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Pratt

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[54] **ELECTRICAL CONDUCTING HYDRAULIC HOSE**

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[51] **Int. Cl.** **F16l 11/12**

[58] **Field of Search** ..... 174/15 C, 47, 74 R, 174/78; 213/1.3, 1.6; 280/420, 421, 422; 285/149, 256; 317/2 J; 339/15, 16 R, 16 C, 16 RC; 340/320

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[57] **ABSTRACT**

A hydraulic pressure hose adapted for electrical conduction through the steel reinforcing layer of the hose by insulating each hose end from the hose fitting and by providing each fitting with insulated terminals which extend inwardly to contact the conductive reinforcing layer.

8 Claims, 2 Drawing Figures

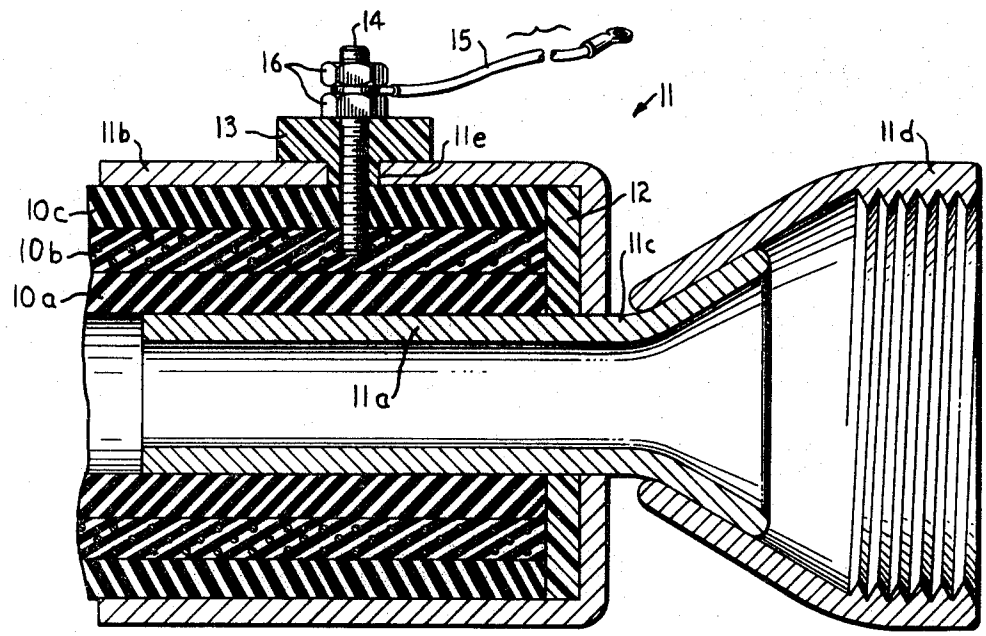


Fig. 1.

