

March 29, 1966

S. R. M. ELLIS ETAL
TOWER PACKING UNITS

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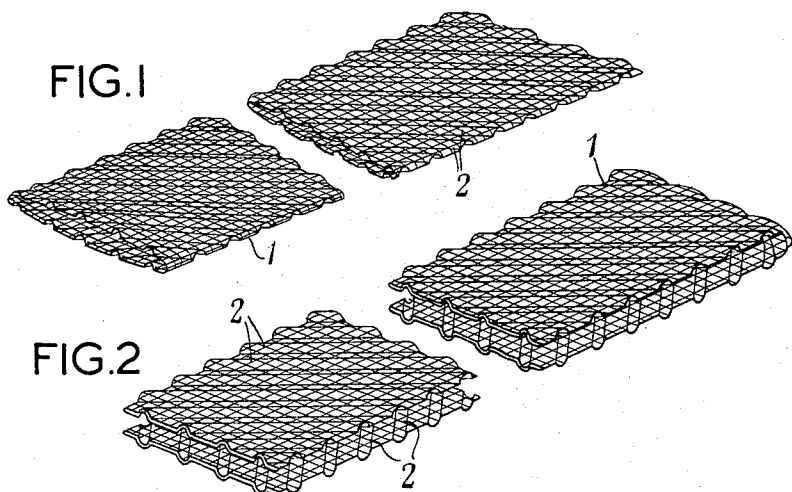
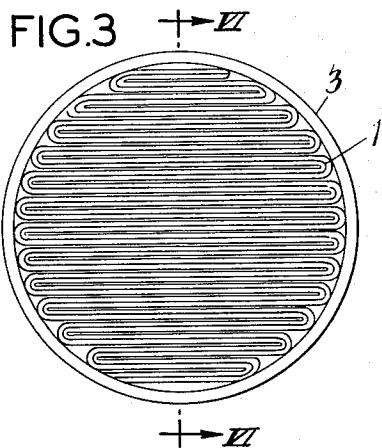
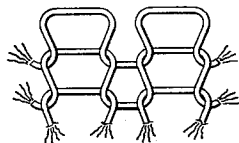
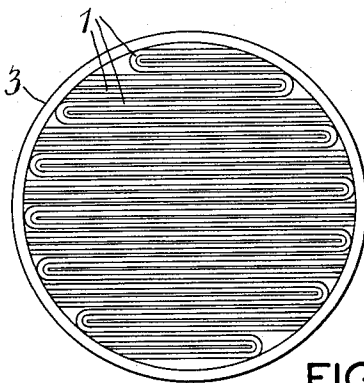


FIG.5

FIG.4

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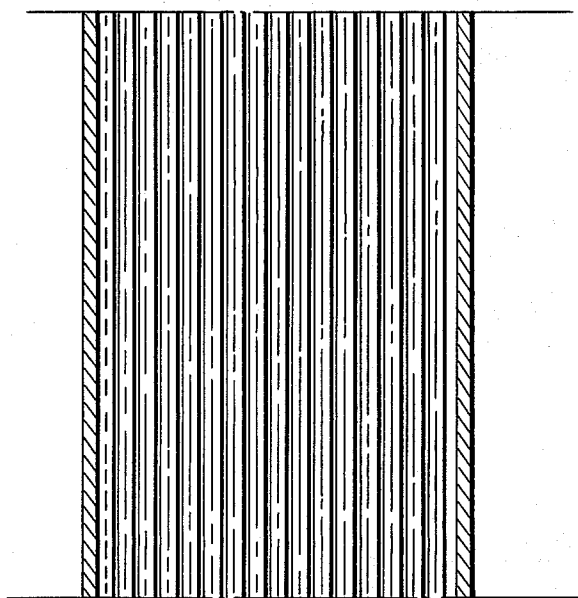
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Fig. 6



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TOWER PACKING UNITS

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4 Claims. (Cl. 261-94)

This invention relates to tower packing units for use in mass transfer processes carried out in towers or columns in which fluid media are contacted, and is particularly concerned with improvements in packing units of the kind utilizing filamentary material.

With a view to attaining a relatively high efficiency and lower pressure drop characteristics not obtainable with prior wire gauze packings and rolled knitted monofilament mesh packings, it has been proposed to use fabrics knitted from suitable multi-filament materials to form a tube which is thereafter flattened to make a double thickness of ribbon which is crimped along parallel lines at an angle to the centre line.

Heretofore, these fabrics were used in the following manner: two double thickness ribbons were superimposed one on the other so that the crimping lines of the two ribbons at the adjacent faces crossed and the double layer material was then rolled up spirally to form a cartridge having substantially the same diameter as that of the tower or column into which it is to be fitted. Packing units formed in this manner appeared to be highly satisfactory in small towers or columns e.g. of up to about 2 inches in diameter, but it was found that in larger columns e.g. of about 6" in diameter there was a serious decline in efficiency which appeared to be due to the tendency of liquid to channel towards the centre of the packing, this being evident from measurement which demonstrates concentrated flow of liquid at the centre of the packing.

In order to overcome this undesirable tendency, various expedients have been tried. For example, concentric layers of the knitted fabric have been separated by impervious membranes of polytetrafluoroethylene or the like.

The present invention has for its object to provide an improved form of packing unit utilizing knitted multi-filament material of the kind above referred to, whereby more uniform liquid distribution throughout the cross-sectional area of the packing unit and consequent higher efficiency is obtainable.

