Sept. 3, 1963 W. A. PLUMMER 3,102,740

PROTECTIVE JACKET FOR ASSEMBLY ABOUT COLD FLUID-CONVEYING DUCTS

Filed May 20, 1959

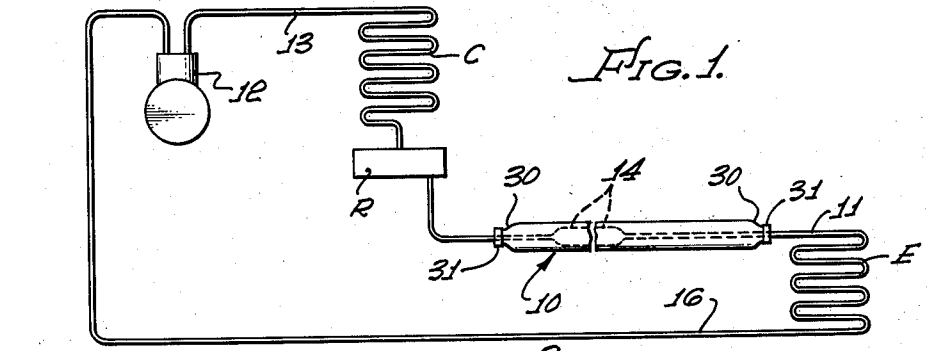


FIG. 1.

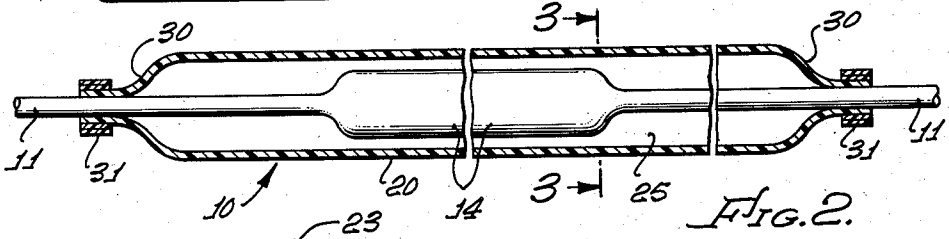


FIG. 2.

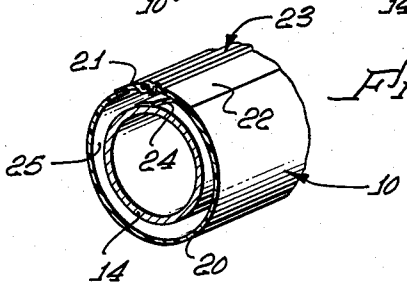


FIG. 3.

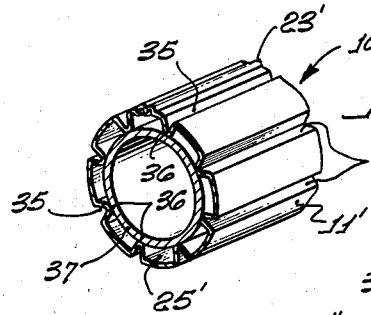


FIG. 4.

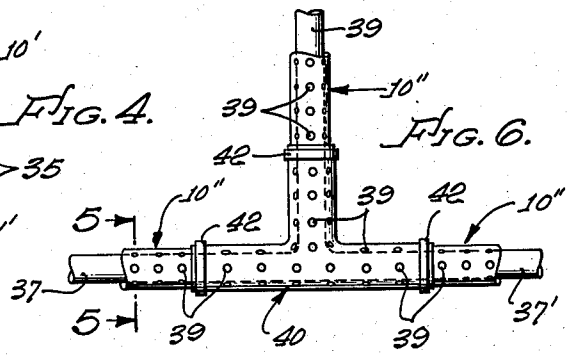


FIG. 6.

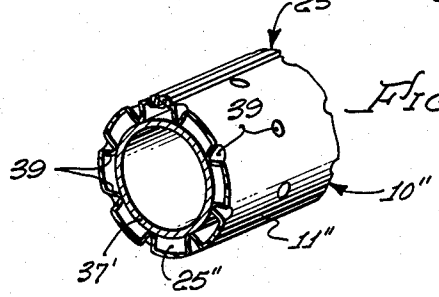


FIG. 5.

