

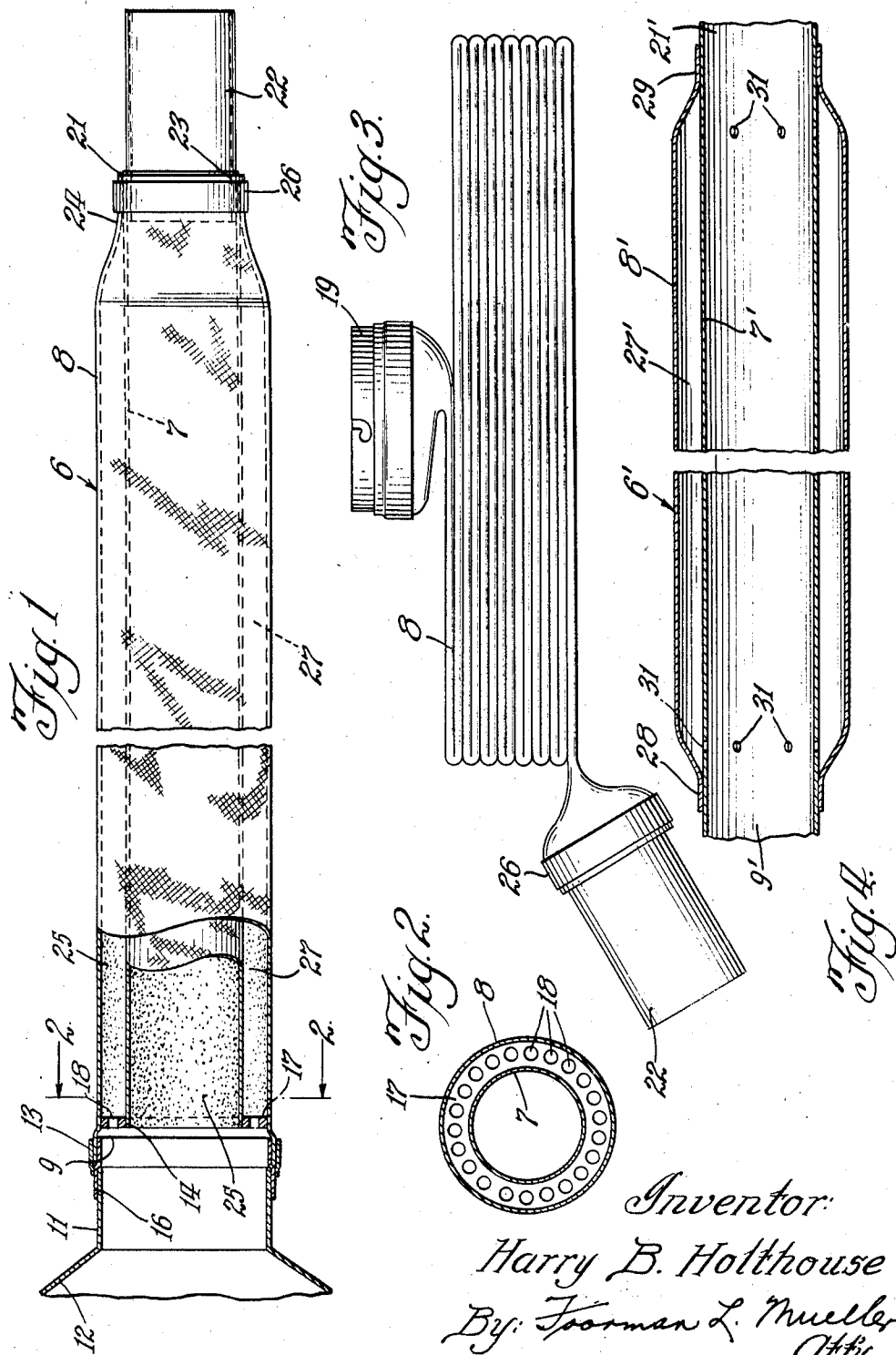
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CONDUIT CONSTRUCTION

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CONDUIT CONSTRUCTION

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This invention relates generally to conduit means and particularly to means for carrying a conditioned fluid, namely fluid either heated or cooled relative to room or outside temperatures, which is adapted to be inflated when carrying the fluid and collapsible when not carrying the fluid so as to be rolled or folded into a small compact package for transport.

