April 26, 1955 P. M. HARDWICK 2,707,116

HOSE COUPLING

Filed Nov. 24, 1950

Fig. 1.

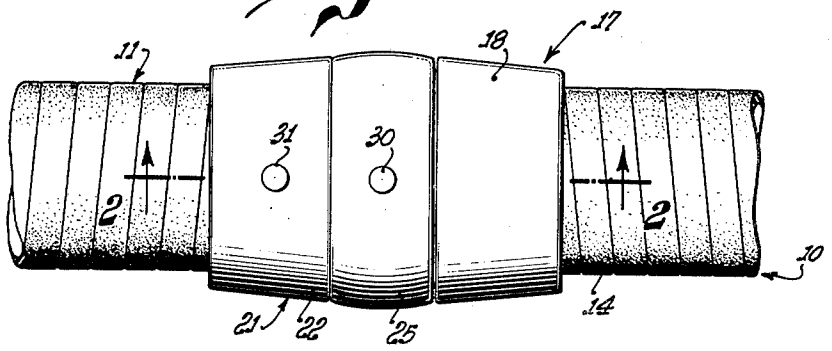


Fig. 2.

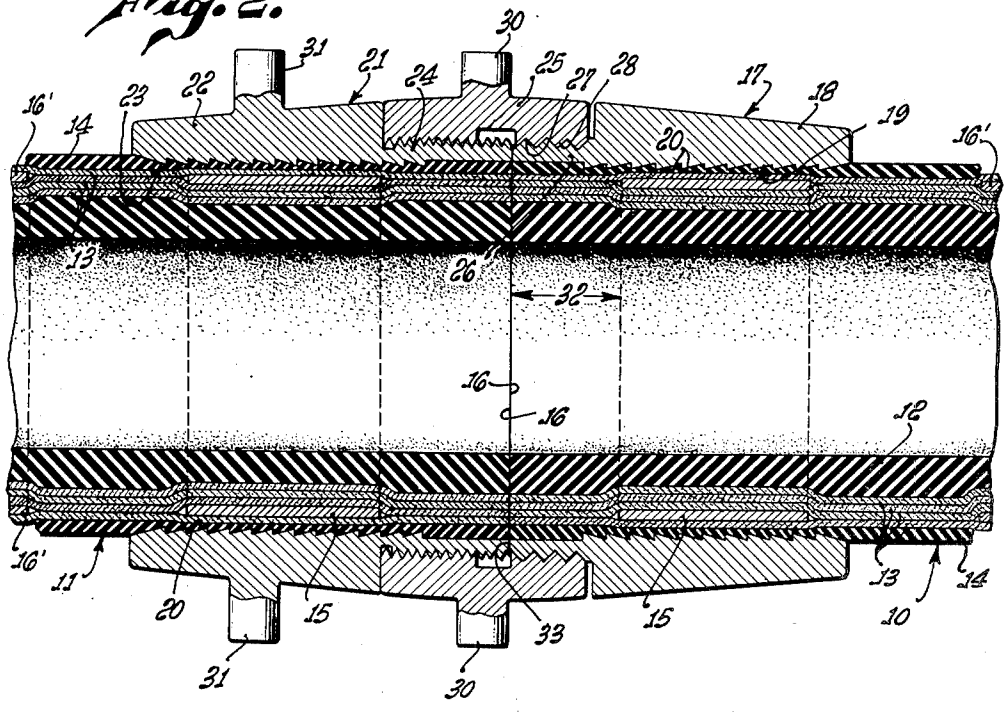
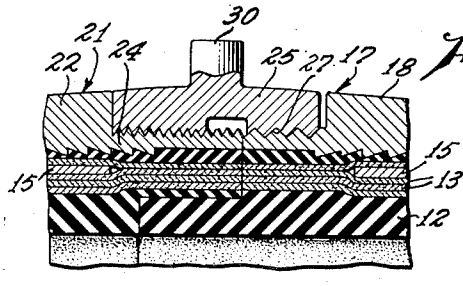


Fig. 3.



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United States Patent Office 2,707,116 Patented Apr. 26, 1955

2,707,116

HOSE COUPLING

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Application November 24, 1950, Serial No. 197,429

2 Claims. (Cl. 285—72)

The invention relates to hose couplings, and has particular reference to a hose coupling of the type found useful in connecting rubber hose reinforced by fabric, wherein ends of the hose abut each other within the coupling so that there is no break in the continuity of the path of fluid through the lining. The particular type of hose to which the coupling is expressly adapted to be applied is hose found useful in conducting abrasive material such as sand.

