

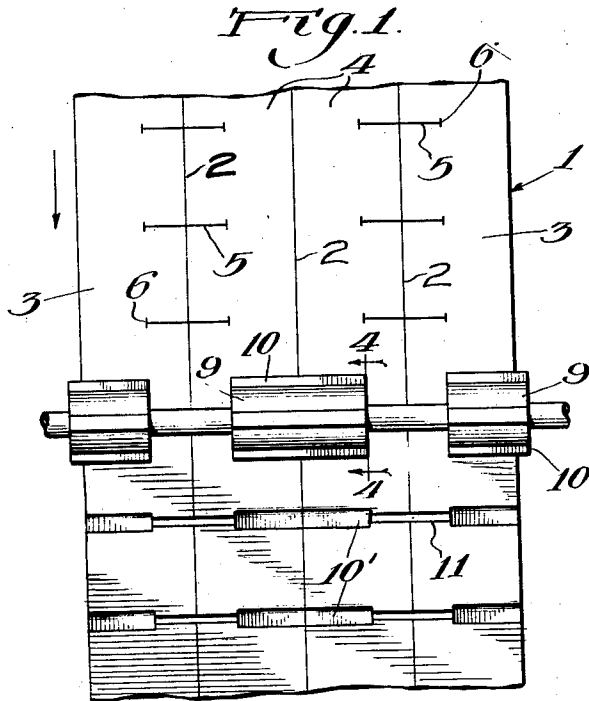
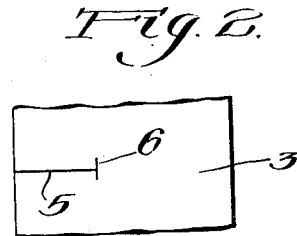
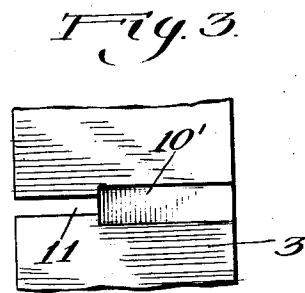
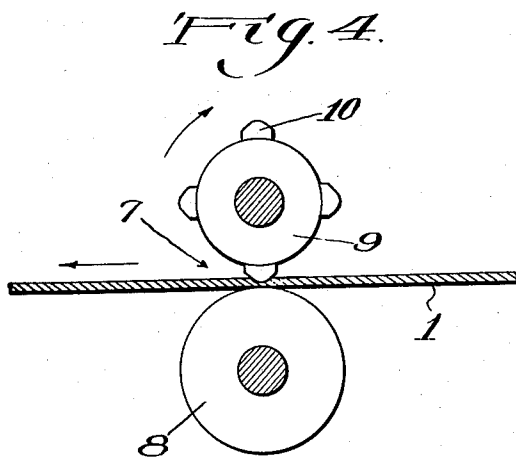
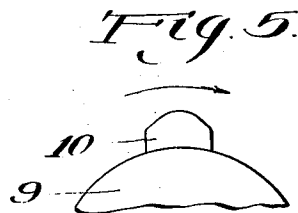
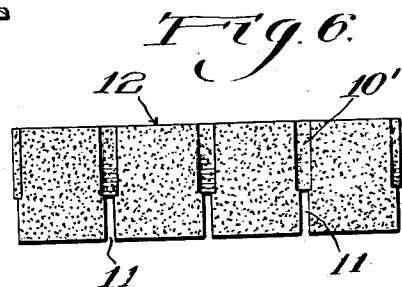
Sept. 30, 1930.

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MANUFACTURE OF EXPANDED FIBROUS MATERIAL

Filed Jan. 2, 1930



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UNITED STATES PATENT OFFICE

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MANUFACTURE OF EXPANDED FIBROUS MATERIAL

Application filed January 2, 1930. Serial No. 418,001.

This invention relates to improvements in the manufacture of expanded fibrous material, and more particularly to the manufacture of a flexible felted fibrous sheet structure in which a series of apertures are provided by the expansion.

The product of the present invention is peculiarly adapted for use in building construction, as a roof covering either in the form of a continuous sheet or in the form of shingles simulating slabs or slips, or as sheathing for the side walls of a building.

It is an object of the present invention to provide a practical and economical process whereby a continuously advancing sheet of flexible fibrous material is expanded and lengthened in such a manner that the expanded sheet will cover a greater area by five to twenty percent, more or less, than the unexpanded sheet, without any material loss in structural strength.