Flexible conduit means for carrying conditioned fluid, such as air, are particularly applicable for what might be called temporary installations, such as in the air connection of a conditioning unit with the cabin of an airplane, the packing space in a truck, or the passenger space in a railroad car when these mobile crafts are standing by. The flexibility in some of the prior art conduit structures employing a single conduit is generally accomplished by the positioning of supporting hoops or the like within the conduit wall or in a supporting relation about the conduit wall. In other prior art structures utilizing two conduits concentrically arranged with one within the other and radially spaced to provide an insulating air space therebetween hoops or the like are usually positioned between the two conduits to define such insulating space and support the complete structure during operation. Thus although these prior art conduit structures are flexible they are non-collapsible and hence are bulky and clumsy to handle, and carry about. Further, when not in use they are incapable of being folded or rolled into a compact unit so that the large space required for their keeping is such as to preclude their being carried on the conditioning unit with which they are to be connected. A further objection to these prior art flexible conduits is that their construction generally provides for excessive thermal losses therein when the conditioned air is to be transmitted over an appreciable distance.

It is an object of this invention, therefore, to provide improved conduit means for carrying conditioned fluid.

Another object of this invention is to provide conduit means for carrying conditioned air, which is collapsible when not in use so as to be rolled flat into a small compact bundle, and inflatable when in use by the air passing there-through.

A feature of this invention is found in the provision of collapsible means for carrying conditioned air which is comprised of a pair of inflatable conduits one of which is arranged within the other, with the inner conduit carrying the air and the outer conduit being in air communi-

cation with the inner conduit and adapted to retain the air entering therein to form an air insulating space about the inner conduit.

Further objects, features, and advantages of this invention will become apparent from the following description when taken in connection with the accompanying drawing in which;

Fig. 1 is an elevational view of the air carrying means of this invention showing the conduit portions thereof in an inflated condition, with a portion of the air carrying means being shown in section for the purpose of clarity;

Fig. 2 is a transverse sectional view as seen along the line 2—2 in Fig. 1;

Fig. 3 shows the conduit means of Fig. 1 when collapsed and folded into a compact bundle for transport; and

Fig. 4 is a modified form of the invention.

With reference to Fig. 1 of the drawing the conduit or air carrying structure of this invention, which is designated generally as 6, is seen to include a pair of conduit portions 7 and 8, with the conduit 7 being of lesser diameter than the conduit 8 and positioned therein. The inlet 9 of the structure 6 is adapted for connection with an outlet 11 of a heating or cooling unit 12 as by a bayonet assembly 13. The corresponding ends 14 and 16 of the conduits 7 and 8, respectively, at the inlet 9 are connected together in a radially spaced relation through a separating ring 17 having apertures 18 peripherally spaced therein (Fig. 2). As is clearly illustrated in Fig. 1 the end 14 of the inner conduit 7 terminates at the ring 18, with the slip ring 19 of the bayonet assembly 13 being carried on the end 16 of the outer conduit 8 which extends beyond the inner conduit end 14.

The outlet 21 of the conduit structure 6 is provided with a nozzle 22 inserted within the end 23 of inner conduit 7, the corresponding end 24 of the outer conduit 8 being connected with the inner conduit end 23 in an airtight connection about the insert 22 by a clamping or retaining ring 25. It is evident, therefore, that both of the conduits 7 and 8 are in fluid communication with the air source 12, with the air entering the conduit 7 passing through the structure 6 and outwardly therefrom at the nozzle 22. However, by virtue of the sealed engagement of the corresponding ends 23 and 24 of the inner and outer conduits 7 and 8, respectively, the air entering the outer conduit 8 through the apertures 18 is retained within such conduit for a purpose to be later noted.

