Sept. 28, 1937. J. M. WEAVER ET AL 2,094,334

HEAT INSULATING TAPE

Filed Feb. 23, 1935

Fig. 1.

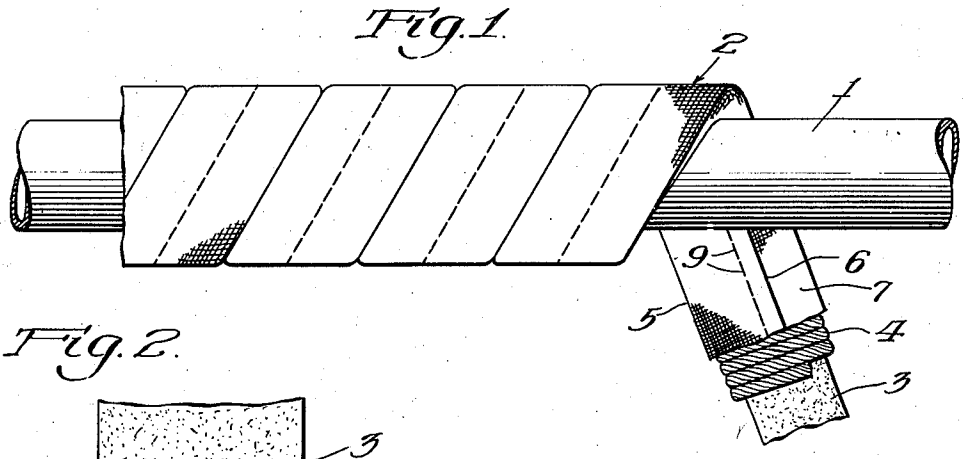


Fig. 2.

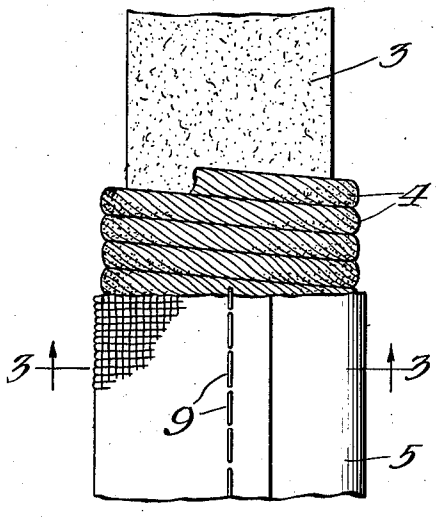


Fig. 3.

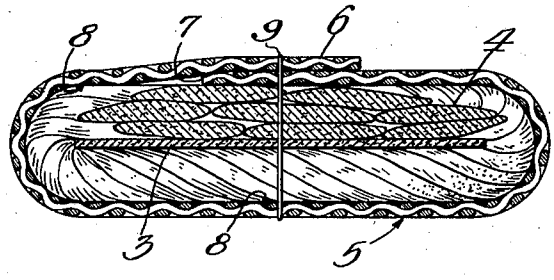


Fig. 4.

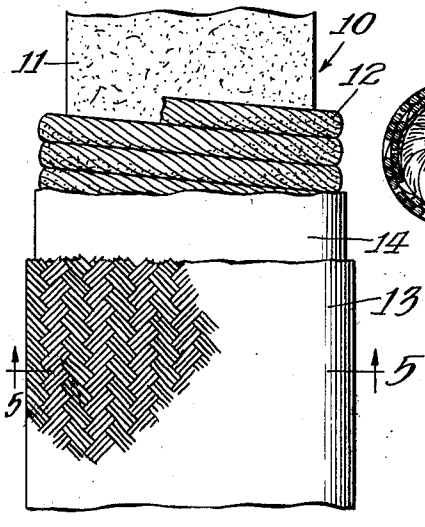
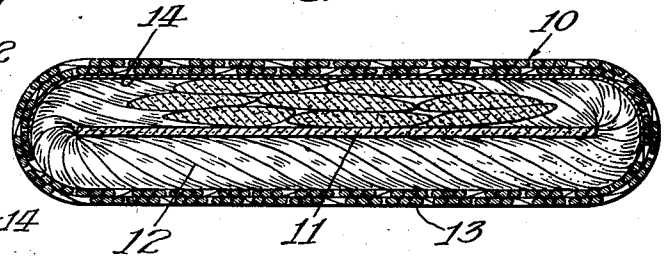


Fig. 5.