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PROTECTIVE JACKET FOR ASSEMBLY ABOUT COLD FLUID-CONVEYING DUCTS

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This invention relates to protective jackets for ducts and more particularly to an inexpensive easily-installed effective jacket adapted to be installed about cold fluid conveying conduits and ducts for the purpose of preventing condensation of moisture from atmospheric air and the like gases surrounding such ducts.

There are many situations where cold fluids passing through duct systems cause condensation of moisture from the surrounding ambient air which moisture drips onto persons and property in the vicinity of such ducts. The problem is particularly common and wide spread, though not restricted to, basements in humid areas. For example, service water pipes passing through basements of homes and buildings generally contain cold water at a temperature below the dewpoint of the high humidity ambient air in the basement. In consequence, the moisture in the air condenses on the exterior of these cold pipes and drips onto the floor and other property in the basement. Not only is this a great nuisance, but the dripping water causes serious damage to property in the basement, creates pools of water about the floor and presents hazards to persons walking across the floor, particularly when wearing smooth rubber soles or rubber heels.

Refrigeration systems of all kinds including air conditioners, sharp freezers, counter coolers, domestic refrigerators and others are subject to similar difficulties by reason of the fact that portions of the system, including the expansion valve and its connection to the evaporator, become quite cool causing condensation of large quantities of moisture from surrounding humid air. Likewise, there are numerous other environments and conditions where similar conditions exist, those mentioned merely serving as illustrative of conditions conducive to the condensation of moisture in objectionable quantities.

Various proposals have been made heretofore for minimizing the results attributable to the condensation of moisture on cold ducts and pipes. For example, it has been common practice to provide drain troughs supported closely adjacent the underside of such pipes and inclined sufficiently to drain the collecting moisture to a point of drainage or disposal. Other proposals have dealt with the provision of air dryers capable of lowering the humidity sufficiently to reduce if not entirely avoid the condensation of moisture on cold pipes. Such air dryers are costly to provide as well as to operate, and require a very considerable amount of space. Furthermore, serious problems are encountered in larger installations in circulating the air through the dryer with sufficient frequency to prevent moisture condensation on cold pipes. Chemical moisture absorbing devices of various types have also been used in large numbers but these are troublesome to service and require frequent reconditioning or replacement of the active agent at frequent intervals. Still another proposal which has had widespread acceptance in recent years concerns the provision of mechanical dehumidifiers in the nature of compact refrigeration systems effective to condense moisture from basement air and to conduct it to a point of disposal. Such equipment is costly to provide, operate and service.

In view of the foregoing, it is a primary object of the invention to provide a simple heat insulating and protective jacket for assembly about cold pipes and ducts and effective to obviate the shortcomings and disadvantages of prior methods of preventing condensation of moisture.

The jacket is preferably formed of inexpensive, thin-wall, flexible plastic material arranged to be readily applied to previously installed duct systems irrespective of branch-outs and auxiliary devices therealong and effective in providing a closed dead air space between the jacket and the exterior wall of the duct. The jacket, being of poor heat conductive material and being augmented by the heat insulating properties of the dead air space, prevents contact of the high humidity air with the cold duct and thereby prevents the condensation of moisture. The jacket is preferably so formed that indentations or projections at frequent intervals therealong serve to hold major portions of the jacket walls out of contact with the cold duct. Such indentations or projections may take the form of waffling or embossing in the main body material of the jacket, in the provision of continuous or intermittent corrugations extending generally lengthwise of the jacket, as well as in the provision of bosses or inwardly extending projections formed as a part of the jacket wall.

Accordingly, it is a prime object of this invention to provide improved easily-installed and inexpensive jacket for assembly about cold ducts and effective to prevent condensation of moisture from ambient air and the like on such ducts.

Another object of the invention is the provision of a simple jacket having endless seam means extending lengthwise thereof which can be readily closed as an incident to the assembly of the jacket about a pipe to be protected and cooperating therewith to provide a dead air, heat-insulating space between the exterior of the pipe and the jacket.