In the practice of this invention it is contemplated

plated that the conduits 7 and 8 be composed of a material known as balloon silk which is comprised essentially of a very light canvas rubberized on one side and is substantially both airtight and waterproof. The outer conduit 8 by virtue of its protecting relation with respect to the inner conduit 7, may be rubberized somewhat heavier than the inner conduit to improve its wearing qualities. However, both of the conduits 7 and 8 are of a very light weight so as to be immediately collapsible when air is withdrawn therefrom, and conversely to be easily inflatable when air is passed therein.

As shown in Fig. 1 the conduit means 6 is shown in an inflated condition corresponding to a passage of air therethrough from the air conditioning unit 12. This air inflates the inner conduit 7 and also the outer conduit 8 by passage of a portion thereof through the apertures 18. Because of the sealed end 24 the air entering the outer conduit 8 is retained therein to provide an air space 27 about the inner conduit 7. By virtue of the light weight construction of the conduits 6 and 7, and the passage of air through each thereof from the same source, substantially equal pressures are exerted on the opposite peripheral surfaces of the inner conduit 7 so that the annular space 27 formed between the conduits 7 and 8 is maintained substantially uniform over the entire length of the conduit structure 6. The conduits 7 and 8 are thus substantially equally separated at all points along their respective lengths by the air insulating space 27. This insulating space 27 is maintained intact even though the conduit structure 6 may be bent around at substantially right angles. It is seen, therefore, that the inner conduit 7 acts to carry the conditioned air through the conduit structure 6, while the outer conduit 8 acts to retain a portion of the air in an insulating space 27 about the inner conduit 7. This insulating space provides for a transfer of the conditioned air through the conduit structure 6 with minimum thermal losses so that the air from the conditioning unit 12 can be carried appreciably long distances without a great deal of change in the temperature thereof. Thermal losses may be further reduced by painting the inner peripheral surfaces of the conduits 7 and 8 with aluminum or like paint, as indicated at 25 (Fig. 1).

On shutting down of the air conditioning unit 12 the conduits 7 and 8 are completely collapsible by virtue of their light weight construction. Because of the complete elimination of any supporting members between the ends of conduits 7 and 8, the conduit structure is thus adapted to be rolled or folded into a small compact bundle as illustrated in Fig. 3. Since the radial spacing between the conduits 7 and 8 and their inflation during operation is accomplished entirely by the air carried therein the conduits 7 and 8 are freely foldable over their entire lengths. Thus when the conduit structure 6 is not in use it may be packed or stored away in a very small space, which space may be provided on the air conditioning unit itself. This package carrying of the conduit structure 6 facilitates its handling relative to the conditioning unit with which it may be operatively associated, and further because of its very light weight is readily manipulated for connection with the space in a mobile craft or the like, which is to be conditioned.

In the modified form of the invention shown in Fig. 4 the inner conduit 7' is illustrated as positioned within, and extended through the outer or

air retaining conduit 8', the inlet 9' being adapted for connection with a source of conditioned air and the outlet of the conduit structure 6' being indicated at 21'. The opposite ends 28 and 29 of the outer conduit 8' are connected in air tight engagement with the outer periphery of the inner conduit 7' between the inlet 9' and outlet 21', thereof. Provided in the inner conduit 7' and within the length thereof between the ends 28 and 29 of the outer conduit 8' are apertures 31 for air connecting the two conduits 7' and 8'. As shown in Fig. 4 the apertures 31 are circularly arranged in the conduit 7' near each end 28 and 29 of the outer conduit 8'. However, it is to be understood that one circle of apertures 31 at either end 28 or 29 may be used to air communicate the conduits 7' and 8'.