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HEAT INSULATING TAPE

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Application February 23, 1935, Serial No. 7,764

13 Claims. (Cl. 154—44)

This invention relates to improvements in waterproofed thermal insulation, and has more particular reference to the provision of a wrapping or tape element possessing both waterproof and thermal resisting properties and characteristics.

More specifically, the invention contemplates the provision of a relatively flexible, waterproofed, heat-insulated wrapping or tape which is adapted to be employed on vessels, containers, conduits, pipes or systems employing the same, (such as heating, refrigerating or other fluid conducting systems) in or through which fluids are passed or retained while maintained under excessively high or relatively low temperatures.

Wrappings or tapes possessing both waterproof and heat-resisting properties have heretofore been suggested for coverings on conduits or pipes through which fluids are conveyed at relatively high temperatures. These tapes usually comprise a core or body of heat-insulating material suitably sheathed or encased within a woven textile covering. In order to render such tapes water-resistant, a portion or all of their outer, exterior surfaces are impregnated or otherwise provided with an external layer of rubber or rubberized material, care being taken to avoid any rubber impregnation of the interior of said tapes.

In utilizing wrapping or tape of the type referred to, certain marked disadvantages have been found to result. In instances where the entire tape is enveloped in a layer of rubber material and subsequently wound, helically or otherwise, upon a conduit or pipe, direct and intimate contact of said layer with the highly heated conduit is unavoidable. Such contact, due to the excessive temperature condition of the conduit, necessarily disintegrates and breaks down the waterproofing layer, resulting in defeat of its waterproofing function. Again, in tapes of the character such that the rubber layer is only applied over those portions of the exterior surface of the tape which are removed from and out of direct contact with the conduit when the tape is applied thereto, moisture collecting upon or seeping through to such conduit is absorbed by the fabric covering of the tape, and, in turn, by its heat-insulating core. As a consequence, the purpose and function of the waterproofing layer is likewise defeated, thus rendering tapes of these general types more or less unsatisfactory as water-resistant.

Again, due to the structural character of the wrappings or tapes of the type referred to, a tendency to buckle due to their inability to conform to the curvature or contour of a conduit to which they may be applied will be found to exist in them, and this buckling tendency will be present in an even more pronounced degree when such tapes are applied to a conduit which is relatively small in diameter.

It is among the objects of the present invention, therefore, to provide a wrapping or tape element of a character such that the difficulties hereinbefore encountered and referred to will be effectively eliminated. It is among the further objects and advantages of the invention to provide a wrapping or tape, the insulating core of which, if desired, may be surrounded by a layer of water impervious material which is removed from and out of direct contact with the conduit or pipe about which the tape may be applied for insulation purposes.

As a feature of the invention, said water-impervious layer may comprise rubber, rubberized material, or a metal foil, adapted to be disposed interiorly of and surrounded by the outer sheath or covering of the tape, such outer sheath consisting of woven asbestos material and serving as an insulating layer between the water-impervious material and the highly heated conduit or pipe to which said tape may be applied.

As a further feature of the invention, the body portion or filler of the tape may comprise a relatively flat, thin, flexible sheet of asbestos paper, around which soft asbestos roving or wicking may be wound in helical fashion, the roving completely covering the asbestos sheet. This construction is such that when the wrapping is wound in spiral or helical fashion about the pipe or conduit, the play between adjoining layers or coils of the roving permits the tape to adjust itself upon the pipe without buckling. This feature permits the wrapping to be wound around pipes of extremely small diameters.

Another feature of the invention resides in the provision of a core for the tape or wrapping which comprises a relatively elongated, thin, flat, flexible sheet of asbestos paper, which, due to its shape, causes the tape or wrapping as a whole to conform therewith, that is, remain relatively flat, and, due to its composition, asbestos, serves as an additional barrier to the conduction of heat.

Other and further objects and advantages of the invention will become apparent from the ensuing detailed description and accompanying drawing, wherein:—

Fig. 1 is a side-elevational view of a pipe section covered by a waterproofed, insulating tape or wrapping of the present invention;

Fig. 2 is a fragmentary side-elevational view of

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the tape shown in Fig. 1, employing as a component part thereof, rubber or rubberized material, parts of said tape being broken away to illustrate its component parts;

Fig. 3 is a cross-sectional view, taken on a line 3—3 of Fig. 2;

Fig. 4 is a fragmentary side-elevational view of a modified insulating tape of the present invention, employing as a component part thereof a layer of metal foil, parts of said tape being broken away to illustrate its component parts; and

Fig. 5 is a cross-sectional view, taken on a line 5—5 of Fig. 4.

