Oct. 15, 1946. G. B. BROWN 2,409,249

INSULATING COVERING AND METHOD OF MAKING THE SAME

Filed May 22, 1941

Fig. 1.

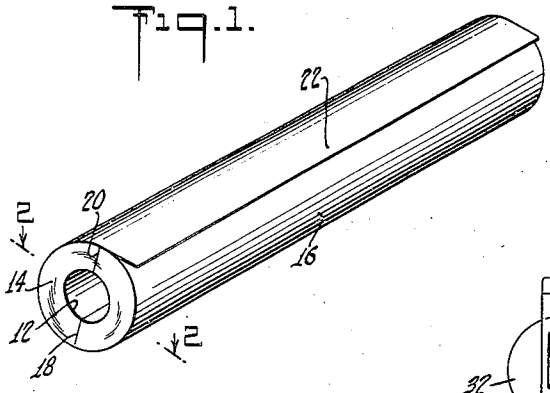


Fig. 3.

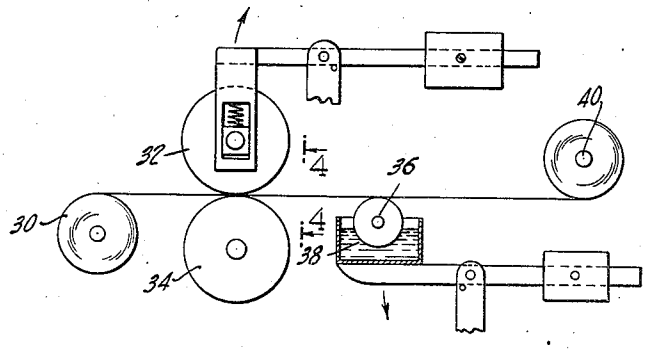


Fig. 2.

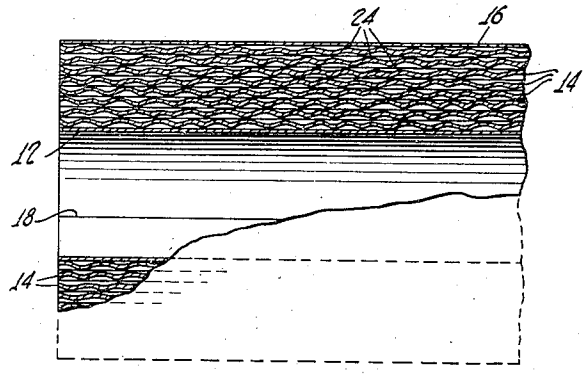


Fig. 5.

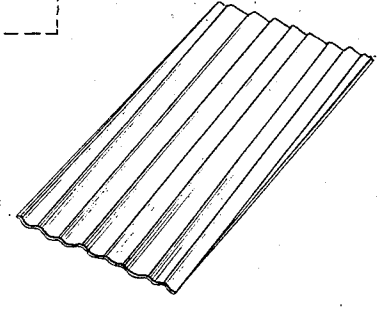
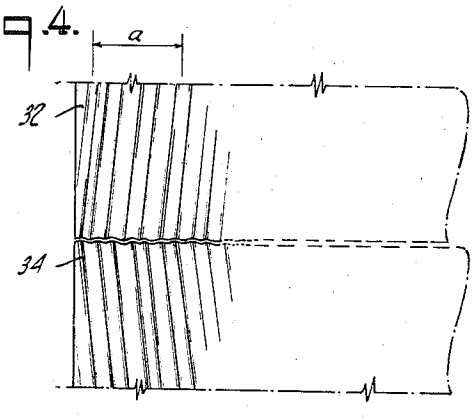


Fig. 4.



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INSULATING COVERING AND METHOD OF MAKING THE SAME

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16 Claims. (Cl. 154—28)

1

The present invention relates to thermal-insulating products and the method of making the same, and more particularly, to insulating coverings of the type known as air-cell insulation.

Heretofore, air-cell insulation, for example, pipe covering, has been manufactured from composited sheets of plane and corrugated paper. Conventionally, the composite material in the form of a continuous web is drawn from a reel, adhesive is applied to the peaks of the corrugations, and the material is then rolled upon a mandrel until walls of the desired thickness are attained. The corrugations extend across the paper, and hence, lengthwise of the completed covering. The tubes thus formed are divided into similar halves to permit their mounting upon a pipe, or the like, the two halves being connected by a cover member of plane asbestos or other paper, which serves as a hinge for the segments and which also conventionally includes an extending sealing flap.

