

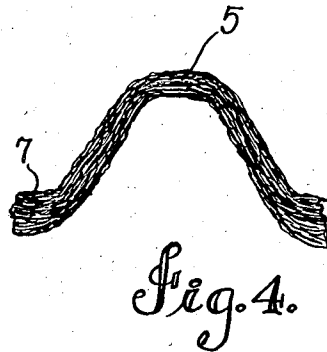
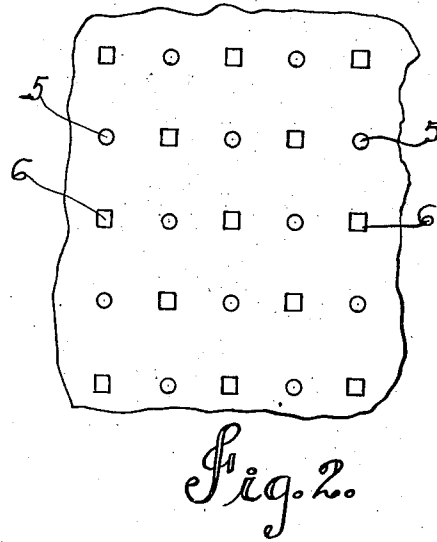
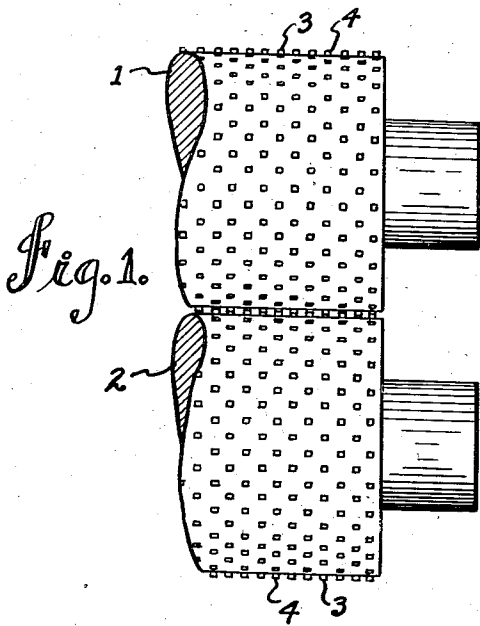
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INDENTED PAPER

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INDENTED PAPER

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2 Claims. (Cl. 154—33)

My invention has to do with the production of an indented paper sheet from other than freshly formed webs. The type of indentation to which I refer is a very small indentation, such that it can be made by intermeshing rows of pins on reversely turning rolls between which the web of paper is fed.

The type of paper which can be indented after it has been made and dried, according to my invention, is one which with a small percentage of added moisture will adapt itself to molding. Such a paper is a sulphate pulp paper or a paper made with long fibers from other than cooked straw or waste paper furnish.

It is not practical to form an indentation such as is usually formed in the indented papers manufactured at the present time, in previously made and dried paper, except with excessive moisture (40% or more), or such large indented areas as to serve but little useful purpose. The only type of indentation which is practical is one which requires the paper to flow transversely as well as lengthwise. Such a type is formed by arranging rows of pins circumferentially of a pair of rolls, each circumferential row offset from the adjacent rows, and meshing the pins in such a way that a pin on each roll projects between two pins on the other roll in a line which is axial of both rolls, and a similar intermeshing of pins taken radially of both rolls.

The rolls used today for indenting have circumferential rows of pins, but each circumferential row is oriented alike so as to form unbroken rows of pins axially of the rolls. These rolls will serve to indent freshly formed webs which have not dried or hardened. They will merely form transverse corrugations in previously finished paper.

The reason for the difference lies in the fact that the rolls of the type used by me actually cause the paper to be stretched axially and transversely of the rolls instead of being creased. The result is that the finished indented sheet is as wide as the paper was before being indented and not reduced in length more than around five per cent.

I have illustrated more or less diagrammatically in the drawing a set of rolls and a portion of the finished web.

Figure 1 is a front elevation of a pair of indenting rolls.

Figure 2 is a plan view of a finished web in diagram.

Figure 3 is a perspective of a piece of the finished web enlarged.

Figure 4 shows a magnified section of one in-

dentation and the stretching effect on the paper web.

The rolls 1 and 2 in the illustration have pins arranged in circumferential rows 3 and 4 which are offset circumferentially of the rolls. The rows 3 of one of the rolls come opposite the rows 4 of the other and mesh between them.