Referring in detail to the drawing, and particularly to Figs. 1 to 3, inclusive, 1 indicates a pipe or conduit which may be adapted to carry fluids at relatively high temperatures. It is to be understood, of course, that while the tape or wrapping embodying the invention is particularly adaptable for use in connection with pipes or conduits, it nevertheless has equal adaptability for use upon containers, vats or the like in which fluids are retained while under relatively high temperatures; and, furthermore, while the invention has been illustrated and described in its application to such pipes or conduits, it is to be in no sense limited thereto. The reference numeral 2 indicates the tape or wrapping, comprising a relatively elongated, thin, flat, flexible core of asbestos paper 3, about which relatively soft asbestos roving, wicking or rope 4 is wound or wrapped in spiral or helical fashion, whereby when such procedure is carried out, the adjacent coils of roving 4 will be disposed in contiguous relationship. The wrapping operation is such that, when effected, the core 3 is maintained in its original shape; that is, the core 3 when wrapped with roving 4, maintains substantially its tape-like form. This type and method of wrapping results in a three-ply insulating body, consisting of one ply of flat asbestos paper and two plies of asbestos roving or wicking.

The three-ply insulating body thus produced may then be suitably enveloped or sheathed within a braided or woven asbestos cloth or yarn jacket 5, provided with overlapping edge portions 6 and 7. The interior surface of the enveloping jacket 5 is suitably coated or impregnated with a waterproof layer 8, preferably of rubber or a compound thereof. The waterproof layer 8 is evenly distributed over said inner surface of the jacket 5, is preferably relatively thin in character, but of sufficient depth and extent, however, to be substantially water-resistant and wholly impervious to moisture. Additionally, the layer 8 shall not be of such thickness or consistency, of course, as to interfere with the requisite flexibility of the jacket 5 or with the tape 2 when constituting a component part of the latter.

Any well-known method or means may be resorted to in effecting such coating or impregnation of an asbestos cloth or fabric to be utilized in conjunction with the invention. Thus, it may be accomplished manually by evenly distributing a rubber compound solution over one surface of an asbestos cloth by means of a brush or other spreading device, or mechanically by means of calender rolls (not shown) adapted to force a layer of rubber compound into and upon the woven constituents of such fabric or cloth. When a given sheet of asbestos cloth has had one surface duly coated with a rubber compound, it may then be cut into strips of the desired width, sufficient in extent, of course, to afford a complete enveloping of the insulating body of the tape, as well as to provide for the overlapping edge portions 6 and 7. If desired, of course, asbestos woven tape of the requisite width may be employed in lieu of the asbestos cloth, and one surface thereof coated or impregnated with a rubber compound in like manner.

In assembly, the insulating body of the tape 2 is wrapped or enveloped within a strip of waterproofed asbestos cloth of requisite width, comprising the jacket 5, with its plain or uncoated side forming the exterior surface of said jacket, while its interior, waterproofed side 8, surrounds and adjacently abuts the insulating body. The end portions 6 and 7 of jacket 5 are preferably disposed in overlapping relationship with respect to each other, sufficient in extent to permit longitudinal stitching 9 thereof, which secures jacket 5 in substantially fixed relationship upon said insulating body, retaining the latter as well as the jacket 5 intact. It is to be understood, of course, that while the jacket 5 is shown as secured by means of stitching 9, such result may be accomplished by other means, such as by adhesively securing in any well-known manner the overlapped end portions 6 and 7 of the jacket.

It will be obvious from the foregoing that a water-impervious, thermal-resisting tape 2 is provided, the thermal-resisting sheath or jacket 5 of which possesses an internal surface coated with a water-impervious layer 8 entirely surrounding and enveloping the interiorly disposed insulating body of the tape 2; said layer 8 functioning to protect said insulating body from moisture absorption or attack, while the outer, uncoated exterior surface of said jacket 5 which directly contacts a conduit or pipe through which fluids pass while maintained at relatively high temperatures, serves as an insulating medium between said conduit or pipe and said water-impervious layer, thus inhibiting and preventing disintegration of the water-impervious rubber layer 8 due to the highly heated condition of said conduit or pipe.