The principal object of the instant invention is the provision of an improved thermal-insulating product generally of the type described above.

Another object of the invention is the provision of a tubular insulating covering in which the intermediate convolutions are composed entirely of corrugated paper, with the corrugations extending circumferentially of the plies in substantially non-nesting relationship with the corrugations of adjacent plies.

A further object of the invention is the provision of a method of manufacture of an insulating material by a continuous process, including the steps of corrugating the paper and assembling it into article form.

My invention will be more fully understood and further objects and advantages thereof will become apparent when reference is made to the more detailed description thereof which is to follow and to the accompanying drawing, in which:

Fig. 1 is a perspective view of a tubular insulating covering in accordance with the instant invention;

Fig. 2 is an enlarged sectional view taken on the line 2—2 of Fig. 1, looking in the direction indicated by the arrows;

Fig. 3 is a diagrammatic elevational view of an apparatus for carrying out the method of the instant invention;

Fig. 4 is an enlarged, fragmentary sectional view taken on the line 4—4 of Fig. 3 and looking in the direction indicated by the arrows; and

Fig. 5 is a fragmentary plan view of corrugated sheet material from which the insulating covering is formed.

2

Referring now to the drawing, and particularly to Figs. 1 and 2, for purposes of illustration there is shown a tubular insulating product generally of the type employed for the covering of pipes, and the like. It will be understood, however, that the instant invention may be employed in insulating products of suitable form for covering various other objects. The covering of Figs. 1 and 2 comprises an inner ply 12, preferably formed of a smooth or plane asbestos paper, or the like, a plurality of intermediate plies 14, having, in accordance with the invention, corrugations extending generally circumferentially of the plies and in non-nesting relationship with corrugations of adjacent plies, and an outer covering sheet 16, preferably of plane paper. The inner and intermediate plies are severed on opposed radial lines, as indicated at 18 and 20, to permit the tube to be opened and applied about a pipe, or the like. The outer covering sheet 16 extends over the line of severance 18 to form a hinge, and includes flap 22 which may be adhesively or otherwise secured across the other line of severance 20 to maintain the covering in assembled relationship after installation. The several plies are secured together at their points of contact by a suitable adhesive, such as sodium silicate, casein adhesive, or other conventional material for this purpose.

Inner ply 12, intermediate plies 14, and outer ply 16 are preferably formed from a single sheet of material. That is, in the manufacture of the covering, each of the several plies constitutes a portion of a continuous sheet.

In accordance with the invention, intermediate plies 14 (see particularly Figs. 2 and 5) include corrugations 24, relatively shallow in depth to permit the winding of the paper, with the corrugations extending generally circumferentially, without undue crushing or deformation of the material. Any usual type of asbestos or other paper may be employed in the manufacture of the covering, but it is preferred that the paper be of relatively light texture. Corrugations 24 extend only generally circumferentially of the plies and are in the form of low-pitch spirals lengthwise of the tube. The corrugations of each ply are offset, at least for the most part, with respect to the corrugations in adjacent plies whereby no appreciable nesting of the several plies results and a multiplicity of air cells are formed between the several plies.

In the preferred embodiment, the corrugations

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of each ply are more or less of random width, for example, they may be in repeating groups of, say, six or more corrugations of different widths (see Figs. 2 and 5). The several plies are maintained in assembled relationship by a suitable adhesive, as previously referred to, at their points of contact.

Referring now to Figs. 3 and 4, in the manufacture of the insulating covering, the plane asbestos paper, or the like, is drawn from a suitable reel or other source of supply, as indicated at **30**, and passes between impressing rolls **32**, **34** provided with spirally extending projections or ribs, as will be hereafter more fully described. After leaving the impressing rolls, the paper passes over an adhesive applicator, such as roller **36**, rotating in contact with an adhesive supply **38**. The sheet is then rolled upon mandrel **40** to build up the necessary number of plies or convolutions the corrugations of each ply being continuous with the corrugations of adjacent plies. The tubular member thus formed is slit as indicated at **18** and **20** in Fig. 1. Rolls **32** and **34** are suitably mounted to permit their separation at any point in the operation. For example, roll **32** may be swingably mounted as indicated. Likewise, the adhesive applicator **36** may be swingably or otherwise movably mounted to be removed from contact with the paper at certain intervals.