The result of bringing the rolls together and passing a sheet between them is illustrated in diagram in Figure 2, in which the projections caused in one side of the sheet are illustrated by circles 5, and the projections caused in the other side of the sheet by squares 6. Rows of alternate projections 5 and 6 extend crosswise of the sheet, as well as lengthwise of the sheet.

Another way of viewing the result is that there are diagonal rows of projections 5 and interspaced diagonal rows of depressions extending across the sheet in either direction.

The sheet cannot contract laterally when it is between the rolls, and hence is forced to flow laterally; and the pins are so close that the same action takes place lengthwise of the sheet. Thereby it results that the indented sheet follows very closely the area of the sheet before indenting.

In Figures 3 and 4 I have endeavored to illustrate how the material flows. There is what may be called the normal level of the web at 7. The paper is deformed into rounded dome-like projections 8 and 9 in each direction from this normal level. There is no such thing as a row of projections to one side only of the sheet from the normal level, except diagonally of the sheet.

In preparing a sheet of nine point kraft paper (usually sulphate pulp or wood pulp, with considerable rosin or other natural binder in it), for indenting, I pass it over a suitable steam jet box, or through a bath and between squeeze rolls, so as to get at least ten to twenty per cent moisture in the sheet. Very much more moisture is of no value in the operation, and increasing the moisture content beyond twenty per cent does not change the product and merely adds to subsequent drying cost.

The more indentations produced in a unit area of the paper (assuming the indentations to be of equal depth), the more resilient the final product will be. This is one reason why I work with very small indentations. But where tiny indenting means are employed, the spacing between indenting pins becomes of great importance, particularly circumferentially of the roll and longitudinally of the web. The pins of the two rolls have to mesh like the teeth of gears in

5 this direction. There is the problem of clearance for the teeth, space for the paper between the teeth, and also the problem of accuracy of registration of the rolls. I have found that if
 10 the space between pins, circumferentially of the rolls, is made about four times the width of the working faces or tops of the pins in the same direction, these requirements are satisfied; and closely spaced indentations can be made. Similarly,
 15 longitudinally of the rolls, the space between the pins should be about three times the width of the working faces or tops of the pins in the same direction. By space or spacing between pins is meant the distance measured from edge to edge at the tops of the pins.

15 So far as I am aware, I am the first to produce an indented paper having small dome-shaped, closely arranged projections and depressions from paper which has been previously made and
 20 dried. So far as I have been able to determine, the paper used must be of a type that when slightly moist, will flow in a tiny mold without breaking. Also, the indenting roll pattern must be one which holds the sheet and forces it to
 25 flow, rather than permitting it to flute, as in corrugating.

30 The product is a much better cushion than corrugated paper, and it needs no liners. Furthermore, it is much more economical than corrugated paper, because there is substantially no contraction in area due to the indentation as compared to corrugated paper which contracts something like thirty per cent of original length as a result of corrugating.

35 Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A method of forming indented paper, which

consists in employing a web of paper which has been previously made and dried, moistening the paper so that it contains more than around ten per cent moisture, and not more than around
 5 twenty-five per cent moisture, and passing the paper between rolls equipped on their surfaces with pins, said pins being arranged in alternate
 10 offset rows lengthwise of each of the rolls, whereby a pin on one roll will engage the paper between two pins on the other roll, both circumferentially and lengthwise of the rolls, said pins being of
 15 small size and spaced so as to form a substantially continuously deformed product, the spacing between the indenting pins on each roll in one direction longitudinally of the web being about
 20 four times the width of the tops of the said indenting pins taken in the same direction, and the spacing between the indenting pins in one direction transversely of the web being about three
 25 times the width of the tops of the said indenting pins taken in the same direction.

2. A method of forming indented paper which consists in employing a web of paper which has been previously made and dried, moistening the paper so as to impart plastic flow, and passing
 25 the paper between rolls equipped with pins in alternate offset rows lengthwise of each of the rolls, the spacing between pins in the rows being about three times the dimension of the tops of the pins in the direction of the rows, and the spacing of
 30 the rows being about twice the dimension of the tops of the pins circumferentially of the rolls, and arranged so that a pin on one roll will engage the paper between two pins on the other roll axially of the other roll and circumferentially
 35 of the other roll.

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