In the handling of abrasive materials, as when sand is carried by air under pressure for use in sand blasting, the sand has an abrasive action during its passage through the hose comparable to abrasive action when the sand is blown by compressed air against an exterior surface upon which the sand blasting operation is to take place. Hose for handling materials of this kind is customarily specially constructed to resist abrasive action, and at the same time made sufficiently strong to retain relatively high pressures. In the manufacture of hose of the type described, it is not feasible commercially to manufacture the hose in indefinite lengths. As a matter of practice the length of hose seldom exceeds 50 feet and it, therefore, becomes necessary to couple together 50 foot lengths of hose where sand is to be carried greater distances, as for example, from a compressor to the top of a building.

Heretofore, considerable difficulty has been experienced in the construction of couplings capable of resisting the abrasive action of the sand as it is blown through the hose. It has been found that where any metal within the coupling is exposed to the sand-laden air stream passing through the hose, the metal is quickly worn away and deteriorates in a relatively short time to such an extent that the coupling is no longer usable. In an effort to avoid the exposure of any metal surface of the coupling to the stream of sand under air pressure some crude expedients have been resorted to which are still prevalent. Among these is one wherein conventional pipe unions have been utilized for holding the hose, and wherein for added security wood screws have been driven through the wall of the parts forming the union into and through the body of the hose. This method of attaching the hose to couplings and subsequently joining the couplings requires considerable time. It is, moreover, injurious to the hose in that the hose wall is pierced. It is furthermore definitely unsafe inasmuch as the wood screws tend to pull out of the hose. Also, the ends of the screws being metal, when projected into the interior of the hose tend to restrict the flow of material being conducted and, in the course of use, may be worn away by the abrasive action of the sand, thereby weakening the coupled joint.

It is, therefore, among the objects of the invention to provide a new and improved hose coupling, especially well adapted to connecting together hose ends wherein the hose is used for conducting abrasive materials, and also for connecting the hose to valves or a source of supply for the abrasive material.

Another object of the invention is to provide a new and improved hose coupling for such items as sand blast hose wherein the coupling has longer wearing qualities than couplings heretofore employed, wherein the coupling members are easily and quickly attached to the hose, and wherein the connection of the coupling members to the hose is secure and safe against separation under all pressures customarily encountered.

Still another object of the invention is to provide a new and improved coupling for connecting together

tubing such as sand blast hose, wherein the connection between the coupling member and the hose is such that should the connection weaken sufficiently to make it unusable, the connection can be removed, the end of the hose cut off, and an equally effective new connection made by use of the same coupling member and the newly cut end of the hose.

Also included in the objects of the invention is to provide a new and improved coupling for hose adapted to the conduct of abrasive material wherein the hose within the coupling is securely sealed against air leak, wherein the path through the hose itself is continuous and uninterrupted within the coupling, and also to provide an inexpensive coupling conforming as nearly as possible to specifications currently extant so as to avoid as much as is practicable any change in existing facilities.

With these and other objects in view the invention consists in the construction arrangement and combination of the various parts of the device whereby the objects contemplated are attained as herein set forth, pointed out in the appended claims, and illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a side elevational view of a hose and coupling incorporating the invention.

Figure 2 is a longitudinal sectional view of the coupling assembly taken on the line 2—2 of Figure 1.

Figure 3 is a fragmentary cross-sectional view of the coupling showing a modified overlapping hose joint.

The invention involved herein contemplates a special construction at the ends of lengths of hose wherein the hose is specially constructed for use in the conduct of abrasive materials. Ordinarily, hose for this purpose is manufactured by providing a pipe mandrel of the desired length which can be mounted so as to be slowly turned around. First a rubber tube stock is wrapped around the mandrel. It should be mentioned at this point that the rubber tube stock is relatively thick and is comprised of rubber so compounded as to be especially tough and resistant to abrasion. Next a layer of fabric is wrapped around the rubber tube stock. On the outside of the layer of fabric there is applied a thin layer of rubber, then another layer of fabric, followed by successive layers of rubber and fabric until the required number of layers or plies have been applied. The number of layers or plies may vary, depending upon the diameter of the hose and the working conditions under which it is expected to operate.