According to the present invention, a tower packing unit made from fabric knitted from suitable multi-filament materials in the form of a tube which is thereafter flattened to form a double thickness ribbon which is crimped along parallel lines at an angle to the longitudinal centre line of the ribbon, is characterized in that the packing unit comprises a laminated assembly of vertically disposed plane layers of the fabric arranged so that throughout the assemblage the crimping lines of adjacent surfaces of alternate layers cross one another. In such an arrangement, the packs of the corrugations formed by crimping any one layer contact in crossed relation the peaks of the corrugations in the adjacent layer so that the main bodies of the layers are thereby spaced apart.

In one embodiment, a length of flattened tubular knitted multi-filament crimped fabric is first doubled upon itself so that adjacent faces between the two layer have the crimped lines crossing one another, and the doubled material is then folded upon itself in zig-zag fashion. For cylindrical towers, the folds increase in length successively from the ends of the doubled length of material

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so as to form a folded package of substantially cylindrical form.

In a modification, single layer or folded double layer pieces of the material may be assembled to form a package in which the crimping lines of each pair of adjacent faces cross one another. The package may be retained by a peripheral band of material which may comprise one or more layers of the double thickness multi-filament crimped material.

It has been found that by the use of tower packing units according to the invention in which the material is arranged in vertically disposed parallel plane layers, there is little or no tendency for liquid to be channelled to the centre and thus the more uniform liquid distribution obtainable by the improved packing units gives improved efficiency.

The fabric may be made of any suitable stiff filamentary or fibrous material. For use at high temperatures the fabric may be made of metal wire, such as stainless steel or copper alloy, or may be made of glass filaments, while for use at lower temperatures, synthetic plastics or other suitable filamentary materials may be employed. In the case of metal wire, the material may be knitted from a strand comprising a bunch of about eight monofilaments. The crimping advantageously is at an angle of between 30° and 45° relatively to the longitudinal centre line of the ribbon of double thickness material.

The invention is hereinafter described, by way of example, with reference to the accompanying diagrammatic drawings, in which:

FIG. 1 is a perspective view illustrating a length of double thickness material formed by knitting a multi-filament strand to form a tube and then flattening said tube and crimping on parallel lines at an angle to the longitudinal centre line of the double thickness ribbon so formed;

FIG. 2 is a perspective view showing the ribbon doubled upon itself so that the crimping lines on the adjacent inner faces and on the outer faces cross one another;

FIG. 3 is a plan view illustrating one embodiment of tower packing unit produced by folding the doubled ribbon shown in FIG. 2 in zig-zag fashion;

FIG. 4 is a plan view illustrating a further modification in which the packing unit is formed by assembling layers of folded double thickness material;

FIG. 5 is an enlarged detail view illustrating a preferred knitted formation of the multi-filament material; and

FIG. 6 is a view in vertical central section taken on line VI-VI of FIG. 3.

Tower packing units according to the invention are made from material which is of known form and is made by knitting multi-filament wire or other suitable filamentary or fibrous material to form a tube which is flattened to form a ribbon 1, FIG. 1, of double thickness material which is crimped on parallel lines 2 at an angle to the longitudinal centre line of the ribbon.

In one embodiment, the ribbon 1 is doubled over, as shown in FIG. 2, to form a double thickness material in which the crimping lines 2 on the adjacent inner faces cross one another and in which the crimping lines 2 on the opposite outer faces are oppositely inclined. The length of doubled material shown in FIG. 2 is formed into a substantially cylindrical package, as shown in FIG. 3, by folding upon itself in zig-zag fashion, the package being conveniently retained by a peripheral band or layer 3 which may comprise a layer or layers of the same or similar material.

In the modification shown in FIG. 4, the tower packing unit may comprise an assemblage of folded double

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thickness pieces of material retained by a peripheral band 3.

In all cases the arrangement is such that the crimping lines of any two adjacent faces cross one another.

In filling a tower or column, the elements are placed one above the other, preferably with the planes of the vertical layers of one unit set at an angle, e.g. of 90° with respect to the planes of the vertical layers of adjacent units.

The term "crimping" used herein includes the forming of continuous or interrupted corrugations in the material or any equivalent formation.

It will be understood that the invention is not limited to the particular embodiment hereinbefore described and that the knitted multi-filament crimped material may be otherwise arranged in vertically disposed plane layers to form tower packings of any desired shape in plan.

We claim:

1. In a tower packing unit for use in mass transfer processes carried out in vapour/liquid contact apparatus, the combination comprising a plurality of sections of a flattened knitted tube of multi-filament material, said plurality of sections being constituted by a continuous length of flattened tube folded back and forth upon itself and being located in side-by-side touching relation in vertically disposed planes, said flattened knitted tube sections being crimped along parallel lines at an angle to the longitudinal centre line of said tube and the lines of crimping of adjacent sections crossing one another, said packing unit having substantially the same diameter as that of a tower into which it is to be fitted.

2. A tower packing unit as defined in claim 1 wherein adjacent sections of said flattened tube have progres-

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sively different lengths so as to develop a packing unit assembly having a cylindrical configuration.

3. A tower packing unit as defined in claim 1 and which further includes a peripherally extending band for retaining said plurality of flattened knitted tube sections in an assembly.

4. A tower packing unit as defined in claim 3 wherein said peripherally extending band is also constituted by a flattened knitted tube of multi-filament material crimped along parallel lines at an angle to the longitudinal centre line thereof.

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