Jan. 22, 1957 D. J. PEEPS 2,778,609

COMPOSITE HOSE WITH TEMPERATURE CONTROL

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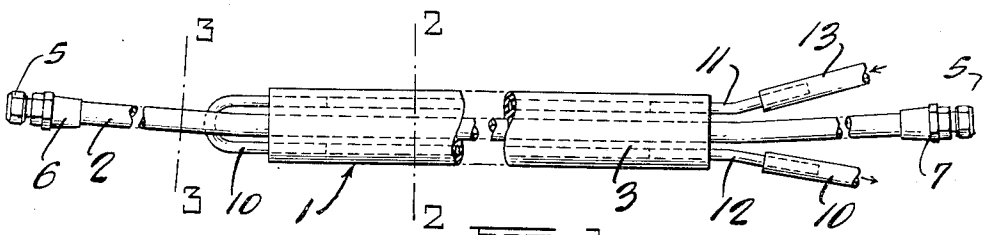


FIG-1-

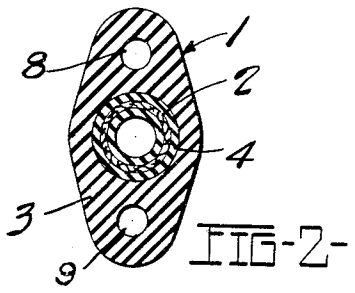


FIG-2-

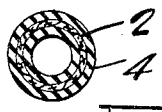


FIG-3-

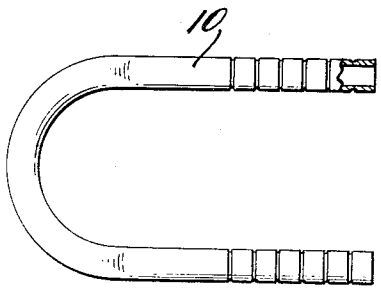


FIG-4-

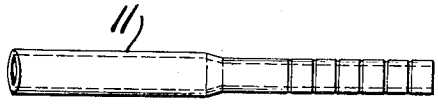


FIG-6-

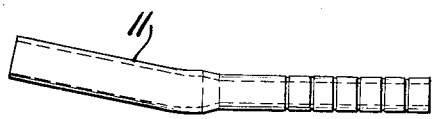


FIG-7-

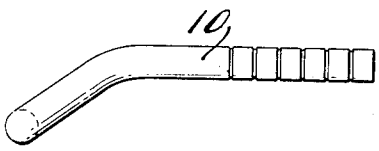


FIG-5-

INVENTOR:
DONALD J. PEEPS.
BY
W.P. Carr
ATTY.

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COMPOSITE HOSE WITH TEMPERATURE CONTROL

Donald J. Peeps, Toledo, Ohio, assignor to The DeVilbiss Company, Toledo, Ohio, a corporation of Ohio

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7 Claims. (Cl. 257—241)

This invention relates to a composite hose for delivering coating material to a spray gun with means for maintaining the material traveling through the hose at a selected temperature.

The benefit of reduced viscosity and other advantages gained through heating many coating materials have steadily gained greater recognition and the practice of applying heated materials has increased proportionately.

Various means have been adopted for the initial heating of coating substances. In some devices metal cores or casings have acted as transfer mediums carrying heat directly from electrical elements. Others utilize a liquid as the main transfer agent. In the latter type the liquid has generally been confined in a static condition in a chamber associated with which are passages for the coating material.

However, the most efficient arrangement so far devised appears to be one in which the liquid heat transfer medium is heated at a separate station and then circulated through a heat exchanger through which the coating material is also directed. This arrangement has proved very efficient from a transfer standpoint and subject to close temperature control. The possibility of overheating the coating substance is thus reduced to a minimum. Because of its high heat capacity and conductivity as well as its ease of flow water is a very effective transfer medium in such a system.

As spray operations in general are not without occasional interruptions heating spray material at the supply source alone permits an undesirable cooling of the material in a single hose leading to the spray gun. Numerous arrangements have been devised for keeping the material traveling to the spray gun at the selected temperature. A common method has involved the use of a return hose to the heated source and a pump to propel the material in a constant stream through one hose to the spray gun and then back through the return hose to the heating reservoir. While effective this system requires a costly investment in the pump and other necessary equipment. In addition, with two hoses depending from the spray gun manipulation of the gun is awkward and extra tiring.

An electrically heated single hose is likewise objectionable because of its weight and bulk besides presenting the danger of overheating the coating substance as it lies static in the hose when the spray operation is temporarily halted.

In view of the difficulties attending the employment of these prior apparatuses, much attention and effort has been given to the development of a hose structure or hose casing through which a heating medium set at a safely controlled temperature could be circulated to maintain the coating material at a selected temperature whether the coating material is in transit or momentarily at rest in its passage to the spray gun.