Another object of the invention is the provision of a one-piece continuous jacket having seam means extending along its lateral edges in the form of interlocking, substantially fluid-tight tongues and grooves cooperable to form a fluid-tight jacket having a loose fit about a cold fluid-conveying duct.

Another object of the invention is the provision of a heat insulating jacket adapted to be installed about conduits without need for any but the simplest of tools and effective in preventing condensation of moisture from ambient air on pipes or ducts enclosed thereby.

These and other more specific objects will appear upon reading the following specification and claims and upon considering in connection therewith the attached drawing to which they relate.

Referring now to the drawing in which preferred embodiments of the invention are illustrated:

FIGURE 1 is a schematic view of a refrigeration system having a cold portion of its circuit enclosed by one preferred embodiment of the invention;

FIGURE 2 is an enlarged fragmentary view of the jacketed portion of FIGURE 1, the jacket proper being shown in section;

FIGURE 3 is an enlarged cross-sectional view taken on line 3—3 on FIGURE 2;

FIGURE 4 is a cross-sectional view similar to FIGURE 3 of a second preferred embodiment of the protective jacket;

FIGURE 5 is a cross-sectional view similar to FIGURES 3 and 4, of a further embodiment of the jacket, the view being taken along line 5—5 on FIGURE 6; and

FIGURE 6 is a fragmentary view of a conduit system having a branch-out and showing the protective jacket of FIGURE 5 installed thereon along with a junction fitting or jacket.

Referring more particularly to FIGURES 1 to 3, there is shown one preferred embodiment of the jacket designated generally 10 and applied about a portion of conduit 11 connected between a refrigerant liquid receiver R and evaporator E of a refrigeration apparatus. It will

be understood that this refrigeration apparatus may be designed for any refrigerating function and includes a motor driven compressor 12 operable to deliver compressed refrigerant vapor to condenser C through a conduit 13. The high pressure vapor condenses in passing through the condenser and the resulting liquid passes into refrigerant receiver R from which it flows as required through conduit 11 and any suitable flow control and expansion such as expansion valve 14 to evaporator E. The liquid refrigerant entering the evaporator under reduced pressure vaporizes and returns to compressor 12 through the return conduit 16. The reduction in pressure effected by expansion valve 14 and the suction effect of compressor 12 causes the refrigerant to evaporate producing refrigeration in evaporator E as well as lowering of the temperature at the valve 14 and in the portion of conduit 11 connecting the valve to the evaporator E. Valve 14 and the cool portions of conduit 11 are often so located as to be exposed to humid air. In consequence, the temperature of the air contacting cold portions of pipe 11 and valve 14 is lowered below the dewpoint with the result that the moisture in the air condenses and even forms frost on the cold pipe. During periods when the refrigeration apparatus is not in operation, this frost melts and drips from the pipe causing a nuisance and unsanitary conditions.

The formation of frost and the resulting drip is entirely avoided by the application of the loose fitting protective jacket 10 to those portions of the refrigeration system exposed to the high humidity air. Jacket 10 may be formed of various impervious, non-heat conducting materials including sheet rubber, sheet plastic, and others such as fabric treated to render it impervious. As here shown, jacket 10 includes a wide strip of thin-walled flexible plastic stripping 20 having heat sealed to its lateral edges tapes 21, 22 of identical construction suitably formed along their free edges with complementally shaped interlocking detent means cooperable to form a fluid-tight seam 23 when the mating portions are pressed into interlocking engagement. Preferably, but not necessarily, one of the tapes, such as tape 22, is secured to the main body strip 20 inwardly of the edge of body strip 11 to leave a guard flap 24 of sufficient width to underlie seam 23. Guard flap 24 is not essential but is desirable as an aid in holding the portion of the jacket overlying the topside of the expansion valve housing 14 out of contact with this normally cold portion of the fluid circuit. Accordingly, it will be understood that guard flap 24 aids in holding jacket 10 spaced from the conduit being enclosed to form an annular dead air space 25 which enhances the effectiveness and the efficiency of the jacket for its primary function of preventing the formation of condensate from the ambient air.

