit and by attaching a hose or hose connection to the other end. In Figures 1 and 2 an ideal arrangement is illustrated wherein the upper end of the conduit is closed and the lower end is so formed as to readily provide for the reception of a hose coupling such as the coupling 10. It, however, will be understood that any convenient means may be employed for closing one end of the conduit and placing the other end in substantially non-leaking engagement with a pipe or hose capable of delivering compressed air to the interior of the conduit. When this is accomplished compressed air is delivered to the interior of the conduit and it is expanded under conditions such that its coated outer surface is forced into an adhering engagement with at least two of the op-

posed walls of the wall passage in which the conduit is located.

In Figures 1, 2 and 5 an ideal arrangement is illustrated in which the conduit is so formed that it fits the adjacent surfaces of its enclosing wall passage. As there shown the conduit is similar in shape to the wall passage in which it is located and is of such dimensions that it just fits the space between opposed lath 17 and opposed scantling 16 when expanded. Under such conditions the adhesive coating 22 is forced into engagement with the four walls of the passage and the interior of the conduit 8 provides an open passageway having relatively smooth walls, which may be employed for delivering a flow of air from the basement of the building to an upper story in the operation of air conditioning a space within the building located above the first story.

It is of course apparent that it is not essential to provide conduits of the shape illustrated in Figures 1 and 5. It is desirable, however, to so form the conduit that when expanded the coated surface thereof will contact with the four upright walls of the enclosing wall passage. This contributes to the stability of the circuit as a part of the wall structure, and it takes substantially full advantage of the cross sectional area of the wall passage in which the conduit is located. It, however, will be apparent that a conduit which is normally cylindrical will effectively fulfill the requirements of the invention and particularly if it is of such cross sectional area as to engage all four walls of the enclosing passage when expanded.

The air pressure delivered to the interior of the conduit for the purpose of expanding the same is preferably maintained within the conduit for a sufficient period to insure adequate adherence of all portions of the coating to contacting surfaces of the wall passage. When this adherence is assured the air pressure is shut off and the hose connection is removed and both ends of the conduit are opened.

In Figures 6 and 7 I have shown a box-like structure 24, preferably formed of sheet metal, which is located within the wall passage and constitutes the delivery end of the conduit. The structure 24 is provided with an opening on one side which corresponds in location to the opening in the wall 15 and which is shown in Figure 6 as covered by a register 23. The structure 24 is also provided with an extension 25 which may be so formed as to closely fit the sides of the wall passage and which is adapted to receive the upper end of the conduit and to form a support for the adhesive coated portion thereof. In Figure 7 I have shown a similar arrangement for delivering conditioned air to the lower end of an installed conduit 8. As there shown, a box-like structure 26 is provided with a rectangular extension 27 which extends upwardly into the lower end of the conduit and which is secured in place therein by being secured to adjacent cross girders 12, thus supporting the structure on the girders. As shown a supply pipe or metal conduit 28 is secured to and communicates with the interior of the structure 26 and is adapted to deliver a flow of air to the interior of the installed conduit 8.

It will, of course, be apparent that where partition walls in the upper story of a building are not conveniently located so as to provide a continuous passage from the basement to such upper story or stories, an outer wall of the building may provide such a passage. Whether partition walls or the other walls of the building are employed my invention contemplates the use of pliable conduits, the threading of such conduits through wall passages of a building, the prior coating of each such conduit with a slow setting adhesive and the expansion of the conduit to secure it in place within the wall passage of the building.

Where the conduits are intended for use in heating as well as cooling the building, care must be taken in selecting the material from which they are formed. It is, of course, apparent that many fibrous materials are non-combustible before or after suitable treatment, and where the conduits are to be used for heating as well as cooling it is desirable that they shall be non-combustible. It is also desirable that the conduits shall be formed from material having relatively low heat conductivity so as to avoid the ready transfer of heat either to or from the interior of the conduit.

In Figure 3 I have shown the hose connection 10 as secured to a rope or similar line 29 which is provided with a weight 30 at its lower end. As there illustrated the conduit is being pulled downwardly through a wall passage and the lower end thereof is just entering the space within the basement located between adjacent girders 12. In Figure 4 the conduit is located in its lowermost position, the upper end thereof is closed and is shown as located within the box-like structure 24. The lower end is shown connected to a pump 31 by means of a hose 32 which is secured to the hose coupling 10. The conduit 8 is shown expanded to fill the wall passage in Figure 4 and collapsed or partially collapsed in Figure 3. After an adhesive connection is obtained between the conduit and the contacting walls of the wall passage, the ends of the conduit are opened. Where the conduit is of the form shown in Figures 1 and 3, this will be accomplished by cutting away the end portions. In Figure 4 the upper end will be cut away along the line 33 and by adhering to the extension 25 will provide a substantially air tight connection between the interior of the conduit and the box-like structure 24.

