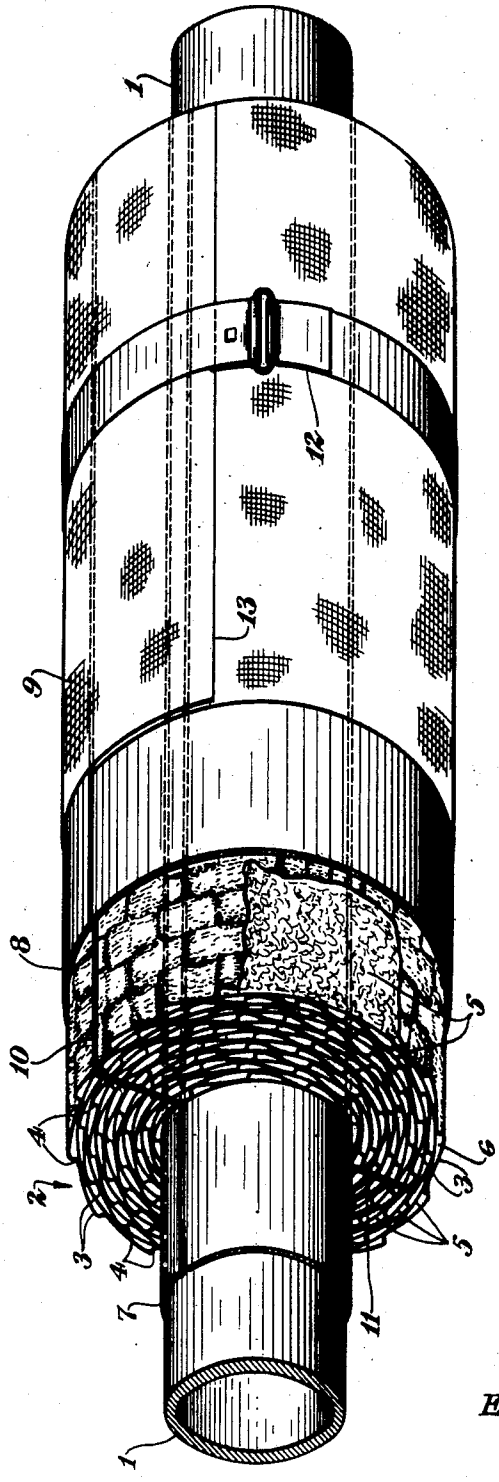
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ARTICLE OF MANUFACTURE

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ARTICLE OF MANUFACTURE

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2 Claims. (Cl. 154—45)

This invention relates to a void-containing article of manufacture, particularly to an improved thermal insulating article provided with voids defined between soft, yielding sheets of felted fibers.

The invention comprises thermal insulating pipe covering in the form of a tube including soft and yielding, spirally wound, alternating sheets of irregular surface and other sheets, not meshing therewith, that define voids between them and the sheets of irregular surface. Thus, the invention comprises pipe covering resulting from making a composite of sheets of plain and indented wool felt and spirally winding the composite into tubular form.

Pipe covering has been made heretofore by spirally winding indented asbestos paper, for example, into tubular form. The voids between the indentations and the adjacent sheets in the tubular article are not sealed, unless a very special type of structure is provided purposely to seal the voids.

There has now been found a method of making a particularly effective thermal insulating article containing voids sealed in a very simple and convenient manner.

The invention is illustrated in the figure which shows a perspective view of a preferred type of thermal insulating article, with parts broken away for clearness of illustration.

In the figure there is shown a pipe 1 with sectional tubular thermal insulating pipe covering 2 in position around the pipe. The pipe covering includes soft, yielding sheets 3 of felted fibers, the said sheets being provided with depressions or irregularities of surface, say, with indentations 4. In the pipe covering these sheets 3 are alternated and composited with sheets 5 of similar composition or properties, but of surface that does not mesh or nest with the sheets 3. Thus, the sheets 5 may have a regular surface, as, for example, cylindrical.

The sheets used in the insulating article should be so soft and yielding that, when composited together in simple manner, the sheets will rest upon each other and seal the voids or spaces between the indentations, for example, in the one sheet and the surface of the juxtaposed sheet. For this purpose, wool felt has been found particularly satisfactory. Also, there may be used a mixture of wool fibers and wood pulp, say news print, the said mixture including a high proportion of wool. Another sheet that may be used is one consisting largely of short, soft hairs in felted form.

The manner in which the soft, yielding sheets rest upon each other and seal the voids is indicated in the case of the void 6.

Because of the softness of the sheets and the consequent fact that tubular insulation made therefrom is subject normally to distortion of shape, it is desirable to use an inwardly disposed, strengthening and shape-retaining member 7 and also an outwardly disposed, strengthening and shape-retaining wrapper 8. The member 7 may consist of asphalt-impregnated rag felt, say a roofing paper that, before impregnation, weighs 6 to 8 ounces per square yard. The outer strengthening and wrapping member may consist of the same type of roofing paper. Also, there may be disposed around the tubular covering a jacket 9 that may consist suitably of light cotton sheeting or heavy paper. The jacket, if paper, may be an aluminum-coated, kraft paper.