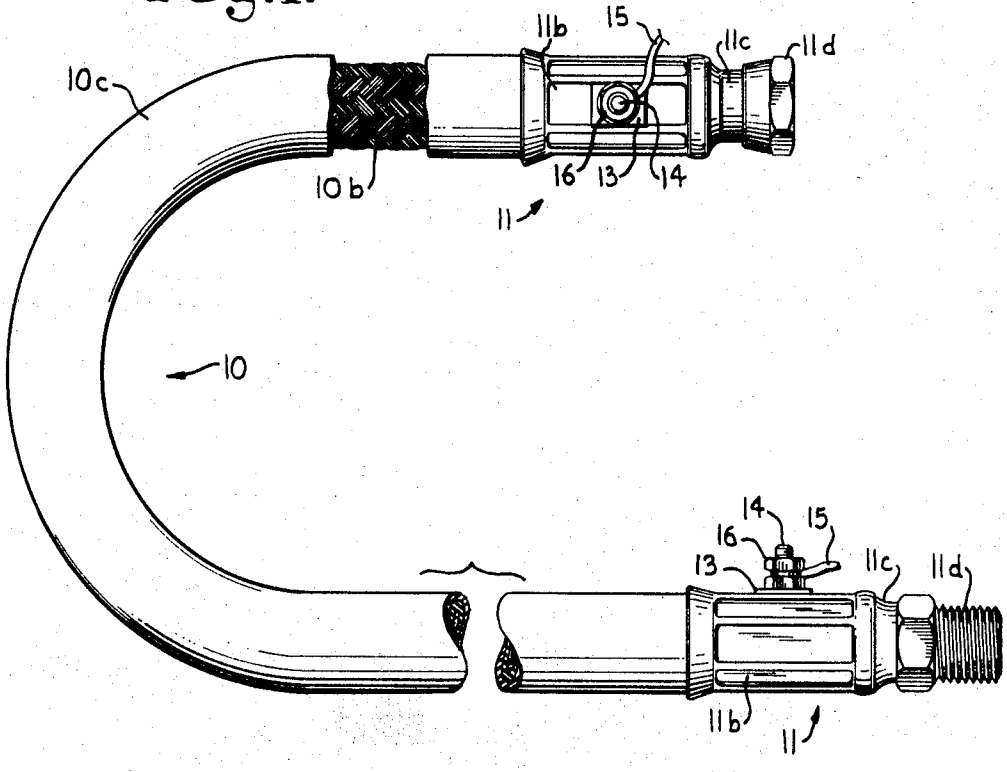
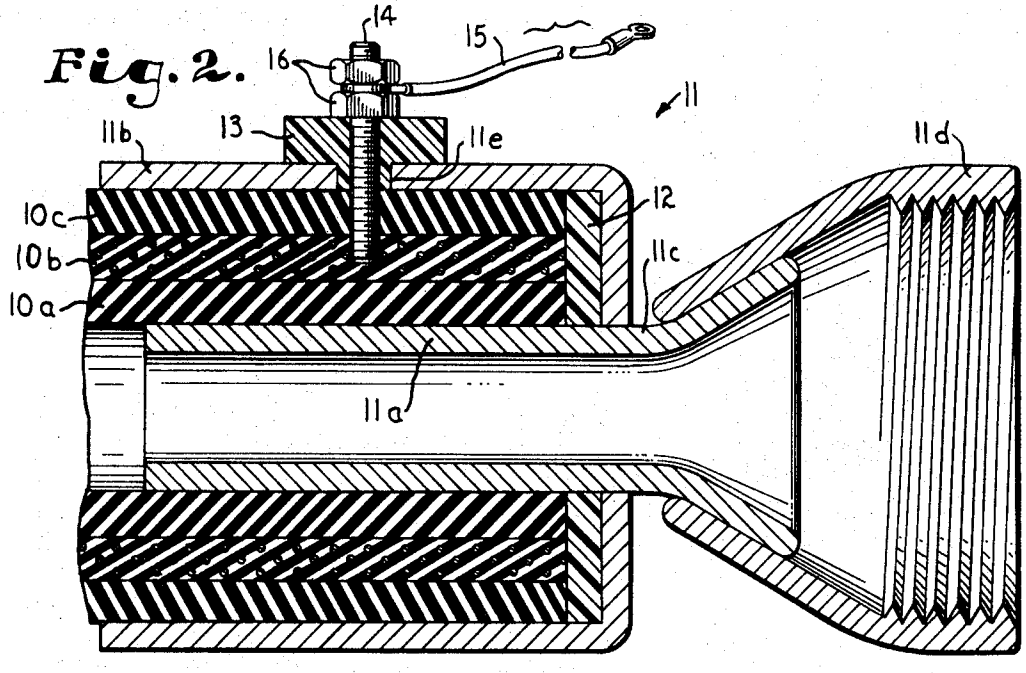

11b
15
11c
11d
10c
10b
16
13
14
11
10
14
15
16
13
11c
11d
11b
11

Fig. 2.


14
15
16
11
11b
13
11e
11d
10c
12
10b
11c
10a
11a

ELECTRICAL CONDUCTING HYDRAULIC HOSE

BACKGROUND AND SUMMARY OF THE INVENTION

In the field of handling and loading equipment, a vehicle known as a "forklift" truck is typically used to transport and elevate various bulky and heavy loads in warehouses, plants, docks, storerooms, and the like. Those familiar with such equipment recognize that the forklift normally includes a load carrying platform or station which may be elevated on a supporting frame or track of hydraulic power to a height substantially above ground level.