After the desired number of plies have been applied, an outside rubber cover is applied. The hose is then temporarily wrapped with fabric and while still on its mandrel is placed in a curing oven where it is vulcanized or cured by heat. After curing, the mandrel with the cured rubber hose around it is removed from the oven and the mandrel is blown out of the hose by air pressure. Following this step the fabric which has been temporarily applied over the outside layer of rubber is removed, and the hose is ready for use.

In the invention described herein the hose employed, frequently designated as sand blast or grout hose, is constructed in a manner similar to the construction of conventional hose, with the notable exception that when the hose is initially made, special expansion bands or rings are built into the hose near the ends.

As illustrated in the drawings wherein one embodiment of the invention is portrayed, there are shown two lengths, **10** and **11**, of sand blast hose. The hose consists of a relatively thick inner rubber liner **12** around which are successively applied layers **13** of fabric bound together by thin films of rubber. Over the exterior of the hose there is applied an outer cover layer **14** of rubber. At the end of the hose in each case an expansion ring **15** is built into the hose and in the embodiment shown the ring is located inside of the outermost layer of fabric and outside the inner layers of fabric. The ring is located inwardly from a free end **16** of the hose and in practice additional rings **16'**, etc. are customarily built into the hose so that two or three, or perhaps more, rings are located in spaced relation to each other near the ends of the hose. The extra rings, although not necessary to the coupling of the hose to the coupling

member on any single occasion, are useful in the event that the hose may fail at the coupling. In that event the damaged hose may be cut off and the new end with a ring **16'** may be employed for safely securing the newly-cut end of the hose in the coupling.

In practice, the rings **16**, **16'**, etc. may be of some appropriate metal, such as steel or brass, capable of being expanded or, under some circumstances, capable of resisting compression. Other materials having comparable physical characteristics may also be employed.

The coupling assembly, as shown in the drawings, comprises a coupling member **17** having a sleeve-like portion **18**, adapted to surround the end of the hose length **10**. The coupling member has an interior bore **19** extending throughout its length and in the embodiment selected the bore is provided with a series of annular recesses **20**, which serve the purpose of roughening the wall of the bore in order to better grip the hose when it is connected within the coupling member.

On the opposite length of hose **11** is another similar coupling member **21** having a sleeve-like portion **22**, and a roughened bore **23** of the same diameter as the bore **19**. The coupling member **22** has an exteriorily threaded portion **24** adapted to engage a correspondingly threaded swivel ring **25**. The ring **25** is joined to an extension **26** of the coupling member **17** by a series of interlocking annular recesses **27** and projections **28**, the recesses and projections being annular and disposed inside the threaded swivel ring permit the swivel ring **25** to freely rotate with respect to the coupling member **17**.

Bosses **30** on the swivel ring and **31** on the coupling member **22** facilitate a drawing together of the coupling members to complete the coupling assembly.

When the hose length **10**, for example, is initially joined to the coupling member **17**, the hose length is cut off square and smooth at the end **16**. The cutoff should be such that a substantial length **32** of hose remains between the cutoff end **16** of the hose and the nearest end of the expansion ring **15**. Although the expansion ring **15** is here illustrated as having a width sufficiently great to occupy approximately half the length of the bore **19**, the length is not critical but should be such that a substantial exterior surface of the ring is presented outwardly so as to spread the compressive force over a considerable area of the hose when parts are made up.

In joining the length of hose **10** to the coupling member **17**, the cut end of the hose is pressed into the bore **19** of the coupling member until the end **16** of the length of hose extends slightly beyond an end face **33** of the coupling member **17**. In this connection it should be stated that the outside diameter of the expansion ring **15** is initially made small enough so that the outside layer of rubber **14** can be readily compressed in order to permit insertion of the hose into the bore. If preferred, the hose may be cut so parts overlap as indicated in Figure 3.

After the hose is in proper position within the bore, the coupling member may be held by some conventional rig or holder so that an expanding mandrel, for example, can be inserted into the hose passage with sufficient force so that the mandrel is capable of expanding the expansion ring **15**, stretching it slightly, which operation is carried to an extent sufficient that the exterior face of the expansion ring presses the outside layers of the hose into engagement with the roughened interior of the bore **19**.

Similarly, the hose length **11** is installed in the coupling member **21**. It should be suggested in this connection that the primary requisite in joining the hose length to the coupling member is to provide compression of the outer layers of the hose between the ring and the bore of the sleeve portion **18**, which compressive effect may be accomplished either by expanding the ring **15** outwardly, or compressing the sleeve portion **18** inwardly.