In the operation, rolls **32** and **34** are separated for a suitable time interval to permit the passage therebetween of sufficient paper to form an inner plane ply. They are then closed for a time interval to indent or corrugate a sufficient length of paper to form the intermediate convolutions or plies and are again separated to permit the passage therebetween of sufficient paper for the outer plane ply **16**, including the attaching flange **22**. Adhesive applicator **36** is kept into contact with the paper, except upon passage thereover of that required to form the outermost ply. As will be readily understood, the operation of mandrel **40** is timed with the movement of the rolls **32** and **34** and the applicator **36** to and from operative position, either mechanically or by any suitable automatic means, to provide the previously described arrangement of the several plies in the covering.

Impressing rolls **32** and **34** are provided with spiral ribs or projections (see Fig. 4), suitably pitched to form corrugations in the paper sheet passing therebetween extending at a relatively small angle to the longitudinal dimension of the sheet. Preferably, the ribs or projections are in groups of random width, such a group being indicated at *a* in Fig. 4.

The rotative movements of rolls **32** and **34** are synchronized to insure cooperation of the respective ribs and valleys in the impressing action. Alternatively, only one of the rolls **32** or **34** need be provided with the spiral ribs, and the other roll may be formed with a surface of relatively soft rubber, or the like, whereby the impressing action is produced by but a single roll. In this case, exact synchronization of rotation of the rolls is not of prime importance.

As will be understood by those skilled in the art, due to the generally longitudinal but somewhat slanting corrugations, when the sheet is rolled on the mandrel, each convolution being slightly greater in diameter than the convolution therebelow, the corrugations will creep longitudinally of the mandrel to a sufficient extent to be out of nesting relationship with the corrugations of the lower convolution. Only occasionally will any nesting occur and this will be for such a short interval that the result will be a negligible nesting between the several convolutions. Furthermore, where the corrugations of different widths are employed, particularly such as described in sets of six or more of random width, nesting is wholly avoided until the convolutions have been displaced lengthwise to an extent corresponding to the number of corrugations of the set. Hence, for practical purposes, there will be no nesting of successive convolutions.

Having thus described my invention in rather full detail, it will be understood by those skilled in the art that these details need not be strictly adhered to, but that various changes and modifications will suggest themselves, all falling within the scope of the invention as defined by the subjoined claims.

What I claim is:

1. An insulating covering comprising a plurality of plies of corrugated paper, with each ply including corrugations of different widths, the corrugations of each ply extending in substantially the same direction and oblique to the longitudinal dimension of the covering but in predominantly non-nesting relationship with the corrugations of adjacent plies.

2. An insulating covering comprising a plurality of convoluted plies of corrugated asbestos paper, with the corrugations of each ply extending in the same general direction and oblique to the longitudinal dimension of the covering but continuous with and in predominantly non-nesting relationship with the corrugations of adjacent plies.

3. A tubular insulating covering comprising a plurality of convoluted plies of asbestos paper, each ply including corrugations of different widths and the corrugations of the several plies extending in substantially the same direction and oblique to the longitudinal dimension of the covering but in predominantly non-nesting relationship with the corrugations of adjacent plies.

4. A tubular insulating covering formed from a continuous strip, comprising a plurality of convoluted plies of asbestos paper including an inner plane ply, a plurality of intermediate plies having corrugations extending generally circumferentially of each ply and oblique to the longitudinal dimension of the covering and which are continuous with but in predominantly non-nesting relationship with the corrugations of adjacent plies, and an outer plane ply, and adhesive means securing the several plies together at their points of contact.

5. A tubular insulating covering formed from a continuous strip, comprising a plurality of convoluted plies of asbestos paper including an inner plane ply, a plurality of intermediate plies having corrugations extending generally circumferentially of each ply and oblique to the longitudinal dimension of the covering and which are continuous with but in predominantly non-nesting relationship with the corrugations of adjacent plies, and an outer plane ply, and adhesive means securing the several plies together at their points of contact, the inner and intermediate plies being severed at opposite sides of the center of said covering, said outer ply extending across a line of severance to form a hinge.