Flexible hydraulic hoses are required in the hydraulic system containing fluid under pressure to provide the lifting force for elevating the load station. Such hoses are carried on pulleys, reels, or combinations of both associated with the supporting frame, commonly referred to as the "mast" or "upright," in order to permit the hoses to extend when the load station is elevated and to retract when the station is lowered. In this regard, the load station is frequently equipped with auxiliary attachments such as clam shell arms for gripping large rolls of paper, carton clamps for gripping box-like loads, or rams for pushing a load from the platform, or similar attachments depending upon the application for which the forklift is employed. It is necessary to provide electrical cords running from a power source carried by the forklift up to the load station in order to operate or actuate any auxiliary equipment.

It has not been feasible to incorporate the electrical cord with the reels and pulleys carrying the hydraulic hose since the electrical cord tends to stretch in use and the hydraulic hose does not. When stretched, the electrical cord tends to ride off of the pulley, bind up in the hose reel, or otherwise create enough slack in the cord to allow it to become entangled in the upright structure. This at times presents a serious safety hazard, especially to maintenance personnel who must climb up as high as twenty or more feet to the top of the upright structure to manually release the load and enable the operator of the forklift truck to move away from the load placed on the stack. Unless the load is manually released by the mechanic, it is possible for the operator to pull the whole stack down on himself and the machine.

Accordingly, it has been necessary to provide separate spring-loaded retracting reels or special pulleys for the electrical cords to permit extension of the cords when the load station is elevated and to permit retraction when the station is lowered. In addition to the extra reels and pulleys necessary, the cords themselves have presented a never ending source of problems and represent substantial maintenance and expense requirements.

A primary object of this invention is to provide a hydraulic hose for eliminating the need of electrical cords and their associated cord reels and pulleys in applications requiring the use of reinforced hydraulic pressure hoses.

More particularly, an object of this invention is to provide an electrical conducting hydraulic hose operable to function in a hydraulic fluid system and to also serve as an operating electrical conductor for operating electrical equipment.

Other and further objects of the invention, together with the features of novelty appurtenant thereto will appear in the course of the following description.

DESCRIPTION OF THE DRAWING

In the accompanying drawings, which form a part of the specification and are to be read in conjunction therewith, and in which like reference numerals are employed to indicate like parts in the various views:

FIG. **1** is a view of a reinforced hydraulic pressure hose adapted to conduct electricity in accordance with a preferred embodiment of the invention; and

FIG. **2** is an enlarged sectional view of one end of the hydraulic hose.

Referring to the drawings in more detail, the hydraulic pressure hose, generally referred to by the numeral **10**, comprises an interior cylindrical installation layer **10***a* which provides a conduit for transporting hydraulic fluids through the hose **10**. The interior layer **10***a* is circumferentially wrapped by a reinforcing layer **10***b* typically comprising an interwoven metallic mesh which provides the necessary strength for the hose to withstand high fluid pressures within the hydraulic system. For the purposes of this invention, it is necessary that the layer **10***b* be fabricated from a conductive material and, because of its superior strength characteristics coupled with conductivity, steel is preferable. The reinforcing layer **10***b* is circumferentially wrapped by an exterior cover **10***c* fabricated from an insulation material. The interior and exterior layers **10***a* and **10**c may be fabricated from any nonconductive material, such as rubber or plastic.

Each end of the hose **10** is equipped with a hose fitting **11** having a rearward sleeve portion which, as shown in FIG. **2**, comprises concentrically aligned sleeves **11**a and **11**b providing an annulus therebetween into which the end of the hose is inserted. The outside diameter of the sleeve **11***a* is sized to fit within the inside diameter of the hose **10** and the inside diameter of the exterior sleeve **11***b* is sized to slip over the outside diameter of the hose **10**. The fitting **11** is secured to the end of the hose by crimping inwardly the exterior sleeve **11***b* toward the interior shell **11***a*, as shown in FIG. **1**. Outwardly from the sleeve portion and integral therewith is a neck portion **11**c which is connected to a threaded pipe coupling **11***d*. The pipe coupling **11***d* may be a female joint as shown in FIG. **2** and at the top of FIG. **1**, or it may be a male joint as shown in the lower portion of FIG. **1**.