In undertaking to design such heat maintaining means, structures similar to the composite tubings having three or more bores illustrated in French Patent 773,584 to Erbslob, dated November 21, 1934, have been built. One

of the passages is utilized for the flow of the coating material while the remaining passages are divided between advancing and return paths for the circulated heat transfer agent.

The extrusion of rubber or synthetic rubber in some of the Erbslob forms with thin walls is believed impossible and difficult in any instance. The several attempts at creating such composite hose proved expensive and troublesome although final structures were produced, at least one of which was similar to that of his Figure 17. This comprises a central bore used as a coating material passage and a surrounding casing with four segmental passages used for the feeding and return of the heating medium.

While these composite hose products appeared ingenious in design and had fair compactness and flexibility, they failed when subjected to practical usage. Due to the variance in pressures between the coating material and the supply and return lines of the heating agent breakdown of the relatively thin or irregularly shaped dividing walls occurs. This either causes incomplete circulation of the heating medium or, much more disastrous, the seepage of coating material into the heating medium circuit. Also the odd shape of the passages makes the fitting of the connections a constant source of complaint as leaks are almost impossible to prevent. These various deficiencies brought about the early withdrawal of such hose from the market.

In the face of these previous failures applicant has conceived and built a composite hose having the required qualifications of flexibility and limited weight without the structural weaknesses causing fracture of partitioning portions and incomplete sealing with attached connections.

As hereinafter explained and disclosed in greater detail this composite hose comprises an inner material conduit and a heavy integral casing of elliptical cross-section with heating agent conducting passages on opposite sides of the material conduit with their axes passing through the longest diametric line of the elliptical cross-section. The material conduit is composed of a laminated hose of the strength and structure of a conventional single hose built for transporting coating material under pressure to a spray gun.

It is accordingly an object of this invention to provide a composite hose which is flexible, light and easy to manipulate.

Another object is the provision of such a hose which will stand up under usage without developing breaks or fractures.

A further object of the invention is the provision of a composite hose to which leakproof connections may be easily attached.

Another object is to provide such a hose which is inexpensive to fabricate.

Other objects and advantages will become apparent upon reading the following description and with study of the drawings in which:

Figure 1 is an elevation of a composite hose embodying my invention;

Figure 2 is an enlarged vertical section of the hose taken on the line 2—2 of Figure 1;

Figure 3 is an enlarged vertical section of the end extension of the material conduit taken on the line 3—3 of Figure 1;

Figure 4 is an enlarged elevation of the U-tube joining the advancing and return passages of the heating agent;

Figure 5 is a similar view with the U-tube turned 90° on a horizontal axis.

Figure 6 is a side elevation of one of the tubular in-

serts; and Figure 7 is a similar view with the member turned 90° on a horizontal axis.

Referring to the drawings in more detail the main body 1 of the composite hose is generally elliptical in cross section with the long axis of the cross section approximately one and one half inches in length. The main body is formed of neoprene, a synthetic rubber product extruded through a suitable die about the material conduit 2. Other synthetic or natural rubber compositions may also give quite satisfactory results when used in forming the extruded casing 3. Neoprene, a polymer of chloroprene, is recommended for its elasticity and other mechanical properties at least equal to natural rubber and also because of its superior resistance to various solvents and chemicals.

The material conduit 2 is preferably on the order of a standard paint hose having a solvent resisting liner and an intermediate reinforcing braid layer 4 giving the conduit sufficient strength to withstand at least one hundred pounds working pressure.

In order to limit the overall size of the composite hose and at the same time provide passages permitting ample flow, conduit 2 is designed with an inside diameter within the approximate range of one quarter to five sixteenths inch and an outside diameter substantially in the range of one half to five eighths of an inch. By having these dimensional limits for conduit 2 it has been found that a single forming die may be used for the casing 3 and the latter then is the same size whatever size of conduit, within the specified ranges, is employed.

To give the operator greater freedom in manipulating the spray gun the end of conduit 2 which is attached to the spray gun by the threaded nut 5 of the standard hose connection 6 may extend as much as two feet beyond the main body 1. Likewise at the other end of main body 1 it is convenient to have a short extension of conduit 2 to facilitate its attachment by means of a connection 7 to a supply source of coating material. This extension may not be more than a few inches long.

In the extrusion of casing 3 two parallel bores are formed therein on opposite sides of conduit 2 with their axes crossing the longer diametric line of the elliptical cross section. These are for the advance and return of the heating medium for which water is particularly suitable. As a matter of description, bore 8 will be considered the delivery line and bore 9 the return line. For the purpose of this invention the diameter of each of these bores is preferably about thirteen sixty-fourths of an inch within the range of three sixteenths to one quarter. At the forward or spray gun end of the composite hose, inlet or delivery bore 8 is joined to the return bore 9 by metal U-tube 10 inserted into the bores. The tube is slightly larger than the bores and under the compressive resilience of the neoprene the tube is held in place with no requirement of cement or exterior clamps to withstand the pressure of ten to thirty pounds under which the water flows. As a precautionary measure should there be occasional variations in dimensions cement may of course be applied to these joints.