6. A tubular insulating covering formed from a continuous strip of material, comprising a plurality of convoluted plies of asbestos including an inner plane ply, a plurality of intermediate plies

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each having corrugations of different widths, the corrugations of the several plies extending in substantially the same direction and oblique to the longitudinal dimension of the covering and which are continuous with but in predominantly non-nesting relationship with the corrugations of adjacent plies, and an outer smooth ply, said inner and intermediate plies being severed on opposite sides of the center of said covering and said outer ply extending across one line of severance and including a lapping flange adapted to extend across the other line of severance when the covering is applied, and adhesive means securing said several plies in assembled relationship.

7. The method of making an insulating covering comprising impressing a paper sheet with a plurality of corrugations extending at an oblique angle to the length thereof, and winding said sheet to form a plurality of plies with the corrugations of each ply extending in the same general direction but offset with respect to the corrugations of adjacent plies.

8. The method of making an insulating covering comprising impressing a plane sheet of asbestos paper with a plurality of shallow corrugations of different widths and extending obliquely to the longitudinal dimension of the sheet, and winding a plurality of plies from said sheet, with the corrugations of each ply extending in the same general direction but offset with respect to the corrugations of adjacent plies.

9. The method of making a tubular insulating covering comprising impressing an asbestos sheet with a plurality of shallow corrugations extending generally lengthwise of the sheet but at an angle thereto, and rolling said sheet into a tube of a plurality of integral convolutions, with said corrugations of each convolution extending circumferentially of the convolution and offset with respect to the corrugations of adjacent convolutions.

10. The method of making a tubular insulating covering comprising impressing an asbestos sheet with a plurality of shallow corrugations extending generally lengthwise of the sheet but at an angle thereto, applying an adhesive to the peaks of said corrugations, and rolling a plurality of integral convolutions of said sheet on a mandrel extending at right angles to the length thereof.

11. The method of making a tubular insulating covering comprising rolling an asbestos sheet about a mandrel extending at approximately right angles to the length of said sheet while simultaneously impressing a length of said sheet to form a plurality of convolutions with closely spaced shallow corrugations extending generally lengthwise of the sheet but at an angle thereto, and continuing said rolling operation to cover said plurality of convolutions with an outer plane layer of said asbestos sheet.

12. The method of making a tubular insulating covering comprising rolling an asbestos sheet about a mandrel extending at approximately right angles to the length of said sheet while simultaneously impressing a length of said sheet to form a plurality of convolutions with closely spaced corrugations extending generally lengthwise of the sheet but at an angle thereto, continuing said rolling operation to cover said plurality of convolutions with an outer plane layer of said asbestos sheet, and severing said intermediate convolutions on a line extending through the center of said covering.

13. The method of making a tubular insulating covering comprising drawing a plane asbestos sheet through inoperative impressing means in sufficient amount to form an innner convolution about a mandrel, adjusting said means to impress a sufficient length of said sheet to form a plurality of intermediate convolutions on said mandrel, with closely spaced corrugations extending generally lengthwise of the sheet and at an angle thereto, rendering said impressing means inoperative, and drawing a sufficient length of material through said means to form an outer plane convolution on said mandrel.

14. An insulating covering formed from a single continuous strip and comprising a plurality of convoluted plies of asbestos paper including an inner plane ply, a plurality of intermediate plies having indentations arranged in predominantly non-nesting relationship and spacing each of said intermediate plies from an adjacent ply, and an outer plane ply, and adhesive securing the several plies together at their points of contact.

15. A method of making a tubular covering from a continuous sheet comprising winding a plane inner convolution from said sheet, indenting a length of said sheet to form protuberances of a character and arrangement to be in predominantly non-nesting relationship when said length is wound in a plurality of convolutions and winding a plurality of convolutions thereof on said first convolution, and winding an outer plane convolution on said indented convolutions.

16. The method of making a tubular covering comprising drawing a plane asbestos sheet through inoperative impressing means in sufficient length to form an innner convolution about a mandrel, adjusting said means to impress a sufficient length of said sheet to form a plurality of intermediate convolutions on said mandrel, with closely spaced indentations of a character and arrangement to be in predominantly non-nesting relationship in said intermediate convolutions, rendering said impressing means inoperative, and drawing a sufficient length of material through said means to form an outer plane convolution on said mandrel, and winding said lengths upon said mandrel concurrently with said drawing action.

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