Disposed within the annulus between the inner sleeve **11***a* and the exterior sleeve **11***b* at the end of the hose **10** is an insulation washer **12** which prevents contact of the reinforcing layer **10***b* with the fitting **11** which would result in a grounded electrical circuit.

A circular bore **11***e* is provided through the exterior shell **11**b which receives therein an insulation block or grommet **13** fabricated from a nonconductive material such as plastic or rubber and which is secured to the sleeve **11***b*.

Disposed through the insulation block **13** and protruding radially inwardly is a terminal post **14** which extends through the cover layer **10***c* of the hose to contact the conductive reinforcing layer **10***b*. The terminal **14** preferably terminates at its lower end within the layer **10***b* and does not extend into the layer **10***a*. If, on the other hand, the terminal **14** does extend into the inner layer **10***a*, which may slightly weaken the structural

properties of the hose, it is important that the end of the terminal **14** not contact the interior sleeve **11***a* of the fitting.

The upper end of the terminal **14** extends outwardly from the insulation block **13** in order to provide a post for connecting an electrical lead **15** secured thereto between a pair of nuts **16.**

In operation, a hydraulic hose **10** constructed in accordance with the foregoing principles may be employed to conduit electricity through the terminal **14** at one end thereof and through the reinforcing layer **10***b* to the terminal **14** at the opposite end of the hose. In this manner, the hydraulic hose may simultaneously operate in a hydraulic system and also serve to operate electrical equipment by means of the terminal connections at opposite ends of the hose. It should readily be evident at this point that one significant application for my invention is the use on forklifts to operate such auxiliary attachments as carton clamps, clam shells, and the like without the necessary electrical cords and cord reels and pulleys heretofore known in the art.

From the foregoing, it will be seen that this invention is one well adapted to attain all the ends and objects hereinabove set forth, together with other advantages which are obvious and which are inherent to the invention.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth, or shown in the accompanying drawing, is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

1. A hydraulic pressure hose adapted for electrical conduction, said hose comprising:

a hose section having an interior insulation layer providing a conduit for the flow of hydraulic fluid, an inner reinforcing layer of conductive material encasing said interior insulation layer, and an exterior insulation cover encasing said reinforcing layer;

a first hose connection fitting installed on one end of said hose section without engagement with said reinforcing layer;

a second hose connection fitting installed on the opposite end of said hose section without engagement with said reinforcing layer;

a first electrical terminal mounted near one end of said hose section and having a portion extending through said exterior cover to contact said reinforcing layer; and

a second electrical terminal mounted near the opposite end of said hose section and having a portion extending through said exterior cover to contact said reinforcing layer;

whereby said hydraulic pressure hose is operable to conduct electricity from said first terminal, through said reinforcing layer, to said second terminal.

2. The hose as in claim **1,** said first hose connection fitting including a radial bore through which said first terminal protrudes to contact said reinforcing layer, and said second hose connection fitting also including a radial bore through which said second terminal protrudes to contact said reinforcing layer.

3. The hose as in claim **2,** including a pair of insulation blocks disposed within the bores through said connection fittings to insulate said terminals from contact with said connection fittings.

4. The hose as in claim **1,** including a first insulation washer disposed between the end of said hose and said first hose connection fitting and a second insulation washer disposed between the opposite end of said hose and said second hose connection fitting.

5. The hose as in claim **1,** said first and second terminals extending inwardly through said exterior cover to contact and terminate within said reinforcing layer.

6. The hose as in claim **1** wherein said reinforcing layer is fabricated from steel.

7. A fitting for a reinforced hydraulic pressure hose having an inner reinforcing layer of conductive material, said fitting comprising:

a cylindrical portion sized to fit over the end of said hose;

a neck portion integral with said cylindrical portion extending outwardly from the end of said hose when said cylindrical portion is fitted over the end of said hose;

a hose coupling connected to said neck portion;

a bore through said cylindrical portion;

a terminal extending through said bore and protruding inwardly from said cylindrical portion a sufficient distance to contact said reinforcing layer when said cylindrical portion is fitted over the end of said hose; and

an insulation block disposed within said bore to insulate said terminal from contact with said cylindrical portion.

8. The fitting as in claim **7,** including an insulation washer disposed within said cylindrical portion to insulate the end of said hose from said cylindrical and neck portions.

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