After the hose lengths have been joined to the coupling members in the manner herein described, the coupling members **17** and **21** may be joined together by rotating the swivel ring **25** threadedly upon the threaded end **24** and the coupling members drawn up until the ends **16** of the hose lengths **10** and **11**, respectively, are forced together in sealing relationship. This is highly desirable so that there is no discontinuity in the passage through the rubber liner **12** which forms the inside wall of the hose. The tight grip is effective in preventing any leak of air which may be used to conduct the abrasive material through the hose, and also prevents any abrasive material from being driven into contact with any portion of the coupling members. The compressed condition of the layers of hose between the rings **15** and the surrounding sleeves may readily be made sufficiently great so that the grip of the roughtened interior of the bores of the sleeve combined with the resistance offered by the new relationship of the rings to the sleeves is sufficient to securely hold the hose lengths in the coupling members under all anticipated working conditions.

Should the hose lengths deteriorate by long use or undue flexure of the hose immediately outside the end of the coupling member it is necessary to no more than cut off the hose at the damaged point, remove the cutoff hose piece from the interior of the coupling member, and then remake the connection by placing the ring and sleeve portion of the coupling member in compressed relationship in the same manner as heretofore described.

Couplings made in accordance with the invention herein described can be quickly made by use of conventional tools already employed in the art and without the assistance of specially skilled mechanics. The couplings are secure against leak of fluid pressure and against all usual strain which may be exerted lengthwise upon the hose.

While I have herein shown and described my invention in what I have conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of my invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A coupling assembly for the joining of hose for the transmission of abrasive materials in a fluid stream comprising lengths of hose to be joined, each length comprising a relatively thick inner layer of rubber-like material having its inner circumference exposed throughout the assembly, a multiple series of imperforate alternating layers of fabric and thin layers of rubber and having a substantially cylindrical exterior, each end of each length of hose having a separate annular ring member of material within the cylindrical exterior having a consistency adapted to hold its form under pressures normally utilized within the hose, said ring member being embedded and sealed throughout its exterior surface between layers of the hose near the ends of said lengths of hose, there being a sealed portion of hose layers between the endmost edge of the ring member and the end of the hose, and continuous annular coupling members for the hose ends each comprising a sleeve portion, a substantially cylindrical interior bore larger in diameter than the outside diameter of the ring member and having a series of elevated portions extending throughout the length of the coupling member surrounding the ring member and adapted to grip the exterior of the hose in a position wherein a free end of the hose is substantially flush with a corresponding end of the coupling member, said coupling member being of larger inside diameter at the inner end, the portion of the hose surrounding the ring member being in gripped engagement with the inner surface of the coupling member and in a compressed state between the ring member and the coupling member, the portion of the hose adjacent the end being in a relieved state, and joining means on respective coupling members adapted to join one coupling member to another with the fabric layers and rubber-like layers on each length of hose being in contact respectively with fabric layers and rubber layers on an adjacent length of hose.

2. A coupling assembly for the joining of hose for the transmission of abrasive materials in a fluid stream comprising a length of hose to be joined, said length comprising a relatively thick inner layer of rubber-like material having its inner circumference exposed throughout the assembly, a multiple series of imperforate alternating layers of fabric and thin layers of rubber and having a substantially cylindrical exterior, said end of the length of hose having a separate annular ring member of material within the cylindrical exterior having a consistency adapted to hold its form under pressures normally utilized within the hose, said ring member being embedded and sealed throughout its exterior surface between layers of the hose near the ends of said length of hose, there being a sealed portion of hose layers between the endmost edge of the ring member and the end of the hose, and a coupling member for the hose end comprising a sleeve portion, a substantially cylindrical interior bore

larger in diameter than the outside diameter of the ring member and having a series of elevated portions extending throughout the length of the coupling member surrounding the ring member and adapted to grip the exterior of the hose in a position wherein a free end of the hose is substantially flush with a corresponding end of the coupling member, said coupling member being of larger inside diameter at the inner end, the portion of the hose surrounding the ring member being in gripped engagement with the inner surface of the coupling member and in a compressed state between the ring member and the coupling member, the portion of the hose adjacent the end being in a relieved state, and joining means on the coupling member adapted to join the coupling member to another coupling member.

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