To apply the jacket to the pipes to be protected against the formation of condensate, the jacket 10 is preferably applied from the underside of the parts to be enclosed as the lateral edges are folded upwardly about the duct as the interlocking tongues and grooves are pressed together to form seam 23. As here shown, seam 23 comprises a plurality of interlocking tongues and grooves but it is to be recognized that the nature of the seam may take any well known form, numerous variations of which are commercially available.

After the jacket seam has been closed, the opposite ends 30 may be contracted against conduit 11 and taped snugly in place by one or more layers of friction tape 31 or the like wrapped about the jacket ends. When so assembled, dead air space 25 is sealed at its opposite ends and cooperates with the poor heat conducting properties of the jacket material in isolating the cold conduit 11 and expansion valve 14 from the humid air surrounding the jacket. As a result, moisture does not condense and the many undesirable consequences of condensation are avoided.

Referring to FIGURE 4, there is shown a second preferred embodiment of the protective jacket designated generally 10' and differing from the form shown in FIGURES 1 to 3 primarily in that its main body strip 11' is formed lengthwise thereof with shallow corrugations 35. Crest portions 36 of corrugations 35 are disposed to contact the exterior of duct or conduit 37 and hold the major portion of jacket wall 11' spaced out of contact with the cold duct. Assurance is thereby provided that dead air space 25' is equitably distributed about the entire circumference of the duct. Additionally, this space is divided into elongated chambers spaced circumferentially from one another. Corrugations 35 need not extend the full length of the jacket, but may be of comparatively short lengths and arranged in end-to-end relationship or in staggered relationship, as is found most effective. It will be recognized that among the advantages of the corrugated form of jacket is the fact that it is readily adaptable to a range of duct sizes without interference with its effectiveness and efficiency.

In FIGURE 5 there is shown still another variant of the jacket designated geenrally 10''. In this construction main body 11'' is molded or otherwise formed with appropriately distributed generally conical or frusto-conical inwardly-extending bosses 39 which cooperate with one another to hold the wall proper of the jacket spaced outwardly from the exterior of cold duct 37' to form dead air space 25''. Bosses 39 may be shaped otherwise than shown in FIGURE 5, the frusto-conical shape having certain advantages including minimum area contact with the cold duct 37' and great load supporting ability.

Referring to FIGURE 6, there is shown a cold fluid-conveying duct 37' having a branch-out pipe 39. Each of the straight sections of duct are enclosed with a jacket 10'' in the manner described above, the ends of the jacket terminating a short distance from the junction of branch-out duct 39 with duct 37'. This junction area is covered by a specially formed junction jacket 40 having a one-piece generally T-shaped tubular configuration. Preferably the constructional details of junction fitting 40 are those disclosed in my co-pending application for United States Letters Patent, Serial No. 746,696, filed July 7, 1958, entitled Tubular Junction Fitting. It will be understood that fitting 40 is provided with two pairs of interlocking slide fastener tapes similar to those used in forming the closure seams for the various embodiments of jacket 10, these pairs of tapes extending along the opposite lateral sides of the stem portion of the T-junction and along the underside of the head portion of the fitting. The main body strip used in the junction fitting is preferably constructed in the same fashion as the main body strips of the jackets with which the fitting is to be used. Thus, as shown in FIGURE 6, fitting 40 preferably has frusto-conical bosses 39' for holding the wall of the fitting out of contact with the ducts.

The assembly of jackets 10' and of the junction fitting 40 about the conduit and its branch-out will be readily apparent from the foregoing description. Usually, the straight portions of the jacket 10'' are first assembled along each straight section of the duct system and of any branch-outs, a short gap between the jacket ends being left near the junction of the branch-out with the main duct. Each of the slide fastener tapes of junction 40 are then opened and the fitting is wrapped about the junction with its terminal ends either closely abutting or overlapping the adjacent ends of jacket 10''. Thereafter, the two pairs of seams are closed to hold the fitting snugly asembled about ducts 37', 39, and tapes 42 are wrapped over the ends of the junction fitting to seal the same to the adjacent portions of jacket 10''.