The free portion of U-tube 10 is bent laterally away from the longitudinal axis of the composite hose in order that it be out of interfering line with the centrally located exterior extension of conduit 2.

Into the opposite ends of the bores 8 and 9 are tightly fitted tubular connectors 11 and 12. These are bent outwardly away from the conduit to make it easier to slip rubber tubing 13 over their exposed ends. The connectors 11 and 12 are respectively in communication with the hot water delivery line and the return line to a water heating device with which a pump is associated for circulating the water. These lines may be in series or parallel arrangement with lines running to a heat exchanger where the coating material is brought to the temperature which is substantially maintained within the composite hose while the material is en route to the spray gun.

The inherent strength of the construction of conduit 2 with the solid nature of the extruded casing 3 produces a very sturdy composite hose. The tight fit of the casing about the conduit reinforces both components and the resistance to undue flexing by the laminated conduit protects the casing 3 against such mishandling.

The passages are all separated by partitions of ample proportions. The path of the coating material has between it and each water line bore the laminated wall of the conduit as well as the portion of the casing on the adjacent side of the bore.

The two water passages, bores 8 and 9, are not only widely spaced but have the barrier of the conduit 1 between them in addition to the intervening sections of the casing 3.

These factors all cooperate in assuring a durable composite hose of long life with the possibility of cracks or other openings between passages reduced to a minimum.

As the neoprene of the casing 3 and the rubber type of materials of which conduit 2 is made are all poor heat conductors, the dissipation of heat from the coating material traveling through conduit 2 would be quite slow in any case. Little transfer of heat from the circulating transfer medium is therefor required to retard such dissipation. Much greater heat loss is borne by the medium through the comparatively thinner walls between the medium passages and the atmosphere.

While the purpose of this invention is primarily for maintaining the temperature of a previously heated coating material, it is also adaptable for use alone as a heat exchanger to introduce heat to a conducted material or conversely to remove heat therefrom.

Other uses may suggest themselves as may variations in the particular forms disclosed without departing from the spirit of the invention and the scope thereof as set forth in the appended claims.

What I claim is:

1. A compact, flexible composite hose for conveying a material under temperature control having a centrally located cylindrical conduit of substantial wall thickness providing a passage for the material, an extruded, integral, homogeneous, solid-bodied casing tightly encompassing the conduit for a major portion of its length, said casing having an elliptical cross section with its center on the longitudinal axis of the conduit, two cylindrical bores in the casing extending the full length thereof, said bores being on diametrically opposite sides of the conduit with their longitudinal axes crossing the longest diametric line of the elliptical cross section and means directing heat transfer medium through the bores.

2. A composite hose according to claim 1 in which one of the bores conveys heat transfer medium in one direction and the other or second bore conveys the medium in the opposite direction and there is a connection joining the outlet end of the first bore with the inlet end of the second bore.

3. A compact, flexible composite hose for conveying a coating material under temperature control from a supply source to a spray gun having a centrally located cylindrical conduit of substantial wall thickness providing a passage for the material, an extruded, integral, homogeneous, solid-bodied casing tightly encompassing the conduit for a major portion of its length and extending short of the ends of the conduit, two cylindrical bores in the casing for the full length thereof, said bores being on diametrically opposite sides of the conduit, a connection on one projecting end of the conduit by which it is fastened to a spray gun, a connection on the other end by which it is fastened to a coating material supply source, a laterally bent U-tube connecting the ends of the cylindrical bores at the spray gun end of the casing, and means introducing a heat transfer medium into the other

end of one of the bores and providing an outlet for the heat transfer medium at the other end of the second bore.

4. A composite hose according to claim 3 in which the cylindrical conduit has an inner liner of solvent resisting material, an intermediate layer of reinforcing braided fabric and an overlying cover of rubber-like material.

5. A composite hose according to claim 3 in which the passage in the conduit has a diameter approximately in the range of one quarter to five sixteenths of an inch and the diameter of each of the bores in the casing is between three sixteenths and one quarter inch.

6. A composite hose according to claim 3 in which the casing has an elliptical cross section and the coating material passage and the transfer medium bores are located with their longitudinal axes crossing the longest diametric line of the elliptical cross section.

7. A compact, flexible composite hose for conveying a material under temperature control having a centrally located cylindrical conduit with a fabric reinforced wall

of substantial thickness, said conduit providing a passage for the material, an extruded, integral, homogeneous, solid-bodied casing tightly encompassing the conduit for a major portion of its length with the conduit freely extending beyond one end of the casing, two cylindrical bores formed directly in the casing and extending the full length thereof, said bores being spaced from each other and the conduit and having substantial portions of the casing between them, and means directing heat transfer medium through one bore and back through the other bore.

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