The conduits 7' and 8' are constructed similarly to the conduits 7 and 8, previously described in connection with Fig. 1, and are shown in Fig. 4 in an inflated condition. The air from a source of air is first admitted into the inlet 9' and inflates the conduit 7', with a portion of such air passing into the conduit 8' through the apertures 31 to inflate the same and form an annular insulating air space 27' about the conduit 7'. Where two rings of apertures 31 are used a small flow of air will occur in the annular space 27', but because of the limited flow of this air the air space 27' will be continuously retained. Where a single ring of apertures 31 is used the air entering the conduit 8' through such single circle of apertures is retained therein. Instead of providing a plurality of apertures 31 in the inner conduit portion 7', the conduit 7' may be of such a construction that the porosity thereof permits sufficient air to flow therethrough into the outer conduit 8' to provide the air insulating space 27'.

When air is withdrawn from the conduit structure 6' the conduits 7' and 8' are completely collapsible so as to be adapted for rolling or folding in the manner above described for the conduit structure 6 of Fig. 1.

From a consideration of the above description and drawing, therefor, it is seen that the invention provides means for carrying conditioned air comprising a pair of inflatable conduits one of which is arranged within the other. The inner conduit which carries the air, is in a spaced relation with the outer conduit and in air connection therewith. The air being carried in the conduit structure alone acts to inflate and support the structure in an operating condition, while also acting on the outer conduit to provide an insulating air space entirely about the inner conduit. By virtue of this air insulating space the conduit structure is capable of transmitting conditioned air over appreciably long distances with minimum thermal losses during such transmission. The light weight construction of the conduits provides for their being completely collapsible so as to be easily rolled or folded into a compact bundle for transport or storing. Although air has been generally referred to throughout the specification in describing the conduit means of this invention it is apparent that the invention may also be used to efficiently carry conditioned water or a like fluid since the conduits thereof are waterproof.

It is understood also that although the present invention has been described, with specific reference to several embodiments thereof it is not to be so limited since changes can be made therein which are within the full intended scope

of this invention as defined by the appended claims.

I claim:

1. Means for carrying a temperature conditioned fluid including a pair of collapsible tubes, one of which is positioned within the other, means connecting the opposite ends of said other tube with said one tube, with the opposite ends of said one tube being open for the flow of fluid therethrough, and a portion of said fluid being directed within said other tube, with the fluid in the said two tubes inflating the same in a concentric relation and being the sole means for supporting said two tubes in said concentric relation, and the fluid in said other tube providing an annular fluid filled insulating chamber about said one tube, said two tubes being deflatable so as to lie in a substantially flat form adapted for overlapping folding into a compact bundle.

2. Conduit means for carrying conditioned air comprising a pair of collapsible tubes, one of which is positioned within the other, means connecting opposite ends of said other tube about the outer periphery of said one tube, with said one tube having the opposite ends thereof open to permit the flow of conditioned air there-through, said one tube having openings therein between the ends of said other tube to permit the passage of a portion of the air from said one tube between said two tubes, with the air flowing through said one tube and the portion of air passing between said two tubes inflating

said two tubes and being the sole means for supporting the same in a concentric arrangement, the flow of air between said two tubes being less than the flow of air through said one tube to provide an annular air-filled insulating chamber about said one tube, said two tubes being deflatable so as to lie in a substantially flat form adapted for overlapping folding into a compact bundle.

3. Conduit means for carrying temperature conditioned air including a pair of collapsible tubes one of which is positioned within the other, said one tube having the opposite ends thereof open for the flow of air therethrough and said other tube having one end thereof in sealed engagement about the periphery of said one tube at an end thereof, apertured means connecting the opposite corresponding ends of said two tubes, and means for connecting said conduit means at said opposite corresponding ends of said two tubes to a source of conditioned air so that the air from said source enters apertures of said apertured means and said one tube for inflating said tubes and being the sole means for supporting the same in concentric relation, with the air entering said other tube through said apertured means being retained between said two tubes and providing a thermally insulating air-filled pocket about said one tube, said two tubes being deflatable so as to lie in a substantially flat form adapted for overlapping folding into a compact bundle.

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