Referring now to Figs. 4 and 5, wherein a modified form of the invention comprising a metallically waterproofed, thermal-insulating tape 10 is shown. Said tape 10 comprises a relatively elongated, thin, flat, flexible core of asbestos paper 11, about which soft asbestos roving, rope or wicking 12 is spirally or helically wrapped to form an insulating body or core for said tape 10, in substantially the same manner as tape 2 of Figs. 1 to 3, already described. A suitable asbestos yarn or other type of heat-resisting tubular sheath or jacket covering 13 is braided or woven about said insulating body, serving to envelop and retain the same as a unit. Interposed between the internal face or surface of said covering 13 and the helically wrapped insulating body, and in lieu of the rubber or rubberized waterproof layer 8 shown in Figs. 1 to 3, there may be provided a metallic foil waterproof layer 14, preferably of aluminum, or any other type metal foil, such as tin, lead, or zinc. In addition to its water-impervious nature, the metal foil layer 14, due to its highly polished and bright metal surface, has the desired property of being a reflector of heat rays and inherently possesses a relatively low co-efficient of heat emission. These physical attributes, of course, increase the insulating efficiency of the tape 10 and render desirable the employment of a metal foil layer therein.

The waterproofing layer of metal foil 14 may be incorporated into the tape 10 during the process

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of manufacture of said tape, in any desired manner. Metal foil, being relatively thin and easily workable, when applied to or associated with a given article, readily adapts and conforms itself to the shape of such article. In accordance with the present invention, a sheet of metal foil may be cut into strips of desired and sufficient width, after which they may be wrapped about the paper core-roving-wrapped insulating body, completely enveloping and covering said body and serving to form the metal foil layer 14 for said tape. Any number of metal foil strips may be employed in such wrapping, depending upon their thickness and the degree of waterproofing required. Or, in lieu of the provision of a completely surrounding layer of foil 14, a partially extending and enveloping metal foil layer 14, as shown in the drawing, may be employed. In such instance, strips of previously cut metal foil, of sufficient width to extend over and cover one flat surface as well as the longitudinal edges of said insulating body may be applied to such surface and edges, to provide a waterproof metal foil layer 14 about and over such covered portions of the interior of tape 10. After the metal foil has been applied, either completely or partially about the insulating body, as described, the external insulating jacket 13 may then be braided or woven thereover, to produce the unitary tape member 10. In a modified process of manufacture, and in lieu of applying metal foil directly to the internal insulating body, said foil may be directly applied to a part or all of one surface of the jacket 13, and such jacket may then be wrapped about and secured to the insulating core, as desired. In such event, the jacket surface containing the foil, constitutes the internal portion of said jacket, the foil being thus positioned adjacent to and contiguous with the insulating body of tape 10, to the extent to which the metal foil is applied over a surface of the jacket or covering 13.

The finished tape 10 is wrapped about a conduit in substantially the same manner as tape 2 of Figs. 1 to 3. In wrapping tape 10 of the type shown in Figs. 4 and 5, wherein a portion only of such tape is provided with a metal layer 14, the face portion of such tape which interiorly contains no such layer is applied for direct contact with a conduit during wrapping, while the opposite portion of said tape which does interiorly contain a metal layer 14, forms the external or exposed face of the tape 10 after wrapping on a conduit.

The polished metal layer 14, being impervious to moisture, affords an efficient waterproofing protection for the insulating core of the tape 10. Since such layer is sheathed within the insulating covering 13 which directly contacts a highly heated conduit when the tape is applied thereto, such covering not only affords a desirable insulating medium against thermal conduction to said layer in instances where the latter circumscribes the insualting core, but spacedly disposes and removes the metal layer from the conduit, thus permitting the polished and bright surface of the metal foil to deflect and prevent thermal emission, thereby functioning to give to the finished tape an additional thermal insulating property.

It is to be understood, of course, that although the drawing illustrates a winding composed of a number of strands, such winding may consist of a single strand, or several superimposed strands, depending upon the thickness desired in the final product. If desired, a single layer of roving may be provided by winding one or more strands of roving 4 or 12 upon the cores 3 and 11, respectively, in the form, for instance, of double or triple helices.

As an important commercial feature of our invention, the tapes 2 and 10 may be manufactured and marketed in one width which may be utilized upon a wide range of sizes of pipes or conduits. This results from the fact that the tapes embodying the concept of the invention are so constructed that the filler or body of the tape, namely the rovings 4 and 12, may be readily flexed without causing the tape as a whole to buckle when small diameter pipes are wrapped. Tapes utilized for analogous purposes are manufactured and marketed in varying widths, depending upon the diameters of the pipes or conduits to be wrapped. Obviously, this results in an economic loss which is obviated by the present invention.