The tubular pipe covering may be sawed completely through on one side, as indicated at 10, and scored, that is, sawed almost completely through at the back, as indicated at 11, whereby the covering is adapted to be opened for convenient installation around a pipe to be insulated or for removal therefrom. After being installed around a pipe, the covering may be held in position by metal bands 12, as well as by adhesively securing the flap 13 of the jacket over the joint 10.

In making the article of the present invention, there is first made soft, yielding sheets of fibrous material. Thus, there may be made a wool felt weighing suitably 6 to 8 ounces per square yard. The wool felt may be made by beating woolen rags with water in a paper beater and collecting the beaten fibers to form a felt on a paper machine of conventional design.

A part of the thus formed felt is submitted to treatment to provide irregularities of surface. A felt may be passed between a pair of coacting rollers or pressed between coacting dies provided, in either case, with meshing, pronounced irregularities of surface, to impress the desired irregularities of surface upon the wool felt. It is convenient to have the wool felt slightly moist at the time that it is pressed between the rollers or dies.

After being so provided with irregularities of surface, the felt is dried and is composited with felt of the same kind but with surface of shape that will not nest or mesh with the said irregularities. In compositing two sheets of unlike surface, one of the sheets is treated in localized areas with an adhesive, say with an aqueous

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solution of silicate of soda, and is then pressed upon the other sheet so that the two sheets are united by the adhesive. The pressure used in the compositing is substantially less than the pressure which would cause obliteration of the irregularities of surface of a sheet being composited with another sheet.

The composited sheets are then treated, on one side and in limited areas, with an adhesive. Thus, a solution of sodium silicate may be applied in narrow bands, say 1 to 2 inches apart and extending across one face of the composited sheets. The composited sheets thus treated with adhesive are then wrapped around a mandrel in such manner as to form a spirally wound article in which the two sheets of dissimilar surface alternate with each other.

When the winding has given a tube of desired thickness of wall, the winding is discontinued, unused composited sheet material is removed, and the tube is sawed at position 10 and scored at position 11.

If the inner strengthening and shape-retaining member is to be used, this member is placed around the mandrel before the winding of the composited, soft, yielding sheets is begun. This strengthening member is provided on its outer surface with adhesive which secures it, in the finished article, to the inner sheet of the thermal insulation. If the outer strengthening and shape-retaining member is to be used, it is applied to the outside of the spirally wound composite. Finally the jacket is applied. If the jacket is of cotton sheeting or the like, it is suitably applied with a starch adhesive. The aluminum-coated kraft paper jacket, on the other hand, is applied, preferably, with an aqueous solution of sodium silicate.

A thermal insulating article so made has certain features in addition to those that have been indicated. The article is light in weight, very effective in thermal insulation and is particularly adapted for use under conditions which do not favor the formation of dew within the insulation or at temperatures that are not so high as to cause disintegration by heat. Thus, the article is particularly adapted for use in insulating water lines. A typical product made as described, of size to fit a 3" pipe and of wall thickness 1", and with indented sheets of wool felt alternating with sheets of wool felt of regular surface, weighed approximately 1.75 pounds per linear foot, after being maintained for some time at a temperature of 212° F. This same pipe covering showed a heat transfer of 0.356 B. t. u. per square foot, per hour, for each 1 degree F. of difference of temperature between the warm and cool surfaces. Not only is the material light-weight and efficient but also it is convenient and economical to manufacture.

The backing sheet, which is alternated with the sheet of irregular surface, is preferably of regular surface, say, plane in a flat insulating article or cylindrical in the tubular. However, other types of backing sheets may be used, as, for example, crinkled or creped soft felts. Also, there may be used, either as the backing sheet or as the sheet composited therewith, soft wool felts containing therein particles of sponge, cork or corn cob and made by the method described in U. S. Patent 1,218,679 to Manville.

In general, the sheets that are composited should be so soft and yielding and the irregularities of surface of one or both of the sheets should be of such a nature that the sheets will tend to collapse upon each other and provide sealed voids between them, with the consequent minimizing of air circulation between the various voids. The sheets of the type described are somewhat fuzzy in the sense that they have fibers projecting from their surfaces. These projecting fibers, as well as the collapsing of the sheets themselves, tend to seal the voids defined between two adjacent sheets or to minimize circulation of air between the said voids. This effect is made possible, in part, by the fact that the indentations described are discontinuous, as distinguished from continuous indentations of the type of corrugations.

The details that have been given are for the purpose of illustration and not restriction, and many variations therefrom may be made without departing from the spirit and scope of the invention.

What I claim is:

1. Thermal insulation comprising a plurality of composited, soft sheets of wool felt having discontinuous irregularities of surface, of some of the said sheets, forming voids between adjacent sheets, the adjacent sheets being collapsed upon each other, whereby there is minimized the circulation of air between the voids defined by two adjacent sheets.

2. Thermal insulation, as described in the foregoing claim, having the form of a tube subject normally to distortion of shape and including shape-retaining and strengthening means disposed within the said tube and united thereto.

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