It is another object of this invention to provide a novel method for operating on a continuously advancing sheet of flexible fibrous material to produce apertures therein without cutting out the material forming said apertures and throwing it away. The importance and advantages of this feature taken alone will be appreciated when it is recalled that in one industry, i. e., in the manufacture of flexible fibrous roofing strips, there is cut out and thrown away about two to three percent of the fibrous sheet material fed to the apparatus for making the strips.

More particularly, the present invention consists in first subjecting a continuously advancing sheet of flexible fibrous material to the action of a slitting means to form slits or spaced lines of incision opening to an edge of the sheet, and thereafter applying pressure to the areas of the sheet immediately adjacent the slits to expand and lengthen the sheet as a whole and simultaneously form slots or apertures bounded by the edges of the slits. In this manner an expanded sheet is formed having slots opening to an edge dividing the edge into a plurality of spaced tabs. During the process of manufacture, the sheet may be severed longitudinally and trans-

versely, as is well known in the art of manufacturing roofing strips.

Further features of my invention comprise the manufacture of an expanded fibrous structure which has substantially equal tensile strength as the unexpanded sheet; the production of expanded structures of substantially uniform width which, when once expanded, exhibit little or no tendency to return to unexpanded position. The width of the slot separating the slabs may be governed so that they are all uniform. The manufacture of the expanded sheet involves no waste of material.

Other and further important objects of my invention will be apparent from the accompanying drawings and following detailed description.

In the drawings, Fig. 1 is a top plan view of a sheet of flexible fibrous material longitudinally severed, slitted and expanded.

Fig. 2 is a fragmentary detail view of one of the slits.

Fig. 3 is a fragmentary detail view of the resultant slot produced by expanding the sheet adjacent the end of the slit illustrated in Fig. 2.

Fig. 4 is an end elevational view of the pressure unit for expanding the sheet.

Fig. 5 is a fragmentary enlarged detail view of one of the pressure elements.

Fig. 6 is a top plan view illustrating one embodiment of the final expanded product.

Referring in detail to the drawings, 1 indicates as a whole a sheet of flexible felted fibrous material of the type now widely used in the manufacture of shingle strips or the like. In Fig. 1 the sheet 1 is illustrated as being approximately 40" wide. This is a standard width used in manufacturing shingle strips, and by severing the sheet on three equi-spaced longitudinal lines, four strips approximately 10" wide are simultaneously produced. It is to be understood, of course, that the sheet 1 may consist of a single strip 6" to 16" wide, more or less, or a double strip 12" to 32" wide, more or less, or a strip from which four longitudinal strips are produced, which may be from 24" to 64" wide, more or less. I illustrate my in-

vention as applied to a sheet from which four longitudinal strips are produced for the purpose of indicating that it is applicable to standard practise. In standard practise sheets are from 32" to 64" wide.

5 The sheet 1 may be fed continuously in the direction of the arrow through apparatus operating thereon to accomplish the steps of the present invention, and may be
10 severed longitudinally as indicated by the continuous lines of severance 2 dividing the sheet longitudinally into two outer strips 3 and two inner strips 4. The means for longitudinally severing the sheet 1 is not shown,
15 since it is conventional and well known to those skilled in this art. Although sheet 1 is illustrated as being divided into four longitudinal strips 3 and 4, it is to be understood that the invention in its broadest aspects
20 contemplates dividing the sheet into any number of strips.

As the sheet 1, now completely severed and divided into a plurality of continuous strips 3 and 4, moves forward, a series of transverse
25 slits may be cut across the lines of severance 2 between each of the strips 3 and 4. An additional slit or incision 6 may be cut across the closed end of each of the slits 5, the slits 5 and 6 forming in effect a T slot having an
30 elongated stem. The means for producing the slits 5 and 6 is not shown since it also is conventional and familiar to those skilled in the art.

The strips 3 and 4 are then passed to a
35 pressure unit 7, which in the present instance may comprises a bed roll 8 over which the strips pass, and a plurality of pressure rolls 9 cooperatively disposed above the bed roll 8 at points under which the unslitted portion
40 of the strips travel. The pressure rolls 9 may have suitably attached in spaced relation on their surfaces longitudinal pressing ribs 10. Each of the rolls 9 may have a plurality of these pressing ribs 10 disposed upon
45 its periphery; the circumferential distance between adjacent ribs being equal to the distance between adjacent slits 5.