If desired, the inner or treated surface 8 of the cover 5 may be dusted with aluminum or other powder having characteristics of high reflectivity whereby the insulation of the tape as to radiant heat will be increased. In addition, if desired, the asbestos cores 3 or 11 may be supplanted by highly polished metal ribbon whereby the efficiency of the tape as an insulator to radiant heat is increased.

We claim as our invention:—

1. A moisture proof insulating tape adapted to be wrapped in helical fashion around a pipe, conduit or container, comprising an elongated core of relatively flat asbestos paper, asbestos roving helically wrapped around said core, a fibrous sheath covering said core and roving, and a water-impervious material interposed between said roving and fibrous sheath.

2. A moisture proof insulating tape adapted to be wrapped in helical fashion around a pipe, conduit or container, comprising an elongated core of relatively flat asbestos paper, asbestos roving helically wrapped around said core, and a fibrous sheath covering said core and roving having its internal surface impregnated with a water-impervious material.

3. A moisture proof insulating tape adapted to be wrapped in helical fashion around a pipe, conduit or container, comprising an elongated core of relatively flat asbestos paper, asbestos roving helically wrapped around said core, and a waterproofed fibrous sheath covering said core and roving.

4. A moisture proof insulating tape adapted to be wrapped in helical fashion around a pipe, conduit or container, comprising an elongated core of relatively flat asbestos paper, asbestos roving helically wrapped around said core, and a thermal resistant waterproofed fibrous sheath covering said core and roving.

5. A moisture proof insulating tape adapted to be wrapped in helical fashion around a pipe, conduit or container, comprising an elongated core of relatively flat asbestos paper, asbestos roving helically wrapped around said core, the adjacent coils of roving comprising the helix being in contiguous relationship with each other, and a waterproofed fibrous sheath covering said core and roving.

6. A moisture proof insulating tape adapted to be wrapped in helical fashion around a pipe, conduit or container, comprising an elongated core of relatively flat asbestos paper, asbestos roving helically wrapped around said core, a fibrous sheath covering said core and roving, and a

layer of rubberized, water-proof material interposed between said roving and fibrous sheath.

7. A moisture proof insulating tape adapted to be wrapped in helical fashion around a pipe, conduit or container, comprising an elongated core of relatively flat asbestos paper, asbestos roving helically wrapped around said core, and a thermal-resistant, rubber impregnated water-proof fibrous sheath covering said core and roving.

8. A moisture proof insulating tape adapted to be wrapped in helical fashion around a pipe, conduit or container, comprising an elongated core of relatively flat asbestos paper, asbestos roving helically wrapped around said core, a fibrous sheath covering said roving and core, and a layer of metal foil interposed between said roving and fibrous sheath.

9. A moisture proof insulating tape adapted to be wrapped in helical fashion around a pipe, conduit or container, comprising an elongated core of relatively flat asbestos paper, asbestos roving helically wrapped around said core, an insulated fibrous sheath covering said core and roving, and a layer of metal foil interposed between and partially extending about said roving and fibrous sheath.

10. A moisture proof insulating tape adapted to be wrapped in helical fashion around a pipe, conduit or container, comprising an elongated core of relatively flat asbestos paper, asbestos roving helically wrapped around said core, an insulated fibrous sheath covering said core and roving, and a layer of aluminum foil interposed between and partially extending about said roving and fibrous sheath.

11. A moisture proof insulating tape adapted to be wrapped in helical fashion around a pipe, conduit or container, comprising an elongated core of relatively flat asbestos material, a fibrous sheath covering said asbestos core, and a water impervious material interposed between said asbestos core and fibrous sheath.

12. A moisture proof insulating tape adapted to be wrapped in helical fashion around a pipe, conduit or container, comprising an elongated core of relatively flat asbestos material, and a fibrous sheath covering said asbestos core and having its internal surface impregnated with a water impervious material.

13. An insulating tape adapted to be wrapped in helical fashion around a pipe, conduit or container, comprising an elongated body having a core of relatively flat asbestos paper, asbestos roving helically wrapped around said core, and a fibrous sheath covering said asbestos core and roving and being in the form of a sheet of material wrapped longitudinally therearound with the edges disposed in overlapping relation, said sheath being secured in place by stitching extending through the body composed of said asbestos core and said asbestos roving adjacent the longitudinal center of the wide faces of the tape.

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