It will thus be apparent that the described jacket provides a continuous covering particularly suitable for installation about installed duct systems of any conceivable configuration, shape and arrangement. It is pointed out that junction fittings of any desired shape and size may

be used and assembled about the duct in accordance with the principles herein disclosed, including those suitable for assembly about valves, couplings, unions and other special fittings of a great variety of designs and types commonly used in the plumbing trade to the end that all parts of such duct systems for conveying cold fluids may be covered and effectively isolated from contact with humid air.

While the particular protective jacket for assembly about cold fluid-conveying ducts herein shown and disclosed in detail is fully capable of attaining the objects and providing the advantages hereinbefore stated, it is to be understood that it is merely illustrative of the presently preferred embodiments of the invention and that no limitations are intended to the details of construction or design herein shown other than as defined in the appended claims.

I claim:

1. A tubular jacket adapted to be opened into a continuous long generally flat strip for packaging and shipping and to be readily assembled about a duct adapted to convey cold fluids and effective in preventing moisture contained in high humidity air from contacting said duct, said jacket comprising a continuous single one-piece thin-walled tube of supple flexible sheet plastic material having poor heat conductivity, said jacket being appreciably larger in diameter than the duct for which it is designed and having fluid-tight reclosable seam-forming means of plastic nonheat conducting material extending from end-to-end thereof to facilitate assembly of the jacket about installed duct systems, spaced-apart portions of said jacket projecting radially inwardly and being cooperable with the exterior of the duct to support said jacketing concentrically and spaced outwardly away from said duct to provide an annular dead air space thereabout free of insulating material and effective in augmenting the poor heat conductive properties of said jacket for the purpose of preventing the cooling of the jacket below the dewpoint of ambient air surrounding said jacket.

2. A jacket as defined in claim 1 characterized in that said jacket includes conical indentations means integral with and projecting inwardly from the interior surface thereof and cooperable with the juxtaposed surfaces of a duct when assembled thereabout to hold the main portion of the jacket out of contact with the duct.

3. A jacket as defined in claim 1 characterized in that said inwardly projecting portions include the crests of corrugations having their longitudinal axes extending generally lengthwise of said jacket and distributed along the length of said jacket, and the supple flexible thin plastic material of said jacket readily permitting the side walls of said corrugations to hinge away from one another along the crest of the corrugations to accommodate the jacket to oversize ducting.

4. A jacket as defined in claim 1 characterized in that said inwardly projecting portions include a multiplicty of inwardly extending, spaced-apart uniformly distributed

indentations, the innermost portions of said indentations having small area contact with the exterior of the duct and distributed along the length of said jacket.

5. An insulating jacket adapted to be opened and laid on a long flat surface or coiled into a roll for packaging and shipping and cut into sections of any desired length for assembly about installed duct systems of the type conveying cold fluid and cooperable with such duct systems when installed thereabout to prevent condensation of moisture from the surrounding atmosphere, said jacket comprising a continuous one-piece elongated strip of thin-walled, supple flexible sheet-plastic material having interlocking plastic slide fastener strips secured along the opposite lateral edges of said strip, the girth of said jacket when assembled about a duct having a loose fit sufficient to provide a closed dead air space therebetween, said jacket being deformed inwardly to provide indentations uniformly distributed therealong and integral with said strip of sheet plastic, said idenstations having limited area contact with the exterior of a duct for the purpose of holding the major portion of the jacket spaced from and out of contact with the duct to minimize heat exchange between the duct and jacket.

6. A jacket as defined in claim 5 characterized in that said indentations include frusto-conical bosses having small area inner ends molded into the wall of said jacket and effective in holding the main body thereof spaced from a duct when the jacket is assembled thereabout.

7. A jacket as defined in claim 5 characterized in that said jacket includes a junction fitting of the same material and construction as said insulating jacket cooperable with a jacket for a branch-out duct and with a jacket for another duct connected therewith at an angle to provide a continuous covering for said duct and said branch-out, said junction fitting being shaped to form tubular enclsures for the junction portions of said duct and of the branch-out therefrom, and said junction fitting being of appreciably greater cros-section than the duct enclosed thereby to provide a dead air space.

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