It is to be understood, of course, that where a single strip is fed through the process that
50 a single pressing roll 9 would be used instead of a plurality of rolls.

The ribs 10 may be so timed as to contact and compress the unslitted material of strips 3 and 4 immediately adjacent the ends of
55 slits 5, thereby expanding and lengthening the strips, as shown at 10' (Fig. 3) and causing the abutting edges of slit 5 to separate and form a slot 11.

Thereafter the strips may be transversely
60 severed, preferably through the center of a compressed portion 10' to form individual strips each having three or more compressed portions.

The pressing surfaces of the ribs 10 may
65 be constructed in such a manner that the ra-

dus of curvature thereof decreases in the direction of rotation of the roll 9 until a minimum radius is reached, after which it again increases. With this construction the tangential thrust of the ribs 10 upon the sheet 1 at the moment of contact is reduced to a minimum, and distorting, tearing or crumpling of the sheet is avoided.

While I have described the invention in connection with the formation of transverse
75 slits 5 in a large width sheet of material, it is to be understood that I do not wish to be limited in any way to this particular series of steps, since the invention in its broader aspects contemplates making the incisions 5 and 6 while
80 the sheet is traveling either in a longitudinal or transverse plane. That is, I do not wish to be limited in any way to the manner in which the incisions 5 and 6 are produced, since the invention broadly contemplates acting upon a sheet to produce spaced slits or
85 incisions therein, and thereafter applying sufficient mechanical pressure immediately adjacent the slits to expand and lengthen the sheet and form slots or apertures bounded by the edges defining the slits. In addition, I do not wish to be limited to the particular form or shape of the pressing ribs 10,
90 nor to the general arrangement of the apparatus illustrated.

Also, in its broad aspects the invention is not to be limited to the formation of slits opening to an edge to produce the final product illustrated in Fig. 6, since in its broad
100 aspects the invention contemplates acting upon a sheet to produce spaced lines of incision therein, and thereafter applying sufficient pressure immediately adjacent said slits to expand and lengthen the sheet. The illustration in Fig. 6 is to be taken only as a preferred embodiment, but not as a limitation.
105 For instance, the slits may be formed internal of the sheet and pressure applied above and below the slit to expand the sheet and produce a product in which a compressed area communicates with opposite edges while a closed aperture exists within the body of the sheet.

From the foregoing it can be readily seen that the sheet is expanded and lengthened
115 without any substantial loss in structural strength, while at the same time slots are provided without any waste of material.

I claim as my invention:

1. A process which comprises acting on a
120 sheet of flexible fibrous material to produce spaced slits therein, and applying sufficient pressure to said slitted sheet immediately adjacent said slits to expand and lengthen the sheet and produce apertures therein bounded
125 by the opposed edges defining the slits.

2. A process which comprises acting on a sheet of flexible fibrous material to produce
130 spaced slits therein opening to an edge, and applying sufficient mechanical pressure to

said slitted sheet immediately adjacent the end of said slits to expand and lengthen the sheet and produce apertures therein bounded by the opposed edges defining the slits.

5 3. A process of increasing the area of a sheet of flexible fibrous material while simultaneously producing spaced apertures therein opening to an edge of the sheet, which comprises acting on said sheet to produce spaced
10 parallel lines of incision therein opening to an edge of said sheet, and applying sufficient pressure to said sheet immediately adjacent an end of said lines of incision to expand and lengthen the sheet while simultaneously
15 producing apertures bounded by the edges defining said lines of incision.

4. A process of forming parallel apertures and interposed tabs in a sheet of flexible fibrous roofing material without cutting out
20 and eliminating any of the fibrous material, which comprises acting on said sheet to produce spaced lines of incision therein opening to an edge of said sheet, and applying sufficient pressure to said slitted sheet immediately adjacent the inner ends of the lines of
25 incision opening to an edge to expand and lengthen the sheet and produce apertures opening to the edge of said sheet bounded by the edges defining said slits.

30 5. A method of expanding flexible fibrous material about a slit formed therein, which comprises applying pressure immediately adjacent an end of said slit.

In testimony whereof I affix my signature.

HARRY A. CUMFER.