While I have illustrated but one form of conduit and while I have described but one procedure for installing a conduit within a completed building, it will be apparent that various structural and procedural changes may be resorted to without departing from the spirit and scope of my invention as defined by the appended claims.

What I claim is:

1. A method of installing an air conditioning conduit in a completed building, which consists in opening a space within the wall structure of such building; employing such space as at least a part of a passageway from an upper story of such building to the basement thereof; coating the outer surface of a pliable, collapsible conduit with a slow setting adhesive; prior to the setting of such adhesive collapsing said conduit and moving the same while collapsed through such passageway to the extent that one end thereof is accessible from such upper story and the other end is accessible from the basement of the building; prior to the setting of such adhesive, expanding the collapsed conduit and forcing the adhesive covered surface thereof into adhering engagement with opposed walls of said passage; maintaining the conduit expanded with its coated surface in contact with such walls at least until the adhesive coating has set; and then placing each end of said conduit in open communication with fluid-delivery equipment.

2. A method of installing an air conditioning conduit in a completed building, which consists in opening a space between adjacent scantling in a wall structure of such building and employing such space as at least a part of a passageway between an upper story of such building and the basement thereof; providing a section of collapsible, pliant conduit of a length sufficient to extend throughout substantially the entire length of such passageway; coating the external surface of such section of conduit with a slow setting adhesive; prior to the setting of such adhesive collapsing the conduit so coated; prior to the setting of such adhesive drawing the collapsed conduit through such passageway to a position such that one end thereof is accessible from the basement and the other end is accessible from such upper story of the building; prior to the setting of such adhesive expanding the conduit by delivering fluid under pressure to the interior thereof and thereby forcing the coated surface of the conduit into contact with at least portions of opposed walls of such passageway; maintaining the expanding pressure within such conduit at least until adhesive engagement is established between said conduit and the contacting portions of the walls of such passageway; then opening both ends of said conduit and applying a fluid-delivery device to each such end.

3. A method of installing an air conditioning conduit in a completed building, which consists in opening a space in the wall structure of such building and establishing in such structure a passageway extending from an upper story of such building to the basement thereof; providing a section of collapsible, pliant conduit of sufficient length to extend throughout substantially the entire length of such passageway; coating substantially the entire external surface of said conduit, at least intermediate the ends thereof, with a slow drying, liquid adhesive; prior to the drying of such adhesive collapsing the conduit so coated and drawing the same through said passageway to a position such that one end thereof is accessible from the basement and the other is accessible from an upper story of such building; prior to the drying of the adhesive delivering air under pressure to the interior of said conduit and thereby expanding the conduit and forcing the coated surface thereof into adhering contact with opposed walls of such passageway; maintaining said conduit under air pressure and expanded with the coated surface thereof in adhering engagement with opposed walls of such passageway at least until such coated surface is permanently bonded to the contacting walls of said passageway; then opening both ends of said conduit and applying a fluid delivery device to each such end.

4. A method of installing an air conditioning conduit in a completed building, which consists in opening a space within the wall structure of such building and employing such space as at least a part of a passageway between an upper story and the basement of such building; providing a section of collapsible, pliant conduit of a length sufficient to extend throughout substantially the entire length of such passageway between such upper story and the basement of the building; spreading a coating of slow setting adhesive on at least a portion of the external surface of such section of conduit between the ends thereof; prior to the setting of such adhesive, moving said section of conduit while collapsed, through said passageway to a position such that one end thereof is accessible from such upper story and the other end is accessible from the basement of the building; prior to the setting of such adhesive, subjecting the interior of said section of conduit to pneumatic pressure and thereby expanding the conduit and forcing the adhesive coated surface thereof into adhering contact with the inner wall of such passageway; maintaining such conduit under pneumatic pressure and so expanded until the coated surface thereof is bonded to the inner wall of such passageway; and then opening both ends of said conduit and applying a fluid delivery device to each such end.

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