

METHOD AND APPARATUS FOR THE PRODUCTION OF FIBROUS INSULATION

Technical Field

The present invention is directed to a method and apparatus for the production of fibrous insulation and more particularly is related to a method and apparatus for the production of relatively thick fibrous insulation batts through the lamination of two relatively thin insulation batts.

Background of Prior Art

Recently, due to urgent needs for energy conservation, there has been an increasing need for insulation of greater thickness which generally provides a greater insulating value or an R value, e.g., R values on the order of R-38 or more. It has been a common practice to laminate or glue together two relatively thin insulation batts in order to form a relatively thick insulating batt. However, lamination of insulating batts is somewhat cumbersome because of problems associated with ensuring a complete alignment of the exterior edges of the individual batts forming the final relatively thick insulation batt.

More recently, a manufacturer of insulating material has taken an insulating blanket and has partially cut through the insulating material in order to form a continuous fibrous hinge between the formed insulating batts. Proximate the terminal portion of the insulation production line, a worker uses the hinge to help in aligning the two insulating batts to be joined. Unfortunately, because of the nature of fibrous insulations, this continuous hinge is unsatisfactorily unwieldly and does not allow for a substantially perfect alignment of the exterior edges of the insulation batts. Furthermore, the final laminated batt or product has an objectionable bulge on the side of the laminated batt where the original continuous fibrous hinge was formed.

In another process of the manufacture of fibrous insulation, an insulation blanket is slitted along the machine direction into a plurality of insulation batts separated by a plurality of fibrous

pillars. Notched slit blades are used to form the discontinuous slits between the batts in order to insure that the batts are aligned as they are conveyed towards the packaging area of the fibrous insulation manufacturing line and also to facilitate collective packaging of the batts. If the batts were completely separated, they could become misaligned making packaging difficult. However, this process did not involve folding the batts about the lines of slits to form a relatively thick laminated insulation product.

According to one aspect of the present invention we provide a process for the manufacture of a thick batt of fibrous material comprising the steps of:
a process for the manufacture of a thick batt of fibrous material comprising the steps of:

a. providing a discrete blanket piece formed of the fibrous material

b. intermittently slitting the piece completely through the blanket to form two portions that are interconnected by discrete pillars of fibrous material,

c. applying an adhesive to at least one of said interconnected portions, and

d. folding either of said interconnected portions onto the other of said portions, at least the innermost fibers in the folded pillars functioning as a hinge to ensure proper alignment of the two portions, each of said pillars being sufficiently narrow to enable the outermost fibers in the folded pillars to tear so as not to crimp the thusly formed thick batt.

According to another aspect of the present invention we provide an apparatus for manufacturing a thick batt of fibrous material, from a discrete blanket piece formed of the fibrous material, comprising:

5 means for intermittently slitting each said piece completely through the blanket to form two portions that are interconnected by discrete pillars of fibrous material, said slitting means having at least one notch of sufficient depth
10 that said discrete pillars remain uncut,

means for applying adhesive to at least one of said interconnected fibrous portions, and

15 means for folding either said interconnected portions onto the other of said portions whereby the adhesive laminates the two portions together into a single thick batt.

Referring now to the accompanying drawings:

20 FIG. 1 is a schematic side view illustrating, by way of example, the process steps and apparatus of the present invention;

FIG. 2 is a schematic plan view of the apparatus shown in Figure 1; and

25 FIG 3 illustrates the final laminated relatively thick insulation product.

30 FIG. 1 is a side view schematically illustrating a product line 10 utilizing the method and apparatus of the present invention. The method and apparatus of the present invention are primarily intended for use in a fiber glass manufacturing operation wherein mats,

FIG. 2 is a schematic plan view of the apparatus shown in Figure 1; and

FIG. 3 illustrates the final laminated relatively thick insulation product.

5 FIG. 1 is a side view schematically illustrating a product line 10 utilizing the method and apparatus of the present invention. The method and apparatus of the present invention are primarily intended for use in a fiber glass manufacturing operation
10 wherein mats,

batts or blankets of insulating material are produced. However, the method and apparatus of the present invention can be used in any manufacturing operation wherein flexible products in strip, ribbon, mat or blanket form are being manufactured in a relatively thick configuration.

FIG. 1 illustrates a cured blanket 12 of insulating material coming from a conventional felting operation or other source (not shown) wherein glass fibers or other filaments are felted into a blanket. The blanket 12 is carried by a conveyor 14 to a slitter blade 16 rotatable about an axis and modified in order to perform the process steps and form the product of the present invention. As can be seen from FIG. 1, the slitter blade 16 is of fairly conventional design wherein a slitting or a cutting surface 18 is defined on the entire periphery or circumference of the blade 16. A plurality of substantially non-cutting notches 20 are provided at convenient locations about the periphery of the blade. These notches 20 do not substantially cut the blanket 12 and therefore form a plurality of fibrous pillars or hinges 22 along the length of the blanket 12. The width of each notch 20 is selected to ensure that the width of the fibrous hinge 22 produced is not too large, as will be better explained hereinafter. The slitter blade 16 cooperates with an anvil roll 24 in order to perform the cutting function and subdivide the blanket 12 into two equally sized insulation batts 26 and 28.

The insulation batts 26 and 28 are joined merely by the discrete fibrous hinges 22 and are conveyed to a conveyor 30 where an adhesive material such as a water based adhesive or a hot melt adhesive is applied (fully or partially) to the upper surfaces of either the batt 26 and/or the batt 28. For purposes of illustration only, an adhesive 32 is shown being applied by means of a spray nozzle 34 (see FIG. 1). If a hot melt adhesive is used, it may be conveniently foamed.

After the adhesive material 32 is applied to either the batt 26 and/or the batt 28 the partially joined batts are conveyed to a conveyor 36 which transports the batts to a work table 38 where a worker grabs either the batt 26 or the batt 28 and rotates or flips the selected batt onto the other batt using the fibrous hinges 22 as a guide or an alignment aid. By means of this manual operation a final

relatively thick laminated product 40 is formed as shown in the right hand portion of FIGS 1, 2 and in FIG.3.

Note that as a result of, e.g. batt 26 being
5 flipped or folded over onto batt 28, the fibers
of the original fibrous pillars or hinges 22 tear
as at 42 allowing alignment of the batts to readily
take place. A unique feature of the fibrous hinges
22 is that they work either way, i.e. rotation
10 of one batt versus another may take place either
in a clockwise or counter-clockwise direction.
This is due to the fact that the non-cutting notches
20 do not cut the fibrous blanket and because
the hinges 22 are relatively narrow. If the notches
15 20 cut too deeply into the material at 22, the
hinges will break too readily thereby greatly
increasing the likelihood of misalignment of the
batts 26, 28 as they are being folded and laminated
together. If the hinges are too wide, the tears
20 at 42 may not take place. If the tears 42 do
not occur, the insulation may be objectionably
crimped or compressed at the location of the hinges
22 because of the strength of the fibers. As
an illustration, at least a $\frac{1}{4}$ inch (6.5mm) deep,
25 $\frac{3}{4}$ inch (19mm) wide notch should be used for
fibrous insulation 5 inches (12.7 cm) to $7\frac{1}{2}$ inches
(19cm) thick. With this configuration, the fibrous
insulation will merely be crushed within the notches
and not cut.

30 By this method and apparatus, a laminated
relatively thick product 40 may be formed whose
exterior edges are substantially aligned and
which does not have an objectionable continuous
hinge along one surface (due to the small number
35 of narrow hinges 22). The number of discrete fibrous

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hinges 22 which are formed in the original cured insulation blanket is dependent upon the length of the blanket and upon choice.

Furthermore, while the process has been described
5 as an in-line process, the process step of laminating
the two insulation batts may be done off the production
line. Also, while a generally continuous type
of slitter described in the present invention
may be used, it is quite possible that a reciprocating
10 type of cutter may be used in order to form discontinuous
cuts thereby forming the discrete fibrous pillars
or hinges 22. Lastly, while the flipping of the
batts has been disclosed as a manual operation,
it is clear that this operation may be performed
15 by a suitable mechanism.

While the slitter blade 16 has been shown as being disposed above the anvil roll 24, it is quite possible to position the slitter blade on the bottom and generate the fibrous hinges in the insulation blanket 12. Again, this is due to the fact that the non-cutting
5 notches 20 do not cut the fibrous blanket.

It is also possible to use a plurality of slitter blades 16 in order to form a plurality of batts which may be rotated, counter rotated or flip-flopped one onto the other to form a multiple layer laminated relatively thick blanket. In this way the original blanket
10 would be slit thereby forming an accodian-like insulating material. The worker at the end of the production line would simply alternately flip and then flop one batt onto another. It is clear therefore, that the present method and apparatus can provide for extremely thick insulation.

15 The present method and apparatus does not produce an objectionable bulge of material or a hinge because most of the fibers at the discrete fibrous hinges or pillars actually separate and pull apart, leaving only a small portion of the heights of the pillar intact when the batts are folded over (The direction of rotation is
20 unimportant, as explained earlier). The size and number of pillars can be varied to suit the requirements of the product and the production line.



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1. A process for the manufacture of a thick batt of fibrous material comprising the steps of:

a. providing a discrete blanket piece formed of the fibrous material

5 b. intermittently slitting the piece completely through the blanket to form two portions that are interconnected by discrete pillars of fibrous material,

10 c. applying an adhesive to at least one of said interconnected portions, and

d. folding either of said interconnected portions onto the other of said portions, at least the innermost fibers in the folded pillars functioning as a hinge to ensure proper alignment of the two portions, each of said pillars being sufficiently narrow to enable the outermost fibers in the folded pillars to tear so as not to crimp the thusly formed thick batt.

20 2. The process of Claim 1 further comprising the step of conveying said blanket piece in a given direction.

3. The process of Claim 2 wherein said intermittent slitting is performed in a direction parallel to said given direction while said blanket piece is being conveyed.

25 4. An apparatus for manufacturing a thick batt of fibrous material, from a discrete blanket piece formed of the fibrous material, comprising:

means for intermittently slitting each said piece completely through the blanket to form two portions that are interconnected by discrete

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pillars of fibrous material, said slitting means having at least one notch of sufficient depth that said discrete pillars remain uncut,

means for applying adhesive to at least one of said interconnected fibrous portions, and

means for folding either said interconnected portions onto the other of said portions whereby the adhesive laminates the two portions together into a single thick batt.

5. The apparatus of Claim 4 wherein said slitting means comprises a rotating cutting blade which has a plurality of non-cutting notches therein.

6. The apparatus of Claim 5 wherein said blade abuttingly contacts an anvil roll.

7. The apparatus of Claim 4 5 or 6 wherein said adhesive applying means comprises a hot melt applicator.

8. The apparatus of Claim 4 5 or 6 wherein said adhesive applying means comprises an adhesive sprayer.

9. The apparatus of any preceding claim further comprising means for conveying said pieces downstream of said slitting means past said adhesive applying means.

10. A process for the manufacture of a thick batt of fibrous material substantially as hereinbefore described with reference to the accompanying drawings.

11. Apparatus for the manufacture of a thick batt of fibrous material substantially as hereinbefore described with reference to and as shown in the accompanying drawings.



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12. A product formed by the process or apparatus